Urologic Diseases in America

Interim Compendium

National Institute of Diabetes & Digestive & Kidney Diseases

NATIONAL INSTITUTES OF HEALTH

DEPARTMENT OF HEALTH & HUMAN SERVICES · USA

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UROLOGIC DISEASES IN AMERICA

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This book is dedicated to the memory of Dr. Dalia Spektor, 1944–2002.

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Introduction

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The burden of urologic diseases on the American public is immense in both human and financial terms and until now has remained largely unquantified. Urologic diseases encompass a wide scope of illnesses of the genitourinary tract, including conditions that are congenital and acquired, malignant and benign, male and female, medical and surgical. They can occur at any point in the course of human development, from hydronephrosis *in utero* to urinary incontinence in the elderly. They may be acute and self-limited or chronic and debilitating, may primarily affect quality or quantity of life, and may be financially insignificant or catastrophic. Some urologic diseases present with complex signs and symptoms and require extensive evaluation, while others present with classical symptoms and are easily diagnosed. Still others occur without any symptoms at all and are discovered incidentally or during screening. For many urologic diseases the etiology is well understood, and the natural history is fairly predictable. As is the case with many organ systems, physician practice patterns for treating both common and uncommon urologic conditions vary widely and have evolved substantially during recent years.

Accurate information on the epidemiology and impact of urologic diseases is critical to the equitable allocation of scarce resources at the national, state, and local levels. Indeed, as the American population ages, there is a growing need for information about the urologic health problems facing older adults. In conjunction with findings from clinical studies and basic research on biological mechanisms, an epidemiologic approach offers insights on the prevalence, etiology, and impact of urologic conditions. This information can provide the basis for planning health care services and intervention programs (1).

Despite the need, reliable and valid health services data about urologic diseases have been scattered, inconsistent, and not readily available. The capabilities of the information age highlight this deficiency. There is no national surveillance system describing prevalence and incidence across all urologic diseases. Instead, various government and non-government agencies in the United States maintain a patchwork of population-based studies, observational cohorts, national interview surveys, reviews of physician practice patterns, hospital system databases, regional cancer registries, state health department health information systems, and federal, state, and private insurance claims-based datasets that can provide useful health statistics. These sources contain a wealth of epidemiologic and health services information about health care costs, access, and quality, as well as trends in the diagnosis and management of urologic diseases; however, the information sources remain largely untapped.

The overall objective of this project, *Urologic Diseases in America*, is to quantify the burden of urologic diseases on the American public. We undertook this effort with the aid of sophisticated research methodologies and experienced analytic and administrative staff. Our team included epidemiologists, health economists, statisticians, programmers, and urologists trained in health services research. We searched all potential data sources for relevant information and health statistics in order to gather current and retrospective data on all aspects of the epidemiology, practice patterns, costs, and impact of urologic diseases in the United States. This volume is intended to convey meaningful information to users at various levels of medical sophistication, including the public, elected leaders, government officials, non-governmental organizations, media outlets, physicians, nurses, allied health care personnel, and academic researchers.

We began our work by conducting an exhaustive nationwide search for all possible sources of health data for urologic diseases in America. This search included data sources such as the large population surveys maintained by the federal government (e.g., National Center for Health Statistics), health care financing agencies (e.g., Centers for Medicare and Medicaid Services), hospital consortia, insurers, physician groups, state and county medical associations, physician specialty societies, private health care foundations, private sources, and the published literature. After defining a universe of potential data sources, we assessed each one on the basis of relevance, reliability, validity, quality assurance mechanisms, accessibility, cost, user-friendliness, and other factors determined to be important to researchers and the public. With guidance from the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), we selected the datasets most likely to provide useful information (Appendix A). These included datasets from the Centers for Medicare and Medicaid Services, population-based datasets, datasets with information about health care utilization and costs, and those with unique features or populations of interest that added dimension to the project.

We stratified the scope of urologic practice into twelve discrete clinical areas for analysis. Because resources were limited, we were unable to address certain less frequent urologic diagnoses. Table 1 lists the conditions selected for inclusion in the *Urologic Diseases in America* project, the first four of which are covered in this interim compendium.

For each condition, clinical and coding experts developed a set of codes from the National Center for Health Statistics' International Classification of Diseases, 9th revision (ICD-9), the American Medical Association's Current Procedural Terminology (CPT),

Table 1. Conditions analyzed in *Urologic Diseases in America*
Urolithiasis
Benign prostatic hyperplasia and lower urinary tract symptoms
Urinary incontinence
Female
Male
Pediatric
Urinary tract infection
Female
Male
Pediatric
Sexually transmitted diseases
Pre-natal hydronephrosis
Vesicoureteral reflux
Posterior urethral valves
Ureterocele
Ureteropelvic junction obstruction
Male reproductive health
Erectile dysfunction
Peyronie's Disease
Infertility
Undescended testis
Urethral diseases
Hypospadias
Stricture
Interstitial cystitis and chronic prostatitis
Prostate cancer
Bladder cancer
Kidney cancer
Testis cancer

and the Healthcare Common Procedure Coding System (HCPCS) to define relevant diagnoses, diagnostic procedures, and therapeutic interventions. These codes appear in the first table of each chapter. We applied these codes to analytic files from each dataset. Wherever possible, we stratified results into major demographic groups, usually by age group, gender, race/ethnicity, geographic region, and rural/urban status. We age-adjusted certain tables at the discretion of each chapter author (so indicated in those tables). For certain economic analyses, we constructed multivariate models. Urinary incontinence and urinary tract infection are each divided into three chapters – female, male, and children. The chapters on urinary tract infection are complemented by a special chapter on sexually transmitted diseases, which was prepared by staff at the Centers for Disease Control. All analytic techniques and further information on the datasets are presented in great detail in the methods chapter.

After completing initial data analyses and constructing draft tables to present information on trends in incidence, prevalence, practice patterns, resource utilization, and costs, we convened a writing committee of academic physicians with experience in health services research and detailed clinical knowledge of our first four conditions. At this meeting, we also shared with them detailed literature reviews that included all pertinent population-based epidemiologic and economic studies in the urologic conditions of interest. These individuals provided expert feedback and subsequent input on the execution of additional analyses and refinement of the previous ones. After completing a final set of tables and figures, we asked the writing committee members to provide insight, elaboration, and interpretation – to draw qualitative meaning – on the quantitative findings. The essays they submitted on each clinical topic were subjected to three rounds of formal peer review, which was overseen by an External Consultation and Advisory Committee (ECAC). The ECAC included representation from the fields of academic urology, gynecology, nephrology, internal medicine, as well as experts in claims analysis, Medicare data, epidemiology, and health services research. The ECAC met several times to provide guidance and feedback on the selection of databases and analyses, generation of data tables, interaction with the chapter authors, and the development of the chapters themselves. After the review process was complete, the ECAC and NIDDK carried out an additional review to ensure accuracy and readability. The resulting chapters on the first four conditions fill this interim compendium. The final compendium, which will be available in 2006, will include all twelve conditions.

Although the chapter authors have worked hard to identify and summarize principal findings for the first four urologic conditions, we encourage both casual and formal readers of the compendium to roll up their sleeves and wander leisurely through the data tables and figures. The chapters are rife with large and small results, some annotated in the text and others waiting to be discovered in the myriad rows and columns. Interested readers could explore any of these findings in more detailed, multivariate analyses. Tables 2 and 3 recapitulate a few of the most salient observations regarding outpatient visits, inpatient hospitalizations, and costs for the most recent years of data analyzed for the interim compendium.

We faced important challenges in our analytic endeavors. Foremost among these was the limited amount of data available for conditions in pediatric urology, particularly the lack of information on the costs of pharmaceutical and medical services. Other methodological limitations are listed in the methods chapter. Furthermore, each chapter concludes with

Table 2. The burden of urologic diseases in America in 2000.

	Visits to Office-Based Physicians[1] and Hospital Outpatient Clinics[2]		Visits to Emergency Rooms[2]	Hospital Stays	Total Expenditures (in millions of $)[1-4]
	Primary Diagnosis	*Any Diagnosis*			
Urolithiasis	1,996,907	2,682,290	614,647	177,496	$2,067.4
Benign prostatic hyperplasia	4,418,425	7,797,781	117,413	105,185	$1,099.5
Urinary incontinence					
Female adult	1,159,877[a]	2,130,929	*	46,470	$452.8
Male adult	*	*	*	1,332	$10.3
Urinary tract infection					
Female adult	6,860,160	8,966,738	1,311,359	245,879	$2,474.0
Male adult	1,409,963	2,049,232	424,705	121,367	$1,027.9

*Counts too low to produce reliable estimate.

[a]Physician office visits only; counts not available for hospital outpatient clinics.

SOURCES:[1]National Ambulatory Medical Care Survey; [2]National Hospital Ambulatory Medical Care Survey; [3]Healthcare Cost and Utilization Project; [4]Medical Expenditure Panel Survey.

Table 3. Expenditures for Medicare beneficiaries with urologic diseases in 1998.

	Medical Expenditures (in millions of $)			
	Inpatient	Outpatient	ER	Total
Urolithiasis	$518.9	$296.1	$19.4	$834.4
Benign prostatic hyperplasia	$315.0	$441.2	$19.8	$776.0
Urinary incontinence				
Female adult	$110.1	$123.7	$0.6	$234.4
Male adult	$11.3	$27.1	$0.6	$39.0
Urinary tract infection				
Female adult	$687.6	$210.5	$58.4	$956.5
Male adult	$376.4	$81.4	$22.4	$480.2

SOURCE: Centers for Medicare and Medicaid Services.

specific recommendations for improving the available datasets to support more thorough descriptions of the impact of each condition.

By any measure, the burden of urologic disease on the American public is immense and deserves further attention, in terms of clinical investigation, epidemiologic analysis, and health services research.

Accurately describing the burden of urologic disease on the American public is one of the most important efforts that the NIDDK will undertake at the dawn of the new millennium. Documenting trends in epidemiology, practice patterns, resource utilization, and costs for urologic disease has broad implications for quality of health care, access to care, and the equitable allocation of scarce resources, both in terms of medical services and research budgets. The *Urologic Diseases in America* project represents a major step toward accomplishing those goals.

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CHAPTER 1

Urolithiasis

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Urolithaisis

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INTRODUCTION

It has been estimated that up to 10% of males and 5% of females in the United States will form a kidney stone (i.e., experience urolithiasis) at some time during their lives (1, 2). These figures would be slightly higher if stones that form in other parts of the urinary tract were included. While rarely fatal, urolithiasis causes substantial morbidity. In addition to the pain and suffering of an acute stone event, treatment incurs substantial costs, and additional costs result from time lost from work, as many individuals are affected during their working years.

DEFINITION AND DIAGNOSIS

Urolithiasis denotes stones originating anywhere in the urinary tract, including the kidneys and bladder. However, the pathophysiologic bases for the formation of kidney and bladder stones are entirely different. Kidney stones form as a result of physicochemical or genetic derangements leading to supersaturation of the urine with stone-forming salts or, less commonly, from recurrent urinary tract infection with urease-producing bacteria. Stasis in the upper urinary tract due to local anatomic anomalies may also promote or enhance stone formation in susceptible individuals. In contrast, bladder stones form almost exclusively as a result of urinary stasis and/or recurrent infection due to bladder outlet obstruction or neurogenic bladder. The patient populations at risk for different locations of stones are disparate, with kidney stones occurring most often in otherwise healthy individuals and bladder stones occurring in those with neurologic and/or anatomic abnormalities. For the purposes of this chapter, we have tried to distinguish upper urinary tract stones (kidney and ureteral stones) from lower urinary tract stones (bladder stones), although in some cases the data for the two sites are combined. Table 1 presents diagnosis codes associated with urolithiasis.

Although obstructing urinary tract stones are typically associated with symptoms, a definitive diagnosis of urolithiasis cannot be based on symptoms alone. Because of the embryonic development of the kidneys and genital system, as well as the close nerve and vascular supply, pain due to stones may be referred to the gonads or confused with gastrointestinal pathology such as cholecystitis, appendicitis, gastric ulcer, or diverticulitis. Likewise, cystitis and pyelonephritis may mimic acute renal colic. Musculoskeletal pain, particularly over the flanks, may also be incorrectly attributed to stone pain.

A definitive diagnosis of a stone requires either direct stone retrieval after spontaneous passage or surgical intervention, or identification by radiologic imaging. Although an abdominal x-ray of the kidneys-ureters-bladder (KUB) is simple and requires no preparation, it can fail to reveal small or radiolucent stones. Excretory urography, also known as intravenous pyelography (IVP), is more sensitive than KUB and provides more anatomic information, but IVP can still miss small or radiolucent nonobstructing stones. Ultrasound has the advantage of avoiding exposure to radiation or contrast and can

Table 1. Codes used in the diagnosis and management of urolithiasis

Upper Tract

Individuals with one of the following ICD-9 codes:

270.0	Disturbance of amino-acid transport
274.11	Uric acid nephrolithiasis
592.0	Calculus of kidney
592.1	Calculus of ureter
592.9	Urinary calculus, unspecified

Individuals with the following ICD-9 disease code and any one of the following procedure codes, or the procedure code alone:

271.8	Other specified disorders of carbohydrate transport and metabolism
and	
ICD-9 Procedure Code	
55.03	Percutaneous nephrostomy without fragmentation
55.04	Percutaneous nephrostomy with fragmentation
55.92	Percutaneous aspiration of kidney (pelvis)
56.0	Transurethral removal of obstruction from ureter and renal pelvis
56.2	Ureterotomy
59.8	Ureteral catheterization
59.95	Ultrasonic fragmentation of urinary stones
98.51	Extracorporeal shockwave lithotripsy (ESWL) of the kidney, ureter and/or bladder
CPT-4 Procedure Codes	
50060	Nephrolithotomy; removal of calculus
50065	Nephrolithotomy; secondary surgical operation for calculus
50070	Nephrolithotomy; complicated by congenital kidney abnormality
50075	Nephrolithotomy; removal of large staghorn calculus filling renal pelvis and calyces (includes anatrophic pyelolithotomy)
50080	Percutaneous nephrostolithotomy or pyelostolithotomy, with or without dilation, endoscopy, lithotripsy, stenting, or basket extraction; up to 2 cm
50081	Percutaneous nephrostolithotomy or pyelostolithotomy, with or without dilation, endoscopy, lithotripsy, stenting, or basket extraction; over 2 cm
50125	Pyelotomy; with drainage, pyelostomy
50590	Lithotripsy, extracorporeal shock wave
50610	Ureterolithotomy; upper one-third of ureter
50620	Ureterolithotomy; middle one-third of ureter
50630	Ureterolithotomy; lower one-third of ureter
52320	Cystourethroscopy (including ureteral catheterization); with removal of ureteral calculus
52325	Cystourethroscopy (including ureteral catheterization); with fragmentation of ureteral calculus (e.g., ultrasonic or electro-hydraulic technique)
52330	Cystourethroscopy (including ureteral catheterization): with manipulation, without removal of ureteral calculus
52351	Cystourethroscopy, with ureteroscopy and/or pyeloscopy; diagnostic (prior to 2001 was 52335)
52352	Cystourethroscopy, with ureteroscopy and/or pyeloscopy; with removal or manipulation of calculus (ureteral catheterization is included (prior to 2001 was 52336)
52353	Cystourethroscopy, with ureteroscopy and/or pyeloscopy; with lithotripsy (ureteral catheterization is included) (prior to 2001 was 52337)

Lower Tract

Individuals with one of the following ICD-9 codes:

594.0	Calculus in diverticulum of bladder
594.1	Other calculus in bladder
594.2	Calculus in urethra
594.8	Other lower urinary tract calculus
594. 9	Calculus of lower urinary tract unspecified

detect most renal calcifications, but it is less sensitive in delineating stone size and number and cannot detect most ureteral stones. Magnetic resonance imaging is not a recommended modality because stones do not generate a signal, although medium to large stones will be seen as signal voids within the collecting system.

The most sensitive imaging modality for the diagnosis of renal, ureteral, and bladder calculi is non-enhanced, thin-cut helical computed tomography (CT), which can detect stones as small as 1 mm in diameter, regardless of composition, with the exception of indinavir stones. In recent years, non-contrast helical CT has emerged as the imaging study of choice for the evaluation of acute flank pain because of its high sensitivity and specificity in detecting renal and ureteral calculi, rapid acquisition time (less than a breath hold), and avoidance of intravenous contrast. Indeed, data derived from the Centers for Medicare and Medicaid Services (CMS) show that although IVP was still used more commonly than CT in 1998, there was a 31% decrease in the use of excretory urography and a threefold increase in the use of non-contrast CT for the diagnosis of urolithiasis between 1992 and 1998 (Table 2).

Individuals with persistent crystalluria may never form a stone, and these individuals are unlikely to be given a diagnosis of urolithiasis unless they form one. There is no clear definition that distinguishes crystalluria (or the passage of *sludge*) from urolithiasis, so the diagnosis depends on the resolution of the imaging method used. Occasionally, calcifications in the renal parenchyma are distinguished from calcifications in the urinary collecting system. Recent work suggests that intrarenal calcifications may be important precursors to stone formation (3), although further studies are needed to clarify this issue. Of the various stone compositions that occur in the urinary tract, each has specific risk factors. Most upper tract stones are composed of calcium oxalate, calcium phosphate, uric acid, struvite, or cystine; most bladder stones are composed of uric acid or calcium phosphate. Less common stones include those made of xanthine, indinavir, ephedrine, and 2,8-dihydroxyadenine.

RISK FACTORS

Risk factors for urolithiasis include age, sex, diet, geographic location, systemic and local medical conditions, genetic predisposition, and urinary composition. Urinary composition determines stone formation based on three factors: exceeding the formation product of stone forming components, the quantity of inhibitors (e.g., citrate, glycosaminoglycans, etc.) and promoters (e.g., sodium, urates, etc.) in the urine. The anatomy of the upper and lower tracts may also influence the likelihood of stone formation by predisposing to urinary tract infection or stasis. The reader is referred to major urology textbooks for additional details.

TREATMENT

The indications for surgical intervention for upper tract stones include recurrent pain, high-grade obstruction, associated infection, growth of stones despite medical therapy, and large size of stones. Treatment options include shock wave lithotripsy (SWL), ureteroscopy, percutaneous nephrostolithotomy (PCNL), and open or laparoscopic stone removal. SWL is the most commonly employed treatment modality for renal and ureteral calculi and for stones associated with some anatomic abnormalities, specifically obstruction (e.g., ureteropelvic junction obstruction, ureteric stricture, etc.) and the only completely non-invasive treatment option. Ureteroscopy is primarily used to treat ureteral stones but is increasingly being used to treat renal calculi for which SWL has failed or is ill-advised. Percutaneous nephrostolithotomy is indicated for large-volume renal calculi and for stones associated with some anatomic abnormalities. Finally, open and laparoscopic surgery are reserved for stones that have not been treatable with less invasive treatment options or are associated with extensive anatomic abnormalities that require simultaneous repair. However, open or laparoscopic therapy for urolithiasis is indicated in fewer than 2% of patients today.

Bladder stones are predominantly treated with endoscopic fragmentation, and less commonly with SWL or open procedures. Rarely, these stones have been approached laparoscopically. Because of the

Table 2. Use of imaging procedures in evaluation of urolithiasis among Medicare beneficiaries, count[a], rate[b]

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total	131,200	81,466	166,580	91,546	184,320	97,825
Intravenous pyelogram	36,600	22,682	38,820	21,334	31,460	16,697
Ambulatory surgery center	1,720	1,066	1,860	1,022	1,540	817
Inpatient	13,020	8,069	11,820	6,496	7,960	4,225
Hospital outpatient	520	322	620	341	480	255
Physician office	21,340	13,225	24,520	13,475	21,480	11,400
Plain film/KUB	70,760	43,852	93,100	51,165	107,700	57,160
Ambulatory surgery center	13,220	8,193	16,380	9,002	18,220	9,670
Inpatient	15,560	9,643	13,280	7,298	13,640	7,239
Hospital outpatient	1,860	1,153	1,820	1,000	1,940	1,030
Physician office	40,120	24,864	61,620	33,865	73,900	39,221
Ultrasound (renal)	18,320	11,353	27,440	15,080	32,460	17,227
Ambulatory surgery center	520	322	500	275	800	425
Inpatient	6,020	3,731	7,660	4,210	9,800	5,201
Hospital outpatient	240	149	220	121	240	127
Physician office	11,540	7,152	19,060	10,475	21,620	11,474
Magnetic resonance imaging, abdomen	60	37	60	33	100	53
Ambulatory surgery center	0	0.0	0	0.0	0	0.0
Inpatient	40	25	40	22	40	21
Hospital outpatient	0	0.0	0	0.0	20	11
Physician office	20	12	20	11	40	21
CT abdomen/pelvis with contrast	1,180	731	1,640	901	2,280	1,210
Ambulatory surgery center	60	37	220	121	160	85
Inpatient	920	570	1,060	583	1,560	828
Hospital outpatient	0	0.0	0	0.0	0	0.0
Physician office	200	124	360	198	560	297
CT abdomen/pelvis without contrast	1,160	719	1,660	912	5,980	3,174
Ambulatory surgery center	60	37	200	110	420	223
Inpatient	640	397	1,020	561	3,320	1,762
Hospital outpatient	20	12	0	0.0	80	42
Physician office	440	273	440	242	2,160	1,146
CT abdomen/pelvis with and without contrast	1,400	892	2,080	1,143	2,560	1,359
Ambulatory surgery center	200	124	180	99	140	74
Inpatient	720	446	920	506	1,120	594
Hospital outpatient	0	0.0	60	33	100	53
Physician office	520	322	920	506	1,200	637
CT scan abdomen, unspecified						
Inpatient	1,720	1,200	1,780	978	1,780	945

[a]Unweighted counts were multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 based on number of Medicare beneficiaries with diagnosis of urolithiasis.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, 5% file, 1992, 1995, 1998.

underlying anatomic predisposition to bladder stones, simultaneous treatment of bladder outlet obstruction is commonly performed, combining either open prostatectomy or transurethral prostate resection with stone removal or fragmentation.

Improvements in the instrumentation and technique for endoscopic stone removal and refinements in the indications for SWL treatment have improved success rates and reduced the morbidity associated with stone treatment. As a result, treatment selection has changed over time to accommodate the new technology. These changes, along with changes in prevalence, have altered the economic impact of stone disease. A trend toward less invasive treatment options that require shorter hospital stays and enable quicker convalescence has reduced hospital costs and lessened the burden of lost workdays. Nevertheless, the costs of stone disease—both direct medical expenditures and the costs of missed work and lost wages—are difficult to ascertain. This chapter provides data from a variety of sources to assist in estimating the financial burden of urolithiasis in terms of expenditures by the payor.

While this chapter presents the best available information regarding the financial burden of stone disease, some important limitations should be kept in mind when viewing the tabular data. Although there are clear differences in some rates by age and sex, the rates for many of the factors of interest are age-adjusted only in certain tables, and none of the data were sex-adjusted. This may have an impact on the interpretation of the rates, as indicated later in the chapter. There is no new information available on rates for specific stone types and sizes or for first-time versus recurrent stone formers; nor is there new information on incidence rates in the strict epidemiologic sense (first event). Finally, because of the structure of the databases that were used to collect the information, we cannot draw causal inferences about risk factors.

PREVALENCE AND INCIDENCE

Because stones in the urinary tract may be present but asymptomatic, prevalence estimates based on questionnaires or medical encounters are likely to be underestimates. For clarity of interpretation, it is important to distinguish between *prevalent stones* (stones that are actually in the patient) and *prevalent stone disease* (patients with a history of stone disease but who may not currently have a stone). For this chapter, the term *prevalence* refers to prevalent stone disease unless otherwise noted.

Several factors have hampered our understanding of the prevalence and incidence of urolithiasis. Lack of comprehensive data has led to a variety of beliefs regarding the frequency of stone disease. Because a number of factors, including age and sex, influence prevalence and incidence, care must be taken when interpreting results and

Table 3. Percent prevalence[a] of a history of kidney stones (±SE) in United States adults by gender, age group, and time period (NHANES II, 1976 to 1980; NHANES III, 1988 to 1994)

	Males			Females		
Age	1976 to 1980	1988 to 1994	Difference (95% CI)[b]	1976 to 1980	1988 to 1994	Difference (95% CI)[b]
20–29	0.9 ± 0.31	1.3 ± 0.42	0.4 (–0.6, 1.4)	1.4 ± 0.36	2.0 ± 0.51	0.6 (–0.6, 1.9)
30–39	4.2 ± 0.51	3.6 ± 0.75	–0.6 (–2.4, 1.1)	2.0 ± 0.37	3.0 ± 0.57	1.0 (–0.8, 2.8)
40–49	6.9 ± 0.99	9.5 ± 1.45	2.6 (–0.8, 6.1)	2.2 ± 0.40	4.2 ± 0.70	2.0 (0.4, 3.5)
50–59	7.5 ± 1.26	9.6 ± 1.17	2.1 (–1.3, 5.4)	5.3 ± 0.64	7.0 ± 1.10	1.7 (–0.7, 4.3)
60–69	8.3 ± 0.66	11.1 ± 1.68	2.8 (–0.8, 6.3)	4.2 ± 0.48	5.6 ± 0.88	1.4 (–0.6, 3.3)
70–74	6.7 ± 0.86	13.3 ± 1.81	6.6 (2.7, 10.5)	3.7 ± 0.68	6.9 ± 1.38	3.2 (0.2, 6.3)
All ages[c]	4.9 ± 0.42	6.3 ± 0.56	1.4 (0.05, 2.8)	2.8 ± 0.17	4.1 ± 0.27	1.3 (0.7, 1.5)

[a]Crude unadjusted prevalence.

[b]Difference is prevalence in 1988 to 1994 minus prevalence in 1976 to 1980; 95% CI denotes the lower limit, upper limit of the 95% CI estimate of the difference. Bold type indicates that the difference was statistically significant at P < 0.05.

[c]Persons 20 to 74 years of age.

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comparing studies. Demographic factors that are traditionally believed to be associated with risk of upper tract stone disease but are by no means proven include sex (the ratio of male:female incidence is 2:1 to 3:1), age (peak incidence occurs between 20 and 60 years of age), race, and geography (North–South and West–East gradients). The data presented here shed considerable light on the relative importance of these factors.

A recent study based on data from National Health and Nutrition Examination Survey (NHANES) II (1976 to 1980) and NHANES III (1988 to 1994) suggests that kidney stone disease is becoming more common (4) (Table 3 and Figure 1). Prevalence of the disease in US adults increased from 3.8% to 5.2% between the two time periods; it increased across all age groups and in both sexes (Table 4), and in both African Americans and Caucasians in all age groups (Figure 2) (5). Stamatelou et al. also found that a history of kidney stone disease was most common among non-Hispanic Caucasians; prevalence among non-Hispanic African Americans was approximately 70% lower, and among Mexican Americans it was approximately 35% lower. In the 1988–1994 period, the age-adjusted prevalence was highest in the South (6.6%) and lowest in the West (3.3%).

Few studies contain information on true incidence rates for urolithiasis, where incidence is defined as the first stone-related event. Factors that influence incidence rates are sex, age, race, and geographic region. Population-based estimates have ranged from 1 to 3 per 1,000 per year for men and 0.6 to 1.0 per 1,000 per year for women (1, 2, 6, 7). Overall, the age-specific rates for males seem to rise

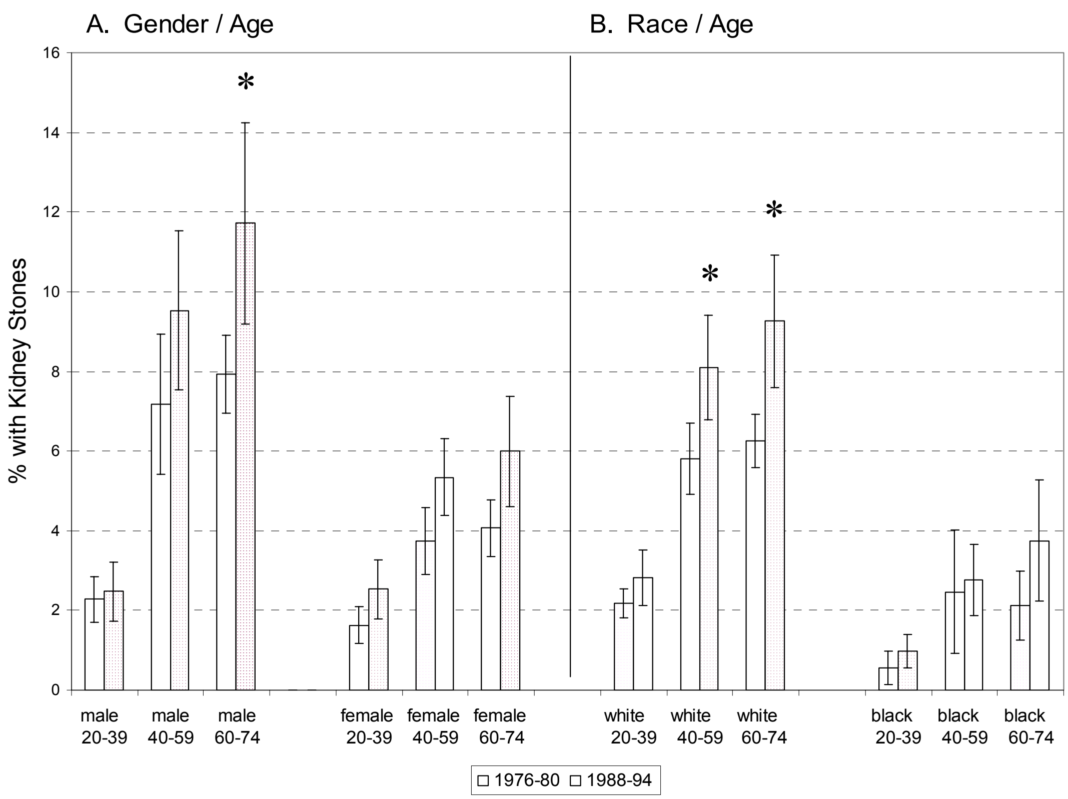

Figure 1. Percent prevalence of history of kidney stones for 1976 to 1980 and 1988 to 1994 in each age group for each gender (A) and each race group (B) . Error bars denote the 95% confidence interval. *Statistically significant time period difference.

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Table 4. Age-, race-, and gender-specific prevalence of kidney stones in CPS II and NHANES II

		CPS II								NHANES II	
		White		Black		Hispanic		Asian		White	
Gender	Age	N	Prev.	N	Prev.	N	Prev.	N	Prev.	N	Prev.
Male	30–39	16,920	4.2	1,264	2.0	405	3.0	226	2.2	921	4.7
	40–49	83,914	7.7	3,746	3.2	1,213	6.2	674	4.3	775	7.4
	50–59	178,442	9.2	6,334	4.3	1,672	6.3	1,257	6.4	755	8.3
	60–69	137,643	10.1	4,854	4.6	780	8.6	877	6.6	1,780	8.8
	70+	60,928	9.2	2,583	4.4	328	6.1	320	5.3	608	7.2
	All[a]	477,847	8.9	18,781	4.1	4,398	6.7	3,354	5.7	4,839	7.5
Prevalence ratio[b]		1.0		0.44 (0.41–0.48)		0.70 (0.63–0.79)		0.63 (0.55–0.72)			
Female	30–39	30,661	2.4	2,902	1.2	822	1.8	441	1.1	1,061	2.1
	40–49	136,597	3.0	7,644	1.7	2,081	2.8	1,114	1.6	852	2.5
	50–59	214,096	3.4	10,575	2.3	2,231	3.3	1,692	2.3	883	5.4
	60–69	161,021	3.7	7,644	2.7	1,019	3.6	917	2.1	2,080	4.6
	70+	83,763	3.7	4,408	2.6	537	3.2	316	1.0	829	4.0
	All[a]	626,138	3.4	33,173	2.3	6,690	3.2	4,480	1.7	5,705	4.1
Prevalence ratio[b]		1.0		0.65 (0.60–0.70)		0.88 (0.77–1.01)		0.55 (0.44–0.68)			

CPS, Cancer Prevention Study; NHANES, National Health and Nutrition Examination Survey; Prev, prevalence.

[a] Prevalences are standardized to the age distribution (5-year age groups) of all CPS II participants.

[b] Ratio of the prevalence for race relative to whites (CPS II only).

SOURCE: Reprinted from Soucie JM, Thun MJ, Coates RJ, McClellan W, Austin H, Demographic and geographic variability of kidney stones in the United States, Kidney International, 46, 893–9, Copyright 1994, with permission from Blackwell Publishing Ltd.

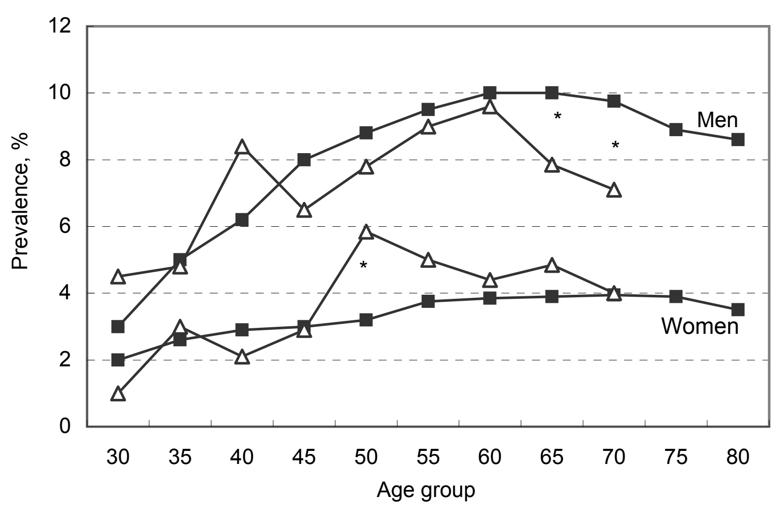

Figure 2. Age-specific prevalence of kidney stones among white men and women in CPS II (■) and NHANES II (△). No partipants in NHANES II were older than 74 years.
***Prevalence extimates differ significantly between studies (P<0.05).**

SOURCE: Adapted from Soucie JM, Thun MJ, Coates RJ, McClellan W, & Austin H, Demographic and geographic variability of kidney stones in the United States, Kidney International, 46, 893–9, Copyright 1994, with permission from Blackwell Publishing Ltd.

in the early 20s, peak in the 40- to 59-year age group, and then decrease. The rates in women appear to be relatively constant across age groups.

Scant population-based information is available on recurrence rates, which depend on a variety of factors, including how recurrence is defined and how treatments are implemented. New data in this chapter focus on *office* or *hospital outpatient visits* and *procedures*, which cannot be extrapolated to determine the true prevalence of stone disease. In addition, these new data cannot be used to determine incidence or recurrence rates.

TRENDS IN HEALTH CARE RESOURCE UTILIZATION

Inpatient Care

Inpatient hospitalizations consist of admissions for surgical treatment of stones and hospitalization for management of acute stone events. Patients admitted for acute management generally receive hydration, analgesics, and antiemetics. Management may also include temporizing procedures prior to definitive stone treatment such as placement of a ureteral stent or percutaneous nephrostomy to relieve obstruction, especially in an infected kidney.

Upper Tract Stones: Hospitalization Rates

According to the Healthcare Cost and Utilization Project (HCUP), the rate of national inpatient hospitalizations for upper tract stones in 2000 was 62 per 100,000 population, with the number of admissions totaling 170,316—a 15% decrease since 1994, when the hospitalization rate was 73 per 100,000 and the total number of admissions was 183,322 (Table 5). The steady decline in the rate of hospitalization for patients with upper tract stones between 1994 and 2000 likely reflects the greater efficiency and reduced morbidity of surgical treatment for upper tract stones that have resulted in more procedures being performed in the outpatient setting, rather than a reduction in admissions for acute stone events; in particular, advances in ureteroscopy and percutaneous nephrostolithotomy have reduced hospital admissions and shortened hospital stays.

According to HCUP, hospitalization rates were highest in the 55- to 64-year age groups in 1994, 1998, and 2000, but were equally high in the 45 to 54, 55 to 64, and 65 to 74 age groups in 1996 (Figure 3). The high rate of inpatient hospitalization for the older age groups likely reflects the lower threshold for admission for an acute stone event or after surgical treatment due to the greater number of comorbidities in these older patients.

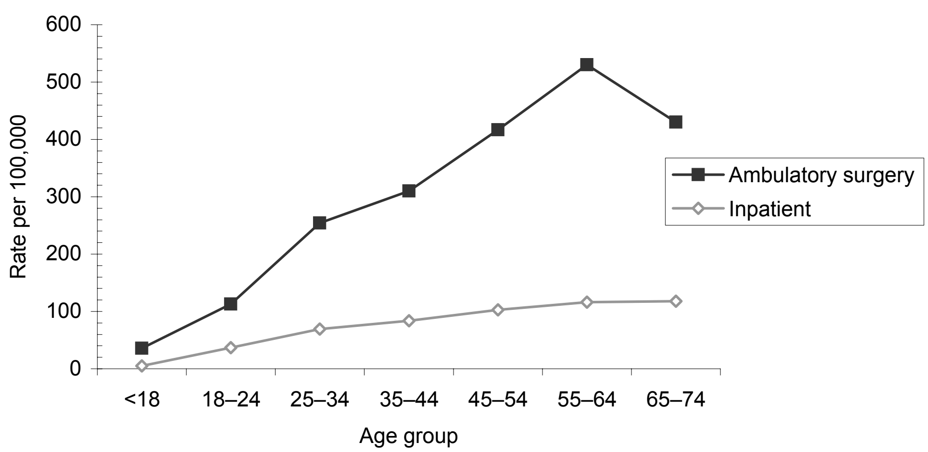

Figure 3. National rates of inpatient and ambulatory surgery visits for urolithiasis by age group, 2000.

SOURCE: Center for Health Care Policy and Evaluation (Ambulatory Surgery); Healthcare Cost and Utilization Project (Inpatient), 2000.

Table 5. Inpatient hospital stays by individuals with upper tract urolithiasis listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	183,322	73 (69–76)	170,218	65 (62–67)	165,296	62 (59–64)	170,316	62 (60–65)
Age								
< 18	2,931	4.3 (3.7–4.9)	2,565	3.6 (3.2–4.1)	2,962	4.1 (3.7–4.6)	3,419	4.7 (4.2–5.3)
18–24	10,541	43 (39–46)	9,935	40 (37–43)	9,152	37 (34–39)	9,478	36 (33–39)
25–34	29,608	73 (68–77)	28,370	70 (66–75)	26,402	68 (63–72)	25,511	68 (63–73)
35–44	40,906	102 (96–108)	38,541	90 (84–95)	37,583	85 (80–90)	36,956	83 (78–88)
45–54	37,438	130 (123–138)	35,468	112 (106–118)	34,698	102 (96–107)	36,935	101 (96–107)
55–64	27,009	134 (126–141)	23,513	112 (106–118)	24,283	109 (103–116)	26,138	112 (106–117)
65–74	22,700	128 (121–135)	20,601	113 (107–119)	18,563	104 (98–109)	18,955	107 (101–112)
75–84	10,403	108 (101–115)	9,454	89 (84–94)	9,791	87 (81–92)	10,684	91 (86–96)
85+	1,777	64 (55–73)	1,755	63 (55–71)	1,845	64 (56–71)	2,236	72 (64–79)
Race/ethnicity								
White	122,566	66 (63–69)	111,036	58 (56–61)	106,437	56 (53–58)	107,087	55 (53–58)
Black	6,737	21 (19–23)	6,709	20 (19–22)	6,905	21 (18–23)	6,497	19 (17–21)
Asian/Pacific Islander	1,562	22 (17–27)	1,589	17 (14–19)	1,733	17 (13–21)	1,804	17 (14–20)
Hispanic	8,816	34 (29–39)	9,453	33 (27–39)	9,915	32 (27–37)	11,855	36 (32–40)
Gender								
Male	117,165	95 (90–100)	105,187	82 (78–86)	100,550	77 (73–80)	99,214	74 (71–78)
Female	66,146	51 (49–53)	65,026	48 (46–50)	64,746	47 (45–49)	71,087	51 (49–53)
Region								
Midwest	47,638	79 (72–86)	42,645	69 (63–75)	40,537	65 (60–69)	43,700	69 (64–73)
Northeast	45,722	89 (82–97)	40,272	78 (72–84)	38,591	75 (67–84)	36,159	70 (63–77)
South	67,950	80 (73–86)	66,582	72 (67–78)	64,728	69 (64–73)	66,628	70 (64–75)
West	22,012	39 (36–43)	20,719	36 (32–39)	21,439	36 (32–39)	23,828	38 (35–42)
MSA								
Rural	40,136	63 (58–68)	38,484	65 (60–69)	35,737	59 (55–63)	39,373	65 (61–70)
Urban	142,429	75 (71–79)	131,392	64 (61–68)	128,366	62 (59–65)	130,651	61 (58–64)

MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US civilian non-institutionalized population.

[b]Persons of missing age, other races, missing or unavailable race and ethnicity, missing gender, and missing MSA are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

When hospitalization rates were stratified by ethnicity, Caucasians had the highest rate. Admission rates for Hispanics were one-half to two-thirds those of Caucasians throughout the periods of observation. Strikingly little regional variation was observed, with the exception of the West, where hospitalization rates were consistently half the rates in the other geographic areas (Northeast, Midwest, and South). Admission rates were similar in urban and rural areas. When rates in HCUP were age-adjusted (Table 6), the geographic variations remained stable; however the ethnic/racial differences were narrower and male-to-female ratios were slightly narrower. In both the age-unadjusted and the age-adjusted data, the male-to-female ratios also fell slightly over time.

Medicare data from the Centers for Medicare and Medicaid Services (CMS) for 1992, 1995, and 1998 (Table 7) indicate that inpatient hospitalization rates for upper tract stones were 2.5 to 3 times higher in this patient population than in the population studied in HCUP. Total admission rates decreased over time, from 194 per 100,000 in 1992 to 188 per 100,000 in 1995 and 184 per 100,000 in 1998, representing an overall 5% reduction in hospitalization rates, compared with a 15% decrease between 1994 and 2000 in the HCUP population (Figure 4). Admission rates of Medicare beneficiaries were consistently higher in the ≥65 age group than in the <65 age group, peaking in the 75- to 84-year group in each year of study. Likewise, the geographic distribution was similar to that seen in the HCUP database, with the highest rates of admission in the Northeast and South and the lowest in the West. In 1995, when CMS racial categories were modified, age-unadjusted admission rates were highest among Caucasians and lowest among Asians; in 1998 the age-unadjusted admission rate was highest in North American Natives, but the relatively small count in this group should lead to caution in interpreting this difference. Age-adjustment did not affect regional differences in admission rates, but it did slightly widen the gender gap. Age-adjustment did not affect admission rates in Caucasians or African Americans, but it did raise the rates in Hispanics and lower the rates in Asians.

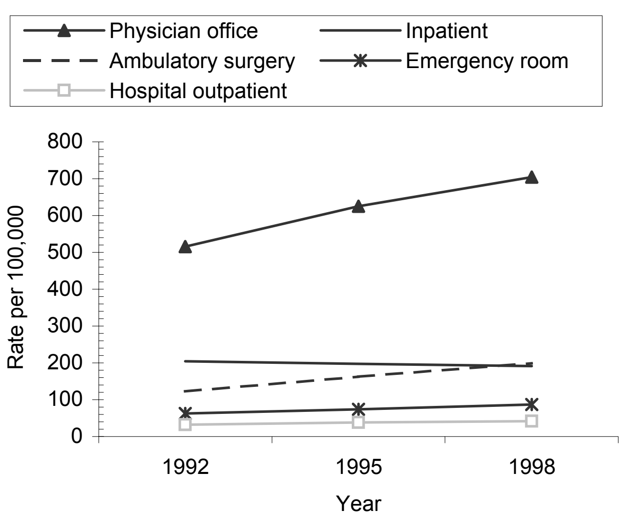

Figure 4. National rates of visits for urolithiasis, by visit setting and year.

SOURCE: Centers for Medicare and Medicaid Services, 1992, 1995, 1998.

Upper Tract Stones: Length of Stay

According to the HCUP data, the mean hospital length of stay (LOS) associated with admission for upper tract stones as a primary diagnosis declined steadily from 1994 to 2000, dropping from a mean of 2.6 days in 1994 to 2.2 days in 2000 (Table 8). Starting at age 18, there was a steady rise in LOS with age, peaking in the 85+ age group. Indeed, in 2000, the mean LOS in the 18- to 24-year age group was 1.8 days, compared with 4.4 days in the 85+ age group. Although a longer LOS in the elderly population is understandable due to the overall poorer health of this group, reasons for the higher LOS in the pediatric population (<18 years of age) compared with that in the youngest adult group (18 to 24 years) are less clear. However, the disparity in the LOS between these groups narrowed over time, and by 2000 the mean LOS was comparable for the two groups at 1.9 and 1.8 days, respectively.

Using the National Association of Children's Hospitals and Related Institutions (NACHRI) database of pediatric inpatients with a primary diagnosis of urolithiasis (both upper and lower tract stones) (Table 9), during 1999, 2000, and 2001, the mean LOS was nearly twice as high during each of the years of observation for the 0- to 2-year age group as it was in the 3 to 10 or 11 to 17 age group, most likely because stones occurring in infants are often associated with other systemic illnesses, and

Table 6. Inpatient hospital stays by individuals with upper tract urolithiasis listed as primary diagnosis, age-adjusted count, age-adjusted rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	199,638	79 (75–83)	193,325	73 (70–77)	190,129	71 (68–74)	193,699	71 (68–74)
Race/ethnicity								
White	131,957	71 (67–75)	124,173	65 (62–68)	120,284	63 (60–66)	119,745	62 (59–65)
Black	7,772	25 (22–27)	7,957	24 (22–26)	8,272	25 (22–28)	7,643	22 (20–24)
Asian/Pacific Islander	1,818	26 (19–32)	1,831	19 (16–22)	2,038	20 (14–26)	2,068	20 (16–23)
Hispanic	10,205	40 (34–45)	11,366	40 (33–47)	12,153	40 (33–46)	14,724	45 (40–50)
Gender								
Male	123,765	100 (95–106)	116,243	91 (86–95)	112,690	86 (81–91)	108,937	82 (78–86)
Female	75,857	59 (56–61)	77,074	57 (54–60)	77,439	56 (54–59)	84,744	60 (58–63)
Region								
Midwest	51,727	86 (77–94)	48,167	78 (71–85)	46,514	74 (69–80)	49,578	78 (72–84)
Northeast	49,834	97 (88–107)	45,182	88 (81–95)	44,119	86 (76–96)	40,210	78 (69–86)
South	73,657	86 (78–94)	76,193	83 (76–90)	74,548	79 (73–85)	76,661	80 (73–87)
West	24,420	44 (39–48)	23,782	41 (36–45)	24,947	41 (37–46)	27,250	44 (39–48)
MSA								
Rural	43,444	68 (62–74)	43,931	74 (68–80)	41,353	68 (63–74)	45,093	75 (70–80)
Urban	155,363	82 (77–87)	149,002	73 (69–77)	147,378	71 (67–75)	148,257	70 (66–73)

MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US civilian non-institutionalized population; age-adjusted to the 2000 US Census.

[b]Persons of missing age, other races, missing or unavailable race and ethnicity, and missing MSA are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 7. Inpatient stays by Medicare beneficiaries with upper tract urolithiasis listed as primary diagnosis, count[a], rate[b] (95% CI), age-adjusted rate[c] (95% CI)

	1992			1995			1998		
	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate
Total all ages[d]	67,080	194 (193–196)	194 (193–196)	66,460	188 (186–189)	188 (186–189)	61,540	184 (182–185)	184 (182–185)
Total < 65	9,000	164 (161–168)		10,140	165 (162–169)		9,400	151 (148–154)	
Total 65+	58,080	200 (198–201)		56,320	192 (191–194)		52,140	191 (189–192)	
Age									
65–74	34,300	209 (207–211)		30,360	188 (185–190)		25,640	179 (177–181)	
75–84	19,880	211 (208–214)		20,080	208 (205-211)		20,920	220 (217–223)	
85–94	3,660	128 (124–132)		5,520	180 (175–184)		5,280	171 (166–175)	
95+	240	72 (63–80)		360	99 (88–109)		300	75 (67–84)	
Race/ethnicity									
White	58,400	200 (198–202)	199 (197–200)	59,420	196 (194–197)	195 (194–197)	54,560	192 (190–194)	192 (190–193)
Black	4,580	155 (150–159)	158 (154–163)	4,800	149 (145–153)	152 (148–156)	4,320	139 (135–144)	141 (137–146)
Asian	…	…	…	120	72 (59–84)	48 (37–59)	360	115 (103–126)	108 (97–120)
Hispanic	…	…	…	640	160 (148–173)	175 (162–188)	1,180	168 (158–177)	179 (169–189)
N. American Native	…	…	…	60	165 (124–207)	221 (171–270)	120	222 (183–261)	222 (183–261)
Gender									
Male	38,440	261 (258–264)	267 (264–269)	38,200	251 (248–254)	256 (254–259)	33,320	230 (228–233)	234 (232–237)
Female	28,640	145 (143–146)	140 (139–142)	28,260	140 (138–142)	136 (134–137)	28,220	148 (146–150)	145 (143–147)
Region									
Midwest	16,720	192 (189–194)	191 (188–194)	16,120	179 (176–182)	179 (176–182)	15,460	179 (176–182)	176 (173–179)
Northeast	16,980	220 (217–224)	219 (215–222)	17,400	227 (223–230)	225 (221–228)	13,400	200 (197–203)	196 (192–199)
South	26,020	213 (210–215)	216 (214–219)	25,180	198 (196–201)	200 (198–203)	24,600	199 (196–201)	203 (201–206)
West	6,680	131 (128–134)	125 (122–128)	7,280	140 (137–144)	137 (134–140)	7,420	150 (146–153)	149 (146–153)

… data not available.
[a]Unweighted counts were multiplied by 20 to arrive at values in the table.
[a]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.
[c]Age-adjusted to the 2000 US Census.
[d]Persons of other races, unkown race and ethnicity, and other region are included in the totals.
NOTE: Counts less than 600 should be interpreted with caution.
SOURCE: Centers for Medicare and Medicaid Services, MedPAR and 5% Carrier File, 1992, 1995, 1998.

Table 8. National trends in mean inpatient length of stay (days) for individuals hospitalized with upper tract urolithiasis listed as primary diagnosis

	Length of Stay			
	1994	1996	1998	2000
All	2.6	2.4	2.3	2.2
Age				
< 18	2.5	2.4	2.2	1.9
18–24	2.2	2.0	1.9	1.8
25–34	2.2	2.0	1.9	1.9
35–44	2.3	2.1	2.1	2.0
45–54	2.4	2.3	2.1	2.1
55–64	2.7	2.4	2.3	2.3
65–74	3.4	3.1	2.8	2.6
75–84	4.3	3.7	3.5	3.3
85+	4.7	4.3	4.6	4.4
Race/ethnicity				
White	2.6	2.4	2.2	2.1
Black	3.5	3.4	3.1	3.1
Asian/Pacific Islander	2.8	3.1	2.6	2.7
Hispanic	2.9	2.7	2.6	2.4
Other	3.9	2.4	2.5	2.3
Region				
Midwest	2.4	2.2	2.1	1.9
Northeast	3.1	2.7	2.5	2.4
South	2.6	2.3	2.3	2.3
West	2.4	2.4	2.2	2.3
MSA				
Rural	2.4	2.1	2.0	1.9
Urban	2.7	2.5	2.4	2.3
Primary payor				
Medicare	3.9	3.3	3.1	3.0
Medicaid	3.5	3.2	2.9	2.7
Private insurance/HMO	2.2	2.0	2.0	1.9
Self-pay	2.2	2.1	2.0	2.0
No charge	*	2.3	2.6	2.7
Other	2.6	2.3	2.3	2.3

MSA, metropolitan statistical area; HMO, health maintenance organization.

*Figure does not meet standard for reliability or precision.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

treatment is more challenging than it is in the older pediatric population. As in the adult population, mean LOS of African Americans was consistently longer than that of other racial/ethnic groups.

When stratified by ethnicity, mean LOS in the HCUP database was consistently lowest for Caucasians and highest for African Americans (Table 8). Geographic variation was less pronounced, but mean LOS was marginally highest in the Northeast for all years analyzed and lowest in the Midwest in 1996, 1998, and 2000. Mean LOS was consistently higher in urban than in rural areas.

When LOS was stratified by payor, private insurance/HMO and self-pay groups were associated with the shortest LOS (Table 8). Moreover, these two groups with comparable LOS showed little variation in mean LOS over the years studied. The Medicare group had the highest LOS in each of the years analyzed, likely due to their more advanced age. However, Medicare patients demonstrated the most-pronounced reduction in LOS over time, dropping 23% between 1994 (3.9 days) and 2000 (3.0 days); the Medicaid group likewise showed a similar reduction in LOS, but their overall LOS was shorter than that of the Medicare group.

Lower Tract Stones: Procedures

During hospital admission for urolithiasis, a variety of procedures may be performed, including radiographic studies, drainage procedures for relief of obstruction (i.e., placement of a ureteral stent or percutaneous nephrostomy), or surgical procedures to remove stones. Although most surgical interventions for stone disease are minimally invasive treatments performed on an outpatient basis, some procedures typically used for outpatients may be performed during inpatient admission for an acute stone event to provide definitive treatment after the patient is stabilized. Alternatively, some procedures for stone removal, such as percutaneous nephrostolithotomy, are associated with a short hospital stay. The numbers and rates of procedures performed during inpatient hospitalization on patients with a primary diagnosis of urolithiasis (both upper and lower tract stones) in 1994, 1996, 1998, and 2000, derived from the Center for Health Care Policy and Evaluation, are shown in Table 10. Although the total number of procedures increased from 1994 to 1998, the rate decreased (from

Table 9. Trends in mean inpatient length of stay (days) for children hospitalized with urolithiasis listed as primary diagnosis (95% CI)

	1999		2000		2001	
	Count	Length of Stay	Count	Length of Stay	Count	Length of Stay
All	461	3.1 (2.7–3.6)	553	2.8 (2.6–3.1)	619	3.2 (2.7–3.8)
Age						
0–2	43	7.5 (3.8–11.2)	45	4.8 (3.2–6.4)	37	6.2 (4.2–8.2)
3–10	193	2.8 (2.4–3.2)	198	2.6 (2.3–2.9)	225	2.9 (2.4–3.4)
11–17	225	2.6 (2.3–2.9)	310	2.7 (2.3–3.1)	357	3.1 (2.2 - 4.1)
Race/ethnicity						
White	338	3.1 (2.6–3.6)	385	2.7 (2.4–3.0)	447	2.8 (2.5–3.1)
Black	31	3.4 (1.9–5.0)	34	3.7 (2.5–4.8)	38	4.1 (1.8–6.3)
Asian	1	4.0	3	1.3 (0–2.8)	2	1.5 (0–7.8)
Hispanic	36	3.1 (2.4–3.8)	51	2.8 (2.0–3.5)	78	3.4 (2.6–4.1)
American Indian	0		3	2.7 (0–5.5)	1	2.0
Other	17	2.4 (1.2–3.5)	21	2.4 (1.5–3.3)	32	8.6 (0–18.6)
Missing	38	3.6 (2.5–4.6)	56	3.6 (2.4–4.7)	21	2.9 (2.1–3.6)
Gender						
Male	261	3.0 (2.5–3.6)	280	2.8 (2.4–3.2)	312	3.0 (2.5–3.4)
Female	200	3.3 (2.6–4.0)	273	2.8 (2.4–3.2)	307	3.5 (2.4–4.5)
Region						
Midwest	160	3.3 (2.4–4.3)	197	2.7 (2.2–3.2)	199	3.2 (1.6–4.8)
Northeast	24	2.5 (1.7–3.2)	39	2.5 (2.0–3.0)	56	2.6 (2.1–3.1)
South	203	3.0 (2.5–3.5)	246	2.8 (2.4–3.2)	287	3.0 (2.6–3.4)
West	61	3.2 (2.4–4.2)	50	3.3 (2.0–4.7)	77	4.4 (3.0–5.7)
Missing	13	3.9 (2.0–5.8)	21	3.9 (2.5–5.3)	0	

SOURCE: National Association of Children's Hospitals and Related Institutions, 1999–2001.

25 per 100,000 to 22 per 100,000) but then increased in 2000 to the 1994 level. The reasons for these trends in the rates of procedures are not clear from these data; further analysis of the types of procedures performed is required. In all years of study, the rates of procedures increased with age to a maximum in the 55- to 64-year age group. Beyond that age, procedure counts in this database were too small to be reliable. Also, differences in sampling strategies in the datasets analyzed may have contributed to differences in estimates of the burden of stone disease.

Lower Tract Stones: Hospitalization Rates

Inpatient hospitalizations for lower tract stones, primarily bladder stones, demonstrated greater stability over time than did those for upper tract stones. According to data derived from HCUP, the absolute number and the rate of inpatient hospitalizations both remained stable from 1994 to 2000, with rates of 2.5 to 3.3 hospitalizations per 100,000 population (Table 11). For all years of study, hospitalization rates were highest in the 85+ age group, although they increased substantially after age 64—by 2.5 to 5 times—likely reflecting the higher prevalence of bladder stones in the older male population with bladder outlet obstruction. When rates in HCUP were age-adjusted, they remained fairly stable across racial/ethnic, geographic, and rural/urban groups; however, male-to-female ratios dropped from 2:3 to 3:4. (Table 12).

The Medicare population represented in the CMS database experienced a 30% decrease in hospitalization rate for lower tract stones between 1992 and 1998 (from 10 per 100,000 to 7 per 100,000), with a 43% to 60% higher rate of hospitalization in the

Table 10. Inpatient procedures for individuals having commercial health insurance with urolithiasis listed as primary diagnosis, count[a], rate[b]

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total	272	25	375	24	539	22	682	25
Age								
< 3	1	*	1	*	3	*	4	*
3–10	2	*	0	0.0	4	*	7	*
11–17	2	*	1	*	7	*	10	*
18–24	7	*	22	*	34	15	46	18
25–34	47	25	69	25	104	25	133	30
35–44	61	28	112	34	144	28	160	29
45–54	93	59	105	43	145	36	175	37
55–64	49	65	54	46	79	39	126	52
65–74	10	*	10	*	17	*	16	*
75–84	0	0.0	1	*	2	*	5	*
85+	0	0.0	0	0.0	0	0.0	0	0.0
Gender								
Male	172	33	230	29	323	26	394	29
Female	100	18	145	18	216	18	288	21
Region								
Midwest	177	27	226	25	237	20	325	24
Northeast	31	20	29	*	44	22	42	26
Southeast	53	27	113	26	243	26	305	28
West	11	*	7	*	15	*	10	*

*Figure does not meet standard for reliability or precision.
[a]Counts less than 30 should be interpreted with caution.
[b]Rate per 100,000 based on member months of enrollment in calendar year for individuals in the same demographic stratum.
SOURCE: Center for Health Care Policy and Evaluation, 1994, 1996, 1998, 2000.

≥65 age group than in the <65 age group (Table 13). Given the higher frequency of bladder stones in men, the rate of hospitalization, not surprisingly, was 6 to 9 times higher in men than in women. Geographic variation was also evident, with rates highest in the Northeast and lowest in the West. Racial/ethnic variation was less consistent, with the highest rates occurring among Hispanics in 1995 and among African Americans in 1998. When the CMS data were age-adjusted, hospitalization rates among Hispanics dropped by 33% in 1995 and rose by 50% in 1998, underscoring the inconsistency in racial/ethnic group differences. Age-adjustment did not affect gender or geographic group comparisons.

Lower Tract Stones: Length of Stay

Similar to the trend observed with upper tract stones, the mean LOS for lower tract stones declined steadily over time, decreasing by 15% from a mean of 3.4 days in 1994 to 2.9 days in 2000 (Table 14). No clear trends with regard to age-specific LOS were discerned except that mean LOS was highest in the 85+ age group. Stratification of LOS by geographic region revealed that the lowest mean LOS occurred in the West. As observed with the upper tract stone data, LOS for lower tract stones was lower in the private pay/HMO and self-pay groups than in the Medicare groups.

Table 11. Inpatient hospital stays by individuals with lower tract urolithiasis listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	8,280	3.3 (3.0–3.5)	7,852	3.0 (2.7–3.2)	6,700	2.5 (2.3–2.7)	7,180	2.6 (2.4–2.8)
Age								
< 18	*	*	*	*	*	*	*	*
18–24	166	0.7 (0.4–0.9)	237	1.0 (0.6–1.4)	*	*	164	0.6 (0.4–0.8)
25–34	511	1.3 (1.0–1.6)	325	0.8 (0.6–1.0)	303	0.8 (0.6–1.0)	335	0.9 (0.7–1.1)
35–44	598	1.5 (1.2–1.8)	562	1.3 (1.0–1.6)	460	1.0 (0.8–1.3)	425	1.0 (0.8–1.2)
45–54	798	2.8 (2.2–3.4)	627	2.0 (1.6–2.3)	638	1.9 (1.5–2.3)	598	1.6 (1.4–1.9)
55–64	1,094	5.4 (4.6–6.3)	1,022	5.0 (4.1–5.7)	904	4.1 (3.5–4.7)	950	4.1 (3.4–4.7)
65–74	2,565	14 (13–16)	2,347	13 (11–15)	1,775	9.9 (8.7–11)	1,883	11 (9–12)
75–84	1,767	18 (16–21)	2,015	19 (17–21)	1,851	16 (15–18)	2,055	18 (16–19)
85+	585	21 (17–26)	613	22 (17–27)	507	17 (14–21)	662	21 (17–25)
Race/ethnicity								
White	5,538	3.0 (2.7–3.2)	5,551	2.9 (2.6–3.2)	4,212	2.2 (2.0–2.4)	4,521	2.3 (2.1–2.6)
Black	488	1.5 (1.2–1.9)	473	1.4 (1.1–1.8)	393	1.2 (0.9–1.4)	403	1.2 (0.9–1.5)
Asian/Pacific Islander	*	*	*	*	*	*	*	*
Hispanic	435	1.7 (1.3–2.1)	441	1.6 (1.1–2.0)	443	1.4 (1.1–1.8)	451	1.4 (1.0–1.8)
Gender								
Male	6,784	5.5 (5.0–6.0)	6,735	5.2 (4.7–5.8)	5,700	4.4 (4.0–4.7)	6,151	4.6 (4.2–5.0)
Female	1,495	1.2 (1.0–1.3)	1,110	0.8 (0.7–1.0)	999	0.7 (0.6–0.8)	1,029	0.7 (0.6–0.8)
Region								
Midwest	1,796	3.0 (2.6–3.4)	1,315	2.1 (1.8–2.4)	1,591	2.5 (2.2–2.9)	1,654	2.6 (2.3–2.9)
Northeast	2,259	4.4 (3.6–5.2)	2,332	4.5 (3.7–5.4)	1,727	3.4 (2.9–3.9)	1,928	3.7 (3.1–4.3)
South	3,032	3.6 (3.2–4.0)	2,865	3.1 (2.7–3.6)	2,300	2.4 (2.2–2.7)	2,356	2.5 (2.1–2.8)
West	1,192	2.1 (1.7–2.6)	1,340	2.3 (1.9–2.7)	1,082	1.8 (1.5–2.1)	1,242	2.0 (1.6–2.4)
MSA								
Rural	1,469	2.3 (1.9–2.7)	1,171	2.0 (1.6–2.3)	914	1.5 (1.2–1.8)	1,142	1.9 (1.5–2.3)
Urban	6,803	3.6 (3.3–3.9)	6,673	3.3 (3.0–3.6)	5,763	2.8 (2.6–3.0)	6,038	2.8 (2.6–3.1)

*Figure does not meet standards for reliability or precision.

MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US civilian non-institutionalized population.

[b]Persons of other races, missing or unavailable race and ethnicity, and missing MSA are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 12. Inpatient hospital stays by individuals with lower tract urolithiasis listed as primary diagnosis, age-adjusted count, age-adjusted rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	5,852	2.3 (2.1–2.5)	5,379	2.0 (1.8–2.2)	4,725	1.8 (1.6–1.9)	4,842	1.8 (1.6–1.9)
Race/ethnicity								
White	3,795	2.0 (1.8–2.2)	3,619	1.9 (1.7–2.1)	2,789	1.5 (1.3–1.6)	2,907	1.5 (1.4–1.7)
Black	390	1.2 (0.9–1.5)	378	1.2 (0.8–1.5)	347	1.0 (0.8–1.3)	297	0.9 (0.6–1.1)
Asian/Pacific Islander	*	*	*	*	*	*	*	*
Hispanic	390	1.5 (1.1–1.9)	409	1.4 (1.0–1.9)	375	1.2 (0.9–1.5)	415	1.3 (0.9–1.6)
Gender								
Male	4371	3.6 (3.2–3.9)	4194	3.3 (2.9–3.5)	3,672	2.8 (2.6–3.0)	3,785	4.6 (4.2–5.0)
Female	1480	1.1 (1.0–1.3)	1181	0.9 (0.7–1.0)	1,053	0.8 (0.6–0.9)	1,058	0.7 (0.6–0.8)
Region								
Midwest	1,287	2.1 (1.8–2.5)	893	1.4 (1.2–1.7)	1,137	1.8 (1.5–2.1)	1,131	1.8 (1.5–2.0)
Northeast	1,538	3.0 (2.4–3.6)	1,513	2.9 (2.4–3.5)	1,192	2.3 (1.9–2.7)	1,176	2.3 (1.9–2.6)
South	2,167	2.5 (2.2–2.9)	2,034	2.2 (1.9–2.6)	1,627	1.7 (1.5–1.9)	1,661	1.7 (1.5–2.0)
West	860	1.5 (1.1–1.9)	938	1.6 (1.3–1.9)	769	1.3 (1.0–1.6)	874	1.4 (1.1–1.7)
MSA								
Rural	1,081	1.7 (1.3–2.0)	812	1.4 (1.0–1.7)	662	1.1 (0.9–1.3)	826	1.4 (1.1–1.7)
Urban	4,761	2.5 (2.3–2.8)	4,556	2.2 (2.0–2.5)	4,046	2.0 (1.8–2.1)	4,017	1.9 (1.7–2.0)

*Figure does not meet standards for reliability or precision.

MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS),CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US civilian non-institutionalized population; age-adjusted to the 2000 US Census.

[b]Persons of other races, missing or unavailable race and ethnicity, and missing MSA are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

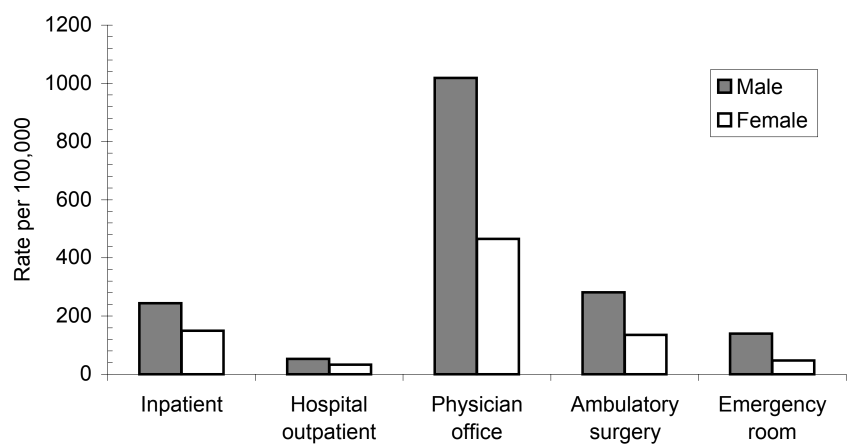

Figure 5. National rates of visits for urolithiasis by gender and site of service, 1998.

SOURCE: Centers for Medicaid and Medicare Services, 1998.

Table 13. Inpatient stays by Medicare beneficiaries with lower tract urolithiasis listed as primary diagnosis, count[a], rate[b] (95% CI), age-adjusted rate[c] (95% CI)

	1992			1995			1998		
	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate
Total all ages[d]	3,460	10 (9.7–10)	10 (9.7–10.4)	3,280	9.3 (8.9–9.6)	9.3 (8.9–9.6)	2,360	7.0 (6.8–7.3)	7.0 (6.8–7.3)
Total < 65	380	6.9 (6.2–7.6)		400	6.5 (5.9–7.2)		280	4.5 (4.0–5.0)	
Total 65+	3,080	11 (10–11)		2,880	9.8 (9.5–10)		2,080	7.6 (7.3–7.9)	
Age									
65–74	1,760	11 (10–11)		1,280	7.9 (7.5–8.3)		800	5.6 (5.2–6.0)	
75–84	1,080	11 (11–12)		1,220	13 (12–13)		1,080	11 (11–12)	
85–94	240	8.4 (7.3–9.4)		380	12 (11–14)		180	5.8 (5.0–6.7)	
95+	0	0.0		0	0.0		20	5.0 (2.8–7.3)	
Race/ethnicity									
White	2,880	9.9 (9.5–10)	10 (9.7–10)	2,840	9.4 (9.0–9.7)	9.4 (9.1–9.8)	2,020	7.1 (6.8–7.4)	7.0 (6.7–7.3)
Black	300	10 (9.0–11)	9.5 (8.3–11)	320	9.9 (8.8–11)	11 (9.4–12)	280	9.0 (8.0–10.1)	9.7 (8.6–11)
Asian	…	…	…	20	12 (6.6–17)	12 (6.6–17)	0	0.0	0.0
Hispanic	…	…	…	60	15 (11–19)	10 (7.0–13)	40	5.7 (4.0–7.4)	8.5 (6.4–11)
N. American Native	…	…	…	0	0.0	0.0	0	0.0	0.0
Gender									
Male	2,840	19 (19–20)	20 (19–20)	2,920	19 (18–20)	19 (18–20)	2,020	14 (13–15)	14 (13–15)
Female	620	3.1 (2.9–3.4)	2.8 (2.6–3.1)	360	1.8 (1.6–2.0)	1.8 (1.6–2.0)	340	1.8 (1.6–2.0)	1.8 (1.6–2.0)
Region									
Midwest	620	7.1 (6.5–7.7)	7.3 (6.8–7.9)	720	8.0 (7.4–8.6)	7.1 (6.5–7.7)	640	7.4 (6.8–8.0)	7.4 (6.8–8.0)
Northeast	960	12 (12–13)	12 (12–13)	960	13 (12–13)	12 (11–13)	520	7.8 (7.1–8.4)	7.5 (6.8–8.1)
South	1,340	11 (10–12)	12 (11–12)	1,220	9.6 (9.1–10)	10 (9.7–11)	900	7.3 (6.8–7.7)	7.3 (6.8–7.7)
West	500	9.8 (8.9–11)	8.6 (7.8–9.4)	300	5.8 (5.1–6.4)	6.2 (5.5–6.9)	240	4.8 (4.2–5.4)	4.8 (4.2–5.4)

… data not available.

[a]Unweighted counts multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]Age-adjusted to the 2000 US Census.

[d]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, MedPAR and 5% Carrier File, 1992, 1995, 1998.

Table 14. National trends in mean length of stay (days) for individuals hospitalized with lower tract urolithiasis listed as primary diagnosis

	Length of Stay			
	1994	1996	1998	2000
All	3.4	3.3	3.2	2.9
Age				
< 18	*	*	*	*
18–24	3.5	2.7	*	2.3
25–34	2.8	2.7	2.5	2.4
35–44	2.4	2.3	2.8	2.6
45–54	2.9	3.6	3.0	2.5
55–64	2.8	2.5	2.7	2.2
65–74	3.5	3.0	3.1	2.8
75–84	3.6	3.6	3.4	3.4
85+	5.3	5.7	4.7	4.0
Race/ethnicity				
White	3.4	3.2	3.1	2.9
Black	3.5	4.2	4.8	4.1
Asian/Pacific Islander	*	*	*	*
Hispanic	3.2	4.3	3.2	3.6
Other	*	*	*	*
Region				
Midwest	3.4	3.2	3.3	2.7
Northeast	4.0	3.7	3.3	3.1
South	3.2	3.2	3.2	3.1
West	2.5	2.9	2.8	2.7
MSA				
Rural	3.2	2.9	3.2	2.9
Urban	3.4	3.4	3.2	3.0
Primary payor				
Medicare	3.8	3.7	3.6	3.2
Medicaid	3.9	3.8	4.3	3.5
Private insurance/HMO	2.7	2.3	2.3	2.2
Self-pay	2.6	2.5	2.6	2.7
No charge	*	…	*	*
Other	3.3	*	*	3.0

… data not available.

*Figure does not meet standard for reliability or precision.

MSA, metropolitan statistical area; HMO, health maintenance organization.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Outpatient Care

An individual may be seen in the outpatient setting as part of the diagnosis of urolithiasis, during urologic treatment (pre- and/or post-procedure), or for medical evaluation and prevention. We have chosen to focus on visits for which urolithiasis (upper and lower tract stones) was the primary diagnosis, except where noted.

Hospital Outpatient Visits: NHAMCS Data

The rates for hospital outpatient visits by patients with urolithiasis as the primary reason for the visit, based on National Hospital Ambulatory Medical Care Survey (NHAMCS) data for the period 1994 to 2000, are presented in Table 15. The estimated rate in 2000 was 40% higher than that in 1994 (63 vs 45 per 100,000); however, the overlapping confidence intervals preclude definitive inferences. The rate for 1996 seems implausibly low. Overall, the absolute number of hospital outpatient visits during this period increased from 114,687 to 171,784.

Information on hospital outpatient visits is also available from Medicare data for 1992, 1995, and 1998 (Table 16). The Medicare data provide more detail than do the NHAMCS data. The visit rate in Medicare patients increased slightly from 1992 to 1998, both for those under 65 and for those 65 years of age and older. For example, in the older group, the rate increased from 28 per 100,000 in 1992 to 36 per 100,000 in 1998. The visit rate decreased with increasing age, and the rates were approximately twice as high in men as in women (Figure 5). Rates were lowest in the South in 1992 and 1995 and in the West in 1998. Rates were

Table 15. National hospital outpatient visits by individuals with urolithiasis, count, rate[a] (95% CI)

	Primary Reason for Visit		Any Reason for Visit	
	Count	Rate	Count	Rate
1994	114,687	45 (29–62)	130,704	52 (34–69)
1996	31,666	12 (6–18)	68,343	26 (13–40)
1998	83,383	31 (14–48)	138,576	52 (30–74)
2000	171,784	63 (34–92)	300,073	110 (69–151)

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US civilian non-institutionalized population.

SOURCE: National Hospital Ambulatory Medical Care Survey — Outpatient, 1994, 1996, 1998, 2000.

Table 16. Outpatient hostpial visits by Medicare beneficiaries with upper and/or lower tract urolithiasis listed as primary diagnosis, count[a], rate[b] (95% CI), age-adjusted rate[c] (95% CI)

	1992			1995			1998		
	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate
Total all ages[d]	10,980	32 (31–32)	32 (31–32)	13,320	38 (37–38)	38 (37–38)	13,920	42 (41–42)	42 (41–42)
Total < 65	2,700	49 (47–51)		3,480	57 (55–59)		4,020	65 (63–67)	
Total 65+	8,280	28 (28–29)		9,840	34 (33–34)		9,900	36 (36–37)	
Age									
65–74	5,100	31 (30–32)		5,960	37 (36–38)		6,660	46 (45–48)	
75–84	2,840	30 (29–31)		3,280	34 (33–35)		2,780	29 (28–30)	
85–94	300	10 (9.3–12)		560	18 (17–20)		360	12 (10–13)	
95+	40	12 (8.3–16)		40	11 (7.7–14)		100	25 (20–30)	
Race/ethnicity									
White	8,060	28 (27–28)	28 (27–28)	10,440	34 (34–35)	34 (34–35)	10,560	37 (36–38)	37 (36–38)
Black	1,920	65 (62–68)	64 (61–67)	1,900	59 (56–62)	57 (54–60)	1,820	59 (56–61)	59 (56–61)
Asian	…	…	…	120	72 (59–84)	72 (59–84)	220	70 (61–79)	70 (61–79)
Hispanic	…	…	…	320	80 (71–89)	80 (71–89)	620	88 (81–95)	85 (78–92)
N. American Native	…	…	…	…	…	…	80	148 (115–181)	148 (115–181)
Gender									
Male	5,780	39 (38–40)	41 (40–42)	8,020	53 (52–54)	53 (52–55)	7,620	53 (51–54)	52 (51–53)
Female	5,200	26 (26–27)	25 (25–26)	5,300	26 (26–27)	26 (25–26)	6,300	33 (32–34)	33 (33–34)
Region									
Midwest	3,460	40 (38–41)	39 (37–40)	3,580	40 (38–41)	40 (38–41)	3,800	44 (43–45)	44 (43–46)
Northeast	2,500	32 (31–34)	33 (32–35)	3,860	50 (49–52)	52 (50–53)	3,720	56 (54–57)	53 (52–55)
South	2,560	21 (20–22)	22 (21–22)	3,660	29 (28–30)	28 (27–29)	4,560	37 (36–38)	37 (36–39)
West	2,040	40 (38–42)	39 (38–41)	1,880	36 (35–38)	37 (36–39)	1,720	35 (33–36)	36 (34–38)

… data not available.

[a]Unweighted counts were multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]Age-adjusted to the 2000 US Census.

[d]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

Table 17. National physician office visits by individuals with urolithiasis, count, rate[a] (95% CI)

	1992		1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate	Count	Rate
					Primary Reason for Visit					
Total	949,581	379 (234–524)	1,002,487	397 (265–528)	924,895	351 (236–466)	1,289,692	481 (321–641)	1,825,123	668 (464–871)
Age										
< 54	669,280	337 (172–501)	630,282	311 (176–447)	554,821	263 (159–367)	661,079	309 (184–434)	1,184,522	545 (319–771)
55+	*	*	372,205	738 (366–1,111)	*	*	*	*	640,601	1,143 (677–1,610)
					Any Reason for Visit					
Total	1,242,509	496 (334–658)	1,275,273	504 (361–647)	1,374,098	521 (370–673)	1,497,817	558 (391–725)	2,382,217	872 (641–1,102)
Age										
< 54	748,240	376 (203–550)	797,164	394 (247–541)	751,502	356 (223–490)	745,868	349 (217–481)	1,582,354	728 (467–989)
55+	494,269	956 (540–1,371)	478,109	948 (542–1,355)	622,596	1,184 (643–1,725)	751,949	1,385 (743–2,026)	799,863	1,428 (941–1,914)

*Figure does not meet standard for reliaiblity or precision.

[a]Rate per 100,000 based on 1992, 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US adult civilian non-institutionalized population.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: National Ambulatory Medical Care Survey, 1992, 1994, 1996, 1998, 2000.

highest for Hispanics in 1995; in 1998 North American Natives appeared to have a substantially higher rate, but this difference is so dramatic that it must be interpreted with caution. Age-adjustment of the CMS data did not alter the relative differences in racial/ethnic, gender, or geographic group comparisons.

Physician Office Visits: NAMCS Data

Physician office visit rates for patients with a primary diagnosis of urolithiasis were determined from National Ambulatory Medical Care Survey (NAMCS) data for the even years between 1992 and 2000 (Table 17). The rates were stable between 1992 and 1996, then increased in 1998 and 2000. The visit rate was 43% higher in 2000 than it was in 1992. Small cell sizes preclude interpretation of age-specific rates, and no gender-specific information is available. The total number of visits nearly doubled between 1992 and 2000, increasing from 950,000 to 1,825,000.

Physician Office Visits: Medicare Data

In the Medicare data for 1992, 1995, and 1998, physician office visit rates increased 41% between 1992 to 1998 for those <65 years of age and 25% for those ≥65 (Table 18). The rates peaked in the 65-to 74-year age group and then declined. Rates were highest in the South. In 1995 and 1998, the rates were higher for Hispanics than for Asians and Caucasians, and rates were lowest for African Americans. When the CMS data were age-adjusted, the gender gap in physician office visit rates slightly widened in all three years of study, but the relative differences in geographic and racial/ethnic group comparisons did not change.

Physician Office Visits: VA Data—Adult Outpatients

A few general comments are in order before discussing the Veterans Health Administration (VA) data. Despite the clear differences in rates by age and race indicated by the data, the data have not been age- or race-standardized (see Methods chapter), except where indicated. Although we use the term rate for the VA data, the data represent the number of cases being seen for the specified condition per 100,000 unique VA outpatients; 95% confidence intervals are not available for the VA rates reported here.

The rates for outpatient visits by VA patients with a primary diagnosis of urinary tract stones decreased between 1999 and 2001 (Table 19). This decrease occurred for both upper tract and lower tract stones; the rate for upper tract stones was nearly 10 times that for lower tract stones.

The visit rate was highest in the 55- to 64-year age group for upper tract stones. The rate in the 85+ group is impressive, but it is not simply a reflection of bladder stones being more common (Table 19). The rate for males was 50 percent higher than that for females, and Hispanics as a group had the highest rates. There were also regional differences, with the highest rates occurring in the South.

The VA is one of the few sources that provides information specifically for bladder stones. The visit rate for a primary diagnosis of bladder stones decreased slightly, from 45 per 100,000 in 1999 to 38 per 100,000 in 2001 (Table 20). Two-thirds of the visits for lower tract stones in 2001 were for bladder stones. The visit rate was higher in the 55+ group than in the <55 group, but there was no further increase with age. No regional differences were observed.

Physician Office and Hospital Outpatient Visits Combined

Combined NAMCS and NHAMCS data revealed nearly 2 million visits in 2000 by patients with urolithiasis as the primary reason for the visit. This translates into a rate of 731 per 100,000 population. There were 2.7 million visits by patients with urolithiasis listed as any of the reasons for the visit (982 per 100,000 population). Thus, the vast majority of visits for urolithiasis (74%) are for urolithiasis as the primary diagnosis (Tables 15 and 17).

Ambulatory Surgery Procedures

Visits to an ambulatory surgery center by individuals with commercial insurance who had a primary diagnosis of urolithiasis (upper or lower tract stones) were tabulated for 1994, 1996, 1998, and 2000 from the Center for Health Care Policy and Evaluation Database (Table 21). The total number of visits increased more than fourfold between 1994 and 1998, and the rate of visits increased by 58% (from 117 to 185 per 100,000). These findings reflect the trend of moving outpatient surgical treatment from hospitals to ambulatory care centers to avoid the high overhead cost associated with hospital-based outpatient surgery. However, the data do not represent all outpatient procedures performed in a population,

Table 18. Physician office visits by Medicare beneficiaries with upper and/or lower tract urolithiasis listed as primary diagnosis, count[a], rate[b] (95% CI), age-adjusted rate[c] (95% CI)

	1992			1995			1998		
	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate
Total all ages[d]	178,320	516 (514–519)	516 (514–519)	221,220	625 (622–627)	625 (622–627)	235,920	704 (701–706)	704 (701–706)
Total < 65	20,800	380 (375–385)		34,000	554 (549–560)		39,680	639 (632–645)	
Total 65+	157,520	542 (539–545)		187,220	640 (637–643)		196,240	718 (715–721)	
Age									
65–74	106,340	647 (643–651)		123,640	764 (760–768)		122,760	857 (852–862)	
75–84	44,400	471 (466–475)		55,440	575 (570–580)		63,460	668 (663–673)	
85–94	6,560	229 (223–234)		7,920	258 (252–263)		9,480	307 (301–313)	
95+	220	66 (57–74)		220	60 (52–68)		540	136 (124–147)	
Race/ethnicity									
White	157,460	539 (537–542)	538 (536–541)	200,800	662 (659–664)	661 (658–664)	209,780	738 (735–742)	738 (735–741)
Black	9,660	326 (320–333)	321 (314–327)	10,440	324 (318–330)	316 (310–322)	11,840	382 (375–389)	375 (368–382)
Asian	…	…	…	1,020	610 (573–647)	646 (607–684)	2,560	815 (784–847)	828 (796–860)
Hispanic	…	…	…	3,100	776 (749–803)	821 (793–849)	5,840	830 (809–852)	845 (823–866)
N. American Native	…	…	…	120	331 (273–389)	276 (221–331)	260	481 (422–540)	481 (422–540)
Gender									
Male	109,560	744 (740–748)	756 (752–761)	139,220	915 (910–920)	925 (920–930)	147,360	1,018 (1,013–1,023)	1,031 (1,026–1,037)
Female	68,760	347 (344–350)	338 (335–340)	82,000	406 (404–409)	399 (396–401)	88,560	465 (462–468)	454 (451–457)
Region									
Midwest	37,560	430 (426–435)	430 (426–435)	46,920	521 (516–525)	523 (518–528)	51,180	593 (588–598)	594 (589-599)
Northeast	37,700	489 (484–494)	482 (477–487)	47,600	620 (615–626)	612 (607–618)	47,560	710 (704–717)	704 (698-710)
South	72,240	591 (587–595)	596 (592–600)	88,220	694 (689–699)	699 (694–704)	100,020	808 (803–813)	814 (809-819)
West	26,500	520 (514–526)	518 (512–524)	32,580	629 (622–635)	624 (617–631)	30,060	607 (600–614)	597 (590-603)

… data not available.

[a]Unweighted counts were multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]Age-adjusted to the 2000 US Census.

[d]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

Table 19. Frequency of upper and/or lower tract urolithiasis[a] listed as primary diagnosis in VA patients seeking outpatient care, count[b], rate[c]

	Upper Tract Stones						Lower Tract Stones					
	1999		2000		2001		1999		2000		2001	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total	18,584	611	19,246	587	20,717	561	2,051	67	2,113	64	2,107	54
Age												
18–24	66	261	69	293	77	334	5	20	3	13	3	13
25–34	790	524	736	518	774	570	44	29	35	25	50	37
35–44	1,909	578	1,786	572	1,661	554	121	37	119	38	86	29
45–54	5,224	758	5,492	766	5,636	748	355	52	357	50	361	48
55–64	4,080	813	4,406	795	5,167	796	392	78	411	74	438	68
65–74	4,222	556	4,326	524	4,596	483	614	81	625	76	599	63
75–84	2,165	404	2,294	357	2,602	325	474	88	511	79	520	65
85+	128	261	137	235	204	260	46	94	52	89	50	64
Race/ethnicity												
White	11,484	841	11,692	794	12,268	762	1,406	103	1,338	91	1,312	81
Black	1,482	444	1,538	449	1,667	470	205	61	243	71	254	72
Hispanic	1,222	1,068	1,295	1,057	1,183	918	108	94	112	91	127	99
Other	143	739	126	622	151	692	10	52	14	69	9	41
Unknown	4,253	353	4,595	348	5,448	346	322	27	406	31	405	26
Gender												
Male	18,079	624	18,682	598	20,088	570	1,998	69	2,068	66	2,061	58
Female	505	358	564	374	629	381	53	38	45	30	46	28
Region												
Midwest	3,717	541	3,790	509	3,799	459	432	63	505	68	424	51
Northeast	3,890	530	3,934	505	4,251	489	575	78	503	65	533	61
South	7,179	705	7,565	678	8,099	626	654	64	701	63	737	57
West	3,798	632	3,957	623	4,568	653	390	65	401	63	413	59
Insurance status												
No insurance/self-pay	11,434	626	11,574	639	12,186	640	1,108	61	1,085	60	1,063	56
Medicare/Medicare supplemental	4,059	583	4,575	500	5,382	455	650	93	729	80	793	67
Medicaid	41	828	61	772	61	679	6	121	6	76	7	78
Private insurance/ HMO/PPO	2,849	587	2,786	546	2,833	512	275	57	270	53	226	41
Other insurance	186	736	237	824	236	708	10	40	19	66	17	51
Unknown	15	785	13	529	19	210	2	105	4	163	1	11

HMO, health maintenance organization; PPO, preferred provider organization.

[a]Represents diagnosis codes for urolithiasis.

[b]The term count is used to be consistent with other UDA tables; however, the VA tables represent the population of VA users and thus are not weighted to represent national population estimates.

[c]Rate is defined as the number of unique patients with each condition divided by the base population in the same fiscal year x 100,000 to calculate the rate per 100,000 unique outpatients.

NOTE: Race/ethnicity data from clinical observation only, not self-report; note large number of unknown values.

SOURCE: Outpatient Clinic File (OPC), VA Austin Automation Center, FY1999–FY2001.

Table 20. Frequency of bladder stones[a] listed as primary diagnosis in VA patients seeking outpatient care, count[b], rate[c]

	1999		2000		2001	
	Count	Rate	Count	Rate	Count	Rate
Total	1,188	45	1,282	44	1,255	38
Age						
40–44	26	14	37	21	20	12
45–54	186	28	179	26	174	24
55–64	242	49	258	48	262	41
65–74	387	52	426	52	412	44
75–84	315	61	347	55	352	45
85+	32	70	35	62	35	46
Race/ethnicity						
White	847	68	815	61	792	53
Black	102	36	155	53	152	50
Hispanic	55	53	64	57	82	69
Other	5	29	9	50	7	36
Unknown	179	18	239	21	222	16
Region						
Midwest	274	45	348	52	292	39
Northeast	355	54	331	47	317	40
South	343	39	390	40	414	36
West	216	42	213	39	232	38
Insurance status						
No insurance/self-pay	579	38	625	41	583	36
Medicare/Medicare supplemental	423	62	480	54	533	46
Medicaid	4	93	3	43	4	50
Private insurance/HMO/PPO	172	40	164	36	127	25
Other insurance	8	38	6	25	7	25
Unknown	2	127	4	193	1	13

HMO, health maintenance organization; PPO, preferred provider organization.

[a]Represents diagnosis codes for bladder stones (no coexisting benign prostatic hyperplasia).

[b]The term count is used to be consistent with other UDA tables; however, the VA tables represent the population of VA users and thus are not weighted to represent national population estimates.

[c]Rate is defined as the number of unique patients with each condition divided by the base population in the same fiscal year x 100,000 to calculate the rate per 100,000 unique outpatients.

NOTE: Race/ethnicity data from clinical observation only, not self-report; note large number of unknown values.

SOURCE: Outpatient Clinic File (OPC), VA Austin Automation Center, FY1999–FY2001.

Table 21. Visits to ambulatory surgery centers for urolithiasis procedures listed as primary procedure by individuals having commercial health insurance, count, rate[a]

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total	1,254	117	2,389	150	4,535	185	6,755	246
Age								
<3	1	*	2	*	7	*	8	*
3–10	7	*	7	*	22	*	36	11
11–17	11	*	21	*	49	18	74	25
18–24	56	57	102	72	220	99	291	113
25–34	194	103	410	147	811	195	1,123	254
35–44	363	166	689	211	1,170	230	1,731	310
45–54	380	243	705	286	1,293	321	1,997	417
55–64	190	250	369	316	800	398	1,295	530
65–74	51	323	72	321	141	438	175	430
75–84	1	*	10	*	21	*	21	*
85+	0	0.0	2	*	1	*	4	*
Gender								
Male	784	149	1,478	187	2,916	236	4,107	298
Female	470	86	911	114	1,619	132	2,648	193
Region								
Midwest	775	119	1,383	153	2,191	182	3,228	237
Northeast	107	71	164	102	253	126	324	197
South	303	155	742	170	1,902	202	2,952	271
West	69	91	100	110	189	174	251	188

*Figure does not meet standard for reliability or precision.
[a]Rate per 100,000 based on member months of enrollment in calendar year for individuals in the same demographic stratum.
SOURCE: Center for Health Care Policy and Evaluation, 1994, 1996, 1998, 2000.

since many are still done in a hospital setting. Although the ambulatory surgery visits in this dataset were not stratified by upper tract versus lower tract stones, the impact of bladder stone treatment should be minimal, since relatively few procedures for such treatment are performed in ambulatory care centers, and the overall incidence of bladder stones is much lower than that of kidney stones. Bladder stones are usually treated in conjunction with prostate surgeries in an inpatient setting.

During the years studied, the male-to-female ratio varied from 1.5 to 1.8—a bit lower than expected in view of the ratio of incidence rates for stone disease. The peak age for visits was between 65 and 74 for 1994, 1996, and 1998, but it dropped to 55 to 64 in 2000 (Figure 3). Regional differences were apparent: the highest rates were consistently seen in the Southeast; the lowest rates were seen in the Northeast in 1994–1998 and in the West in 2000.

The CMS database revealed that ambulatory surgery visits by Medicare patients with a primary diagnosis of urolithiasis also increased over time, from 42,320 total visits in 1992 to 66,580 in 1998; likewise, the visit rate increased from 123 to 199 per 100,000 (Table 22). The male-to-female ratio remained stable at approximately 2 to 1 (Figure 5).

The available data regarding ambulatory surgery for urolithiasis in children are too scant to provide reliable estimates of utilization.

Table 22. Visits to ambulatory surgery centers by Medicare beneficiaries with upper and/or lower tract urolithiasis listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	42,320	123 (121–124)	57,580	163 (161–164)	66,580	199 (197–200)
Total < 65	4,480	82 (79–84)	8,040	131 (128–134)	8,480	136 (134–139)
Total 65+	37,840	130 (129–132)	49,540	169 (168–171)	58,100	213 (211–214)
Age						
65–74	23,460	143 (141–145)	30,060	186 (184–188)	33,500	234 (231–236)
75–84	12,600	134 (131–136)	16,800	174 (172–177)	20,580	217 (214–220)
85–94	1,720	60 (57–63)	2,520	82 (79–85)	3,980	129 (125–133)
95+	60	18 (13–22)	160	44 (37–51)	40	10 (7.0–13)
Race/ethnicity						
White	37,820	130 (128–131)	51,840	171 (169–172)	59,760	210 (209–212)
Black	2,500	84 (81–88)	3,600	112 (108–115)	4,380	141 (137–146)
Asian	…	…	200	120 (103–136)	460	146 (133–160)
Hispanic	…	…	500	125 (114–136)	820	117 (109–125)
N. American Native	…	…	40	110 (77–143)	80	148 (115–181)
Gender						
Male	25,900	176 (174–178)	35,880	236 (233–238)	40,860	282 (279–285)
Female	16,420	83 (82–84)	21,700	108 (106–109)	25,720	135 (133–137)
Region						
Midwest	11,800	135 (133–138)	16,840	187 (184–190)	18,920	219 (216–222)
Northeast	7,180	93 (91–95)	10,120	132 (129–134)	13,160	197 (193–200)
South	18,320	150 (148–152)	23,040	181 (179–184)	26,680	215 (213–218)
West	4,980	98 (95–100)	7,380	142 (139–146)	7,480	151 (148–154)

…data not available.
[a]Unweighted counts were multiplied by 20 to arrive at values in the table.
[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.
[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.
NOTE: Counts less than 600 should be interpreted with caution.
SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

Surgical Trends

A variety of datasets was used to establish trends in the surgical management of upper tract stones. Although no completely new technology for stone treatment has been introduced since extracorporeal shock wave lithotripsy (ESWL) was developed in the 1980s, improvements in endoscopic technique and instrumentation have increased efficacy, reduced morbidity, and increased patient tolerance of the procedures. For example, although ureteroscopy has been used for the treatment of ureteral stones for more than two decades, advances in ureteroscope design and instrumentation have expanded the indications for the procedure to increasingly include lower calyceal renal calculi (8, 9), stones in calyceal diverticuli (10), and large-volume renal stones (11, 12). Likewise, refinements in the indications for ESWL have the potential to improve success rates, but they have also expanded the role of endoscopic management of stones in subgroups of patients who have poor outcomes with ESWL (i.e., those with lower calyceal stones (13).

In Medicare patients with a diagnosis of urolithiasis, rates of ESWL, ureteroscopy, and PCNL treatment of stones remained relatively stable over 1992, 1995, and 1998, with rates of 10,943 to 11,738 per 100,000 population with urolithiasis for ESWL; 8,372 to 8,839 per 100,000 for ureteroscopy; and 665 to 882 per 100,000 for PCNL (Table 23). One of the reasons that the frequency of ESWL has risen slightly may be the fact that today's lithotriptors are less effective than the original HM3, resulting in multiple retreatments

Table 23. Procedures for nephrolithiasis among Medicare beneficiaries, count[a], rate[b]

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total	46,280	21,496	52,880	21,965	54,080	20,942
PCNL	1,900	882	1,600	665	2,180	844
Ambulatory surgery center	0	0.0	0	0.0	0	0.0
Hospital outpatient	300	139	220	91	520	201
Inpatient	1,580	734	1,340	557	1,660	643
Physician office	20	9.3	40	17	0	0.0
Other	0	0.0	0	0.0	0	0.0
ESWL	23,560	10,943	28,260	11,738	29,420	11,393
Ambulatory surgery center	1,000	464	1,160	482	1,400	542
Hospital outpatient	15,300	7,106	22,100	9,179	23,680	9,170
Inpatient	5,580	2,592	3,700	1,537	2,960	1,146
Physician office	860	399	840	349	1,000	387
Other	820	381	460	191	380	147
Uteroscopy	18,840	8,751	21,280	8,839	21,620	8,372
Ambulatory surgery center	120	56	640	266	740	287
Hospital outpatient	5,440	2,527	9,080	3,771	12,100	4,686
Inpatient	12,700	5,899	11,120	4,619	8,440	3,268
Physician office	440	204	340	141	280	108
Other	140	65	100	42	60	23
Open stone surgery	1,980	920	1,740	723	860	333
Ambulatory surgery center	0	0.0	0	0.0	0	0.0
Hospital outpatient	60	28	160	66	120	46
Inpatient	1,800	836	1,480	615	720	279
Physician office	60	28	80	33	20	7.7
Other	60	28	20	8.3	0	0.0
Laparoscopic removal	0	0.0	0	0.0	0	0.0
Ambulatory surgery center	0	0.0	0	0.0	0	0.0
Hospital outpatient	0	0.0	0	0.0	0	0.0
Inpatient	0	0.0	0	0.0	0	0.0
Physician office	0	0.0	0	0.0	0	0.0
Other	0	0.0	0	0.0	0	0.0

ESWL, extracorporeal shock wave lithotripsy; PCNL, percutaneous nephrolithotomy.

[a]Unweighted counts were multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries with a diagnosis of nephrolithiasis.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid, 5% sample, 1992, 1995, 1998.

Table 24. Urolithiasis procedures for individuals having commercial health insurance, count[a], rate[b]

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total	1,074	100	2,042	128	3,514	143	5,180	188
ESWL								
Ambulatory surgery	515	48	1,069	67	1,853	75	2,765	101
Emergency room	0	0.0	0	0.0	0	0.0	1	*
Inpatient	16	*	25	*	44	1.8	47	1.7
Open stone								
Ambulatory surgery	5	*	7	*	20	*	19	*
Inpatient	17	*	16	*	22	*	29	*
PCNL								
Ambulatory surgery	5	*	21	*	28	*	56	2.0
Inpatient	60	5.6	89	5.6	134	5.5	190	6.9
Uteroscopy								
Ambulatory surgery	258	24	545	34	1068	43	1,627	59
Emergency room	1	*	0	0.0	1	*	1	*
Inpatient	197	18	270	17	344	14	445	16

ESWL, extracorporeal shock wave lithotripsy; PCNL, percutaneous nephrolithotomy.
*Figure does not meet standard for reliability or precision.
[a]Counts less than 30 should be interpreted with caution.
[b]Rate per 100,000 based on member months of enrollment in calendar year.
SOURCE: Center for Health Care Policy and Evaluation, 1994, 1996, 1998, 2000.

for the same stone. Given the significant advances in the ureteroscopic management of calculi in the very late 1990s and early 2000s, it is not surprising that the improvement in technology is not reflected by an increase in ureteroscopy up to 1998. The introduction of the Holmium laser in 1995 rendered virtually all stones amenable to fragmentation if they could be accessed endoscopically (14); however, this new technology may have not yet reached widespread use by 1998. Only open stone surgery showed a clear-cut trend, decreasing in use from 920 per 100,000 in 1992 to 333 per 100,000 in 1998.

According to Medicare data, the distribution of procedures changed surprisingly little over the years studied. ESWL has traditionally been the most frequently performed procedure, comprising 51% of the procedures in 1992 and 54% in 1998. PCNL remained relatively stable at 3% to 4% of procedures, and ureteroscopy comprised 40% to 41% of the procedures.

The distribution of procedures was remarkably similar between commercially insured individuals (reported in the Center for Health Care Policy and Evaluation database) and Medicare patients (reported in the CMS database). Among the commercially insured population, PCNL comprised 5% to 6% of procedures and remained stable from 1994 to 2000 (Table 24). ESWL comprised 49% of the procedures in 1994, increasing to 54% in 2000. Ureteroscopy remained stable over time and comprised 40% to 42% of the procedures. Open stone surgery made up only 2% of the total procedures in 1994 and dropped to less than 1% in 2000. As numerous studies in the literature have demonstrated, open surgery should be considered a salvage procedure to be used only when endoscopic or shock wave treatment fails, and its use should be indicated in well under 5% of cases (15). Indeed, CMS data revealed a 64% decline in the use of open stone surgery from 1992 to 1998, and in 1998 this modality comprised less than 2% of all stone procedures performed.

Kerbl and colleagues also reviewed the distribution of surgical procedures over time, using data from the Health Care Financing Administration (the federal agency now known as CMS) (16). They found that although ESWL remained relatively stable at 70% to 80% of the procedures from 1992 to 2000, ureteroscopy increased from 14% in 1992 to 22% in

Table 25. National emergency room visits by individuals with urolithiasis listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total	368,667	146 (110–181)	331,758	126 (93–159)	399,403	149 (112–186)	617,647	226 (175–277)
Gender								
Male	246,375	200 (140–260)	189,647	148 (99–196)	268,193	205 (142–267)	406,137	305 (225–385)
Female	122,292	94 (55–134)	142,111	105 (61–149)	131,210	96 (55–136)	211,510	151 (88–214)

[a]Rate per 100,000 based on 1994, 1996, 1998, and 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US civilian non-institutionalized population.

SOURCE: National Hospital Ambulatory Medical Care Survey — ER, 1994, 1996, 1998, 2000.

2000, still less than half the proportion observed in the Center for Health Care Policy and Evaluation database of commercially insured patients (Table 24). PCNL use remained stable at 4% to 6%, which is comparable to the proportion seen in the Medicare and commercially insured populations. The reason for the differences in the distribution of procedures among the different datasets is unclear.

Emergency Room Care

Between 1994 and 1998, emergency room visits by individuals with a primary diagnosis of urolithiasis remained relatively stable, according to NHAMCS data; however, there was a 50% increase in 2000 (Table 25). Future studies will be needed to determine whether this represented a sharp increase or simply year-to-year variability. In general, the rate for males was twice that for females. It is noted that the confidence intervals for these estimates are wide, and no information is available on geographic variation in rates.

Emergency room visits were less common in the Medicare population (Table 26) than in the NHAMCS population. Among Medicare beneficiaries, the rate increased between 1992 and 1998 for the <65 and ≥65 age groups (53% and 31%, respectively), for both males and females, and in all regions. The visit rate was lower in those 65 and older, and it decreased with increasing age. Males were three times more likely than females to visit an emergency room for urolithiasis. This ratio is higher than that seen in the NHAMCS population (Table 25) and was consistent in age-unadjusted and age-adjusted CMS data; it may be related to different age distributions by sex in the two data sources. There were clear regional variations, with rates highest in the South. The visit rate was higher among Caucasians than African Americans (no data on Hispanics were available for 1992). In both 1995 and 1998, the rates were highest among Hispanics. When the CMS data were age-adjusted, the geographic and racial/ethnic differences did not change.

ECONOMIC IMPACT

The economic impact of urolithiasis includes both the direct medical costs of treating the condition (emergency room visits, office visits, inpatient hospitalizations, ambulatory surgery, and prescription medications) and indirect costs associated with lost work time. Each inpatient or outpatient encounter involves a variety of cost sources, including physician professional fees, radiographic studies, room and board, laboratory, pharmacy, and operating room costs. The distinction between cost, representing the actual cost to the hospital, pharmacy, or laboratory of providing a service, and the charge to the patient or payor, which is related to cost but not necessarily in a predictable manner, is important, although it cannot always be easily arrived at or consistently applied. For the purposes of this chapter, we use the terms *costs* and *expenditures* to reflect total payments made by the patient (co-insurance, co-payments, deductibles, and uncovered expenses) and by all third-party payors (primary and secondary coverage, when available). Using data from the Ingenix dataset for 1999, we estimated that the average annual expenditure for privately insured individuals between the ages of 18 and 64 was $7,656 for those with a medical claim corresponding to a diagnosis of urolithiasis and $3,184 for those without a claim relating to urolithiasis (Table 27). Hence, a $4,472 difference per covered individual

Table 26. Emergency room visits by Medicare beneficiaries with upper and/or lower tract urolithiasis listed as primary diagnosis, count[a], rate[b] (95% CI), age-adjusted rate[c] (95% CI)

	1992			1995			1998		
	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate	Count	Rate	Age-Adjusted Rate
Total all ages[d]	21,840	63 (62–64)	63 (62–64)	26,060	74 (73–75)	74 (73–75)	29,200	87 (86-88)	87 (86–88)
Total < 65	4,900	89 (87–92)		6,700	109 (107–112)		8,460	136 (133-139)	
Total 65+	16,940	58 (57–59)		19,360	66 (65–67)		20,740	76 (75-77)	
Age									
65–74	11,960	73 (71–74)		13,720	85 (83–86)		13,760	96 (94–98)	
75–84	4,200	45 (43–46)		4,920	51 (50–52)		5,980	63 (61–65)	
85–94	720	25 (23–27)		660	21 (20–23)		960	31 (29–33)	
95+	60	18 (13–22)		60	16 (12–21)		40	10 (7.0–13)	
Race/ethnicity									
White	19,200	66 (65–67)	65 (65–66)	23,480	77 (76–78)	78 (77–79)	25,800	91 (90–92)	91 (90–92)
Black	940	32 (30–34)	32 (30–34)	1,460	45 (43–48)	43 (41–45)	1,580	51 (48–54)	51 (48–54)
Asian	…	…	…	100	60 (48–72)	60 (48–72)	260	83 (73–93)	76 (67–86)
Hispanic	…	…	…	360	90 (81–99)	90 (81–99)	720	102 (95–110)	102 (95–110)
N. American Native	…	…	…	0	0.0	0.0	20	37 (20–54)	37 (20–54)
Gender									
Male	14,920	101 (100–103)	104 (102–106)	18,160	119 (118–121)	122 (120–123)	20,260	140 (138–142)	141 (140–143)
Female	6,920	35 (34–36)	33 (32–34)	7,900	39 (38–40)	37 (36–38)	8,940	47 (46–48)	46 (45–47)
Region									
Midwest	5,180	59 (58–61)	60 (58–62)	6,880	76 (75–78)	77 (75–79)	7,860	91 (89–93)	92 (90–94)
Northeast	4,040	52 (51–54)	52 (51–54)	3,720	48 (47–50)	47 (46–49)	4,440	66 (64–68)	65 (63–67)
South	8,980	73 (72–75)	73 (71–74)	11,300	89 (87–91)	89 (87–91)	13,000	105 (103–107)	105 (104–107)
West	3,220	63 (61–65)	64 (61–66)	3,800	73 (71–76)	74 (71–76)	3,280	66 (64–68)	66 (64–68)

… data not available.

[a]Unweighted counts were multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]Age-adjusted to the 2000 US Census.

[d]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

Table 27. Estimated annual expenditures of privately insured workers with and without a medical claim for urolithiasis in 1999[a] (in $)

	Annual Expenditures (per person)			
	Persons without Urolithiasis (N=276,064)	Persons with Urolithiasis (N=2,886)		
	Total	Total	Medical	Rx Drugs
All	3,184	7,656	6,498	1,158
Age				
18–34	2,776	7,243	6,411	831
35–44	2,953	7,506	6,386	1,120
45–54	3,262	8,379	7,113	1,265
55–64	3,362	7,172	6,032	1,140
Gender				
Male	2,776	7,376	6,263	1,113
Female	3,889	8,619	7,321	1,299
Region				
Midwest	3,066	8,747	7,440	1,306
Northeast	3,068	6,918	5,846	1,072
South	3,397	8,352	7,132	1,219
West	3,221	7,489	6,105	1,384

Rx, prescription.
[a]The sample consists of primary beneficiaries ages 18 to 64 having employer-provided insurance who were continuously enrolled in 1999. Estimated annual expenditures were derived from multivariate models that control for age, gender, work status (active/retired), median household income (based on zip code), urban/rural residence, medical and drug plan characteristics (managed care, deductible, co-insurance/co-payments), and 26 disease conditions.
SOURCE: Ingenix, 1999.

Table 28. Expenditures for urolithiasis and share of costs, by type of service (in millions of $)

	Year			
	1994	1996	1998	2000
Total[a]	1,373.9	1,233.9	1,518.5	2,067.4
Share of total				
Inpatient care	785.9 (57.2%)	811.9 (65.8%)	862.5 (56.8%)	971.7 (47.0%)
Physician office	151.1 (11.0%)	154.2 (12.5%)	236.9 (15.6%)	363.9 (17.6%)
Hospital outpatient	233.6 (17.0%)	58.0 (4.7%)	135.1 (8.9%)	244.0 (11.8%)
Emergency room	204.7 (14.9%)	209.8 (17.0%)	285.5 (18.8%)	490.0 (23.7%)

[a]Total unadjusted expenditures exclude spending on outpatient prescription drugs for the treatment of urolithiasis. Average drug spending for urolithiasis-related conditions is estimated at $4 million to $14 million annually for the period 1996 to 1998.
SOURCES: National Ambulatory Medical Care Survey, National Hospital Ambulatory Medical Care Survey, Healthcare Cost and Utilization Project, Medical Expenditure Panel Survey, 1994, 1996, 1998, 2000.

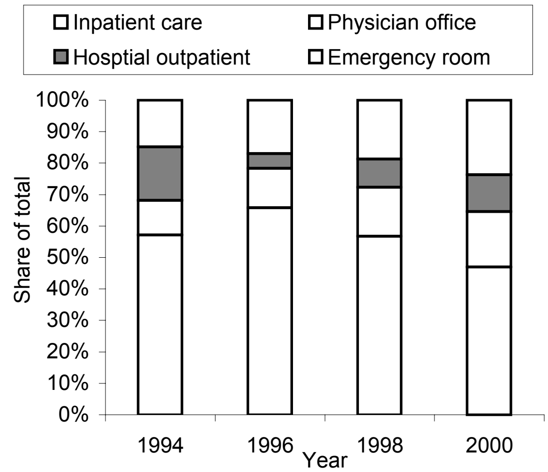

Figure 6. Percent share of costs for urolithiasis by type of service, 1994–2000.

SOURCE: National Ambulatory Medical Care Survey; National Hospital Ambulatory Medical Care Survey; Healthcare Cost and Utilization Project; Medical Expenditure Panel Survey, 1994, 1996, 1998, 2000.

should be accounted for by expenditures either directly or indirectly related to stone disease (indirect expenditures are those for treatment of systemic illnesses that are associated with stone disease, such as primary hyperparathyroidism, chronic diarrheal syndrome due to bowel disease, etc.). This difference in expenditures may be mitigated by unmeasured differences (such as comorbidities) between those with and without stone disease.

The annual expenditures for those with a medical claim for urolithiasis include the sum of the expenditures for medical care ($6,498) and those for prescription drugs ($1,158). When stratified by age, the expenditures of those without a urolithiasis-related claim rose steadily to a maximum of $3,362 in the 55 to 64 age group. In contrast, the peak total medical expenditure for the group with a urolithiasis-related claim, $8,379, occurred in the 45 to 54 age group, perhaps reflecting the peak incidence of stone disease in this group.

Women have higher medical expenditures than men in both groups, although the difference was slightly larger among those with urolithiasis-related claims. However, given the higher incidence of stone disease in men (a factor of 2 to 3), one might expect a greater impact of gender in the group with stones. It should be noted, however, that the diagnosis of stones may be made incidentally, without necessarily prompting or requiring any intervention. Evaluation of regional differences in medical expenditures suggests that overall higher expenditures for the group without urolithiasis-related claims were found in the South and West, whereas in the urolithiasis group, expenditures were highest in the Midwest and South. As prescription drug costs showed little regional variation, the geographic differences in expenditures are likely related to direct medical expenditures or possibly due to differences in the age distributions of the regions.

National estimates of annual medical expenditures suggest that slightly more than $2 billion was spent on treating urolithiasis in 2000, based solely on inpatient and outpatient claims of individuals with a primary diagnosis of urolithiasis. This estimate includes $971 million for inpatient services, $607 million for physician office and hospital outpatient services, and $490 million for emergency room services (Table 28). That these figures are somewhat lower than the $1.83 billion estimated annual cost of urolithiasis for 1993 reported by Clark and colleagues (17) may be related to our more restrictive definition of hospitalization. Total expenditures (excluding outpatient prescription drug costs) increased by 50% from $1.37 billion to $2.07 billion, between 1994 and 2000. During that time period, non-inpatient services (including physician office visits, emergency room visits, and hospital outpatient services) accounted for an increasing proportion of the total expenditures—43% of the total in 1994 and 53% in 2000 (Figure 6). Interestingly, the relative proportion of total expenditures for emergency room services also increased, from 15% in 1992 to 24% in 2000.

Urolithiasis-related treatment costs for the Medicare population also increased significantly over time. Total expenditures for Medicare beneficiaries 65 and older increased 36% (from $613 million in 1992 to $834 million in 1998), with outpatient services accounting for an increasingly larger share of the total (31% in 1992, 38% in 1998) (Table 29).

According to Medical Expenditure Panel Survey (MEPS) data, annual estimates of spending on outpatient prescription drugs for the treatment of urolithiasis in 1996–1998 ranged from $4 million to $14 million (Table 28). Furthermore, MEPS data

Table 29. Expenditures for Medicare beneficiaries age 65 and over for treatment of urolithiasis (in millions of $)

	Year		
	1992	1995	1998
Total	613.4	779.4	834.4
Inpatient	423.7 (69.1%)	513.8 (65.9%)	518.9 (62.2%)
Outpatient	179.2 (29.2%)	250.6 (32.2%)	296.1 (35.5%)
Physician office	56.7 (9.2%)	81.6 (10.5%)	96.1 (11.5%)
Hospital outpatient	5.5 (0.9%)	5.1 (0.7%)	4.8 (0.6%)
Ambulatory surgery	117.0 (19.1%)	163.9 (21.0%)	195.2 (23.4%)
Emergency room	10.5 (1.7%)	14.9 (1.9%)	19.4 (2.3%)

NOTE: Percentages may not add to 100% because of rounding.
SOURCE: Centers for Medicare and Medicaid Services, 1992, 1995, 1998.

suggest that 29% of men and 24% of women with urolithiasis filled a prescription for the treatment of the condition, with mean annual expenditures for outpatient prescriptions being $43 for men and $48 for women (Table 30).

In addition to the direct medical costs of treatment, the economic effects of urolithiasis include labor market outcomes such as absenteeism and work limitations. It is estimated that 30% of employed individuals with an inpatient or outpatient claim for upper tract stones missed 19 hours of work time per year in association with their claim (Table 31). Lower tract stones, presumably bladder stones, were also associated with lost workdays for 32% of employees with a medical claim for the condition, but the mean number of hours of lost work was substantially lower (6.1 hours per year).

The medical costs of treating children with urolithiasis are difficult to estimate, largely because of the paucity of data. However, some data are available in the medical and financial records of the National Association of Children's Hospitals and Related Institutions (NACHRI). According to NACHRI data, in 1999–2001, the average inpatient cost per child was $7,355 in 2001, a 32% to 36% increase over the cost in the two previous years (Table 32). Expenditures in 2001 were nearly twice as high among infants (0 to 2 years of age) as they were among children ages 3 to 10 or 11 to 17 and twice as high among African Americans as among Caucasians and Hispanics. However, there were no significant differences in costs across gender.

CONCLUSION

Urolithiasis is common in the US population, and its prevalence is increasing. The available data on urolithiasis support the important influences of age, sex, region, and race/ethnicity. The setting for both the acute care and the surgical management of patients with stones has changed over time: inpatient admissions and length of stay have decreased as

Table 30. Annual use of outpatient prescription drugs for the treatment of urolithiasis, 1996–1998

	All Persons with Urolithiasis		Conditional on Rx Use	
Gender	Number with Urolithiasis	% with Rx Claim for Urolithiasis	Mean Number of Prescriptions	Mean Rx Expenditures (in $)
Male	676,144	29.2	3.6	43.19
Female	408,948	24.2	3.9	47.89
Total	1,085,092	27.3	3.7	44.96

Rx, prescription.
SOURCE: Medical Expenditure Panel Survey, 1996–1998.

Table 31. Average annual work loss of persons treated for urolithiasis, 1999 (95% CI)

	Number of Workers[a]	% Missing Work	Average Work Absence (hrs) Inpatient	Outpatient	Total
Upper tract urolithiasis	834	30%	4.4 (2.5–6.3)	14.6 (11.5–17.7)	19.0 (14.5–23.5)
Lower tract urolithiasis	60	32%	0.3 (0.0–0.8)	5.8 (3.0–8.6)	6.1 (3.2–9.0)

[a]Individuals with an inpatient or outpatient claim for urolithiasis and for whom absence data were collected. Work loss is based on reported absences contiguous to the admission and discharge dates of each hospitalization or the date of the outpatient visit.

SOURCE: MarketScan, 1999.

Table 32. Mean inpatient cost per child admitted with urolithiasis listed as primary diagnosis, count, mean cost[a] (in $) (95% CI)

	1999		2000		2001	
	Count	Mean Cost	Count	Mean Cost	Count	Mean Cost
Total[b]	461	5,582 (4,806–6,358)	553	5,374 (4,790–5,958)	619	7,355 (5,695–9,015)
Age						
0–2	43	11,311 (4,717–17,905)	45	7,811 (5,178 –10,443)	37	13,875 (7,982–19,767)
3–10	193	5,253 (4,430–6,076)	198	5,067 (4,368– 5,766)	225	7,041 (4,899–9,183)
11–17	225	4,769 (4,103–5,435)	310	5,217 (4,354 –6,080)	357	6,877 (4,405–9,349)
Race/ethnicity						
White	338	5,925 (4,928–6922)	385	5,687 (4,947–6,427)	447	6,252 (5,344–7,160)
Black	31	4,699 (3,205–6,192)	34	6,083 (4,806–7,360)	38	12,627 (1,211–24,042)
Asian	1	4,222	3	3,969 (0–12,517)	2	2,322 (518–4,126)
Hispanic	36	5,089 (3,799–6,379)	51	4,561 (3,495–5,628)	78	5,598 (4,199–6,998)
American Indian	0		3	4,109 (921–7,297)	1	4,731
Gender						
Male	261	5,524 (4,486–6,561)	280	5,455 (4,500– 6,409)	312	7,206 (5,418–8,995)
Female	200	5,658 (4,479–6,836)	273	5,292 (4,621 –5,963)	307	7,506 (4,685–10,327)
Region						
Midwest	160	6,096 (4,280–7,913)	197	5,568 (4,666 –6,471)	199	7,895 (3,539–12,250)
Northeast	24	3,130 (2,239–4,021)	39	4,685 (3,677– 5,694)	56	6,321 (5,179–7,462)
South	203	5,547 (4,737–6,357)	246	5,788 (4,787 –6,789)	287	6,221 (5,084–7,357)
West	61	6,502 (4,445–8,560)	50	5,369 (3,427–7,312)	77	10,940 (5,050–16,831)

[a]Calculated using adjusted ratio of costs to charges, including variable and fixed cost among participating children's hospitals.

[b]Persons of other races and missing race and ethnicity are included in the totals.

SOURCE: National Association of Children's Hospitals and Related Institutions, 1999–2001.

outpatient treatment has burgeoned. The trends in distribution of surgical treatment modalities show some inconsistency among various databases; however, shock wave lithotripsy remains the most commonly performed procedure for upper tract stones, followed by ureteroscopy and percutaneous nephrostolithotomy. The one consistent trend identified by all datasets is a dramatic decrease in the use of open surgery, which is now less than 2% of the procedures. The cost of urolithiasis is estimated at nearly $2 billion annually and appears to be increasing over time, despite the shift from inpatient to outpatient procedures and the shorter length of hospital stays, perhaps because the prevalence of stone disease is increasing.

RECOMMENDATIONS

Although the current ICD and CPT codes seem acceptable for the basic diagnostic and therapeutic management of individuals with urolithiasis and the associated procedures, it would be helpful to researchers if ureteroscopy, like ureterolithotomy, were codified as upper, middle, or lower, dependent upon the site of pathology in the ureter. Additional specificity of the ICD coding is unlikely to be useful for research purposes; such detail must be obtained from the medical record.

From a clinical perspective, prevention is essential to reduce costs and morbidity. Primary prevention is not practical at this time, but aggressive prevention of recurrent stone formation is likely to reduce morbidity and costs.

The Urologic Diseases in America project expended a great deal of time and effort to obtain the best data available on urolithiasis and identified a number of knowledge gaps that need to be filled. We propose the following topics for investigation to improve the understanding of urolithiasis.

Medical evaluation of patients with upper tract urolithiasis

1. How frequently are metabolic evaluations performed for patients with urolithiasis?
2. What is the range of evaluations performed?
3. Should first-time stone formers undergo a medical evaluation to determine the etiology of stone formation?
4. How frequently are preventive measures recommended?
5. What is the rate of adherence to medical recommendations, and how does this change over time?
6. What are the national recurrence rates, and how are they affected by demographic factors?

Imaging modalities in the diagnosis and follow-up of patients with upper tract urolithiasis

1. What is the optimal imaging modality for monitoring patients with a history of urolithiasis?
2. Can imaging studies be used to predict stone composition and consequently affect treatment?

Surgical issues in the management of patients with upper tract urolithiasis

1. What is the optimal urological management of acute renal colic?
2. When should asymptomatic stones be treated?
3. How have practice patterns evolved in the balance between ESWL and flexible ureteroscopy as primary management for upper ureteral stones?
4. How have practice patterns evolved in the balance between ureteroscopy vs percutaneous nephrostomy in the management of upper ureteral stones?

Miscellaneous

1. Is upper tract urolithiasis a risk factor for other conditions (e.g., end-stage renal disease)?

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CHAPTER 2

Benign Prostatic Hyperplasia

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SUMMARY

Benign prostatic hyperplasia (BPH), the most common benign neoplasm in American men, is a chronic condition that increases in both incidence and prevalence with age. It is associated with progressive lower urinary tract symptoms and affects nearly three out of four men during the seventh decade of life. Using definitions in the Agency for Health Care Policy and Research (AHCPR) Diagnostic and Treatment Guidelines for BPH (1), it is estimated that approximately 6.5 million of the 27 million Caucasian men 50 to 79 years of age in the United States in 2000 were expected to meet the criteria for discussing treatment options for BPH (2). In 2000, approximately 4.5 million visits were made to physicians' offices to for a primary diagnosis of BPH, and nearly 8 million visits were made with either a primary or secondary diagnosis of BPH. In the same year, approximately 87,400 prostatectomies for BPH were performed on inpatients in nonfederal hospitals in the United States. While the number of outpatient visits for BPH climbed consistently during the 1990s, there was a dramatic decline in the utilization of transurethral prostatectomy, inpatient hospitalization, and length of hospital stay for this condition. These trends reflect the changing face of medical management for BPH, i.e., increasing utilization of pharmacological agents and minimally invasive therapies. In 2000, the direct cost of BPH treatment was estimated to be $1.1 billion, exclusive of outpatient pharmaceuticals. Given the impact that BPH can have on quality of life and the cost of medical care for millions of American men, investigations into risk factors, diagnostic and therapeutic resource utilization, and outcomes related to BPH are warranted.

DEFINITIONS

Benign prostatic hyperplasia is characterized pathologically by a cellular proliferation of the epithelial and stromal elements within the prostate gland. These changes, which begin histologically in the third decade of life and clinically in the fifth decade of life, are mediated primarily by tissue levels of dihydrotestosterone within the prostate and result in the gland's continued growth throughout life. When prostatic enlargement occurs, increased resistance in the proximal urethra may limit urinary flow during micturition, often resulting in pathophysiologic changes in the bladder wall. Consequently, lower urinary tract symptoms (LUTS) due to prostatic obstruction are inseparable from symptoms due to bladder detrusor dysfunction. Moreover, bladder dysfunction for reasons other than prostatic obstruction, such as aging or diabetic neuropathy, may occur independently; such cases are often misclassified as BPH.

Clinically, BPH is distinguished by progressive development of LUTS. These symptoms are variable and range from nocturia, incomplete emptying, urinary hesitancy, weak stream, frequency, and urgency to the development of acute urinary retention. Such symptoms can have a significant negative impact on quality of life, leading many men to seek treatment (3). While no standard definition of BPH exists,

Table 1. Codes used in the diagnosis and management of benign prostatic hyperplasia

Males 40 years or older with:	
ICD-9 diagnosis codes	
599.6	Urinary obstruction, unspecified
600.0	Hypertrophy (benign) of prostate
600.9	Unspecified hyperplasia of prostate
ICD-9 procedure codes	
60.2	Transurethral prostatectomy
60.21	Transurethral (ultrasound) guided laser induced prostatectomy (TULIP)
60.29	Other transurethral prostatectomy
60.3	Suprapubic prostatectomy
60.4	Retropubic prostatectomy
60.94	Control of (postoperative) hemorrhage of prostate
60.95	Transurethral balloon dilation of prostatic urethra
60.96	Transurethral destruction of prostate tissue by microwave thermotherapy
60.97	Other transurethral destruction of prostatic tissue by other thermotherapy
CPT procedure codes	
52450	Transurethral incision of prostate
52510	Transurethral balloon dilation of the prostatic urethra
52601	Transurethral electrosurgical resection of prostate, including control of postoperative bleeding, complete (vasectomy, meatomy, cystourethroscopy, urethral calibration, and/or dilation, and internal urethrotomy are included)
52606	Transurethral fulguration for postoperative bleeding occurring after the usual follow-up time
52612	Transurethral resection of prostate; first stage of two-stage resection (partial resection)
52614	Transurethral resection of prostate; second stage of two-stage resection (resection completed)
52620	Transurethral resection of residual obstructive tissue after 90 days postoperative
52630	Transurethral resection of regrowth of obstructive tissue longer than one year postoperative
52640	Transurethral resection of postoperative bladder neck contracture
52647	Noncontact laser coagulation of prostate, including control of postoperative bleeding, complete (vasectomy, meatotomy, cystourethroscopy, urethral calibration and/or dilation, and internal urethrotomy are included)
52648	Contact laser vaporization with or without transurethral resection of prostate, including control of postoperative bleeding, complete (vasectomy, meatotomy, cystourethroscopy, urethral calibration and/or dilation, and internal urethrotomy are included)
53850	Transurethral destruction of prostate tissue by microwave thermotherapy
53852	Transurethral destruction of prostate tissue by radiofrequency thermotherapy
55801	Prostatectomy, perineal, subtotal (including control of postoperative bleeding, vasectomy, meatotomy, urethral calibration and/or dilation, and internal urethrotomy)
55821	Prostatectomy (including control of postoperative bleeding, vasectomy, meatotomy, urethral calibration and/or dilation, and internal urethrotomy); suprapubic, subtotal, one or two stages
55831	Prostatectomy (including control of postoperative bleeding, vasectomy, meatotomy, urethral calibration and/or dilation, and internal urethrotomy); retropubic, subtotal
Males 40 years or older with one of the following ICD-9 codes, but not carrying diagnosis code 185 (malignant neoplasm of prostate) as another diagnosis	
594.1	Other calculus in bladder
788.20	Retention of urine, unspecified
788.21	Incomplete bladder emptying
788.29	Other specified retention of urine
788.41	Urinary frequency
788.42	Polyuria
788.43	Nocturia
788.61	Splitting of urinary stream
788.62	Slowing of urinary system

Continued on next page

Table 1 (continued). Codes used in the diagnosis and management of benign prostatic hyperplasia

Any of the following ICD-9 codes and any of the procedure or BPH medication codes	
600.1	Nodular prostate
600.2	Benign localized hyperplasia (eg adenoma of prostate, adenofibramatous hypertrophy of prostate) of prostate

clinically significant BPH is heralded by the onset of LUTS; therefore, LUTS are usually presumed to be due to BPH in the absence of another obvious cause. The International Classification of Diseases (ICD-9-CM) coding system is frequently used to identify cases in studies of BPH prevalence; other approaches include using codes for specific pharmacological or surgical interventions as surrogates for BPH cases.

In this chapter, the burden of illness attributable to BPH and its associated medical care is characterized from a variety of data sources, including administrative datasets using ICD-9 and Current Procedural Terminology (CPT) codes, large national health surveys, and community-based studies. Table 1 lists the codes used in the diagnosis and management of BPH. Although most BPH cases are coded as 600.0, this diagnostic code usually reflects a clinical diagnosis ranging from abnormal digital rectal examination to invasive therapy for symptoms. Although these administrative data provide for concrete estimates of resource utilization, they probably underestimate the number of men affected by BPH. In the National Health and Nutrition Examination Survey (NHANES-III), four items were used to identify symptomatic men:

- number of times a night the man gets up to urinate;
- feeling that the bladder is not empty;
- trouble starting urination; and
- in men older than 60 years, decreased urinary stream.

While NHANES-III data are nationally representative, they fail to capture the full range of BPH-related voiding symptoms. Methodological differences in data collection among the datasets used result in great variability in estimates of BPH prevalence, incidence, and resource utilization. National surveys such as NHANES-III are essential for ascertaining population-based estimates, but they are limited in the quantity of information available from each subject.

In 1994, the Agency for Health Care Policy and Research (AHCPR), since renamed the Agency for Healthcare Research and Quality (AHRQ), released a set of diagnostic and treatment guidelines for BPH tailored to symptom severity (1). The potential impact of BPH can be estimated by applying these guidelines to the proportion of symptomatic males in populations-based studies (Figure 1). As underscored by the AHCPR BPH Guidelines panel, BPH actually comprises four interrelated conditions (2):

- histologic BPH;
- symptomatic BPH;
- bladder outlet obstruction, as evidenced by symptomatic BPH;
- detrusor decompensation.

The AHCPR BPH Guidelines also outline the basic evaluation and stratification of patients for treatment decision making, whereby men are stratified on the presence of mild, moderate, or severe LUTS. The guidelines recommend using the American Urological Association Symptom Index (AUASI), a validated patient-reported measure of LUTS that captures both obstructive and irritative symptoms (4). The AUASI was developed by the American Urological Association (AUA) in collaboration with the Patient Outcomes Research Team for Prostate Disease (4). The self-administered instrument includes seven questions rated on 0-to-5 Likert scales; scores can range from 0 to 35 points. Nearly 60% of urologists reported documenting the AUASI for men with LUTS (5), and the vast majority report following the AHCPR guidelines by using an AUASI score higher than 7 as an indication of moderate-to-severe symptoms. Several large community-based cohort studies, including the Olmsted County Study of Urinary Symptoms and Health Status Among Men and the Flint Men's Health Study, have adopted the AUASI as their measure of disease severity in men with LUTS. Nevertheless, a limitation of these datasets is that histological confirmation of BPH is universally absent.

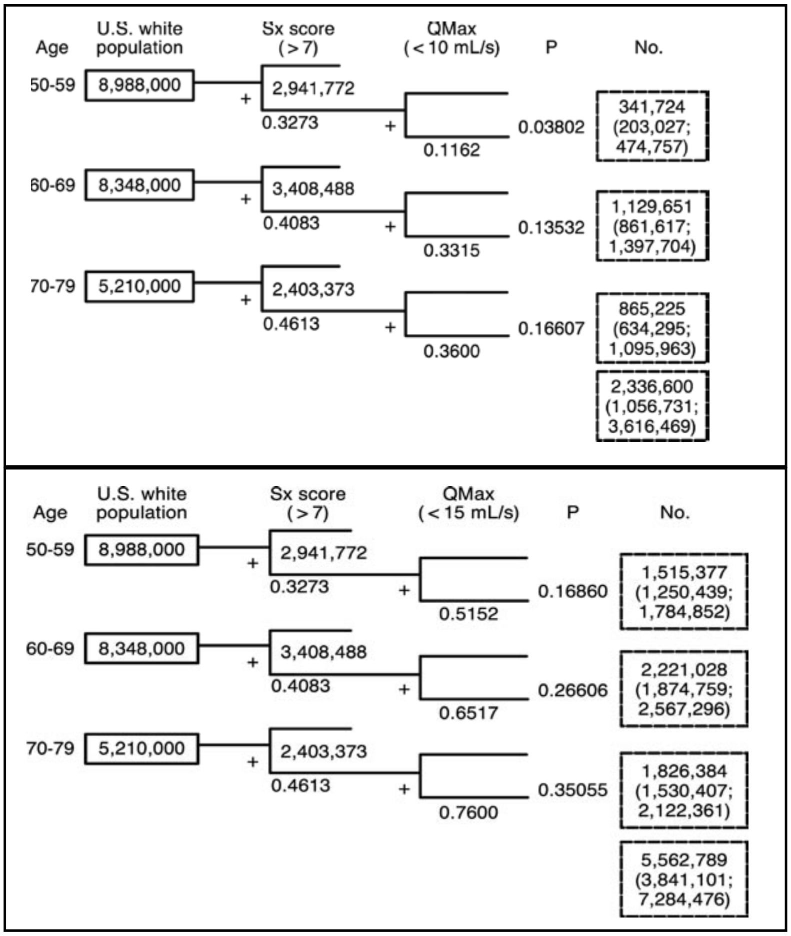

Figure 1. Potential impact of new benign prostatic hyperplasia guidelines on the 1990 US white male population aged 50 to 79 years. Top, Guideline criteria of American Urological Association Symptom Index (AUASI) greater than 7 and peak urinary ow rate (Qmax) less than 15 mL/s. Bottom, Guideline criteria of AUASI greater than 7 and Qmax less than 10 mL/s. P indicates the proportion of men within each age group meeting both criteria; No., number of men meeting both criteria (95% confidence interval). All proportions (decimal figures) are derived from the Olmsted County (Minnesota) Study of Urinary Symptoms and Health Status Among Men.

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Despite the widespread acceptance of the AUASI, the absence of an accepted standard definition for BPH suggests that comparisons across datasets should be approached with caution.

PREVALENCE

Recent data from NHANES-III suggest that BPH and LUTS are common in men 30 years of age and older and increase with age; nocturia was the most prevalent of the obstructive symptoms measured (6) (Table 2). Among men aged 60 to 69, nearly three out of four men complained of nocturia; the proportion was nearly 83% among men 70 years and older, illustrating the increasing burden of LUTS that occurs with aging. However, NHANES-III captured only nocturia, urinary hesitancy, incomplete emptying, weak stream, and surgery. Other population-based studies, such as the Massachusetts Male Aging Study (MMAS), may provide more accurate assessments of prevalence because they also include irritative symptoms such as urinary frequency and urgency (7). In the MMAS cohort, BPH was identified by clinical diagnosis or history of surgery for BPH. The

Table 2. Prevalence of specific lower urinary tract symptoms and noncancer prostate surgery in US men over 30 years of age, NHANES III[a]

Age at Interview (yr)	Actual (weighted) Sample Size	Nocturia (times per night) 0	1	2	3+	Incomplete Emptying	Hesitancy	Weak Stream[b]	Noncancer Prostate Surgery[c]
30–39	1,601 (20,737,223)	64.8 ± 1.8	27.3 ± 1.6	5.3 ± 0.9	2.6 ± 0.6	6.1 ± 0.9	2.4 ± 0.6	—	—
40–49	1,307 (16,103,901)	54.4 ± 2.1	36.2 ± 2.3	6.1 ± 1.0	3.3 ± 0.7	8.0 ± 1.1	4.4 ± 0.8	—	—
50–59	935 (10,486,737)	40.7 ± 2.1	39.1 ± 2.3	13.2 ± 1.4	7.0 ± 1.0	10.2 ± 1.6	4.8 ± 1.0	—	—
60–69	1,250 (8,888,814)	28.0 ± 2.0	41.7 ± 2.1	20.3 ± 2.0	10.0 ± 1.1	17.4 ± 1.7	10.7 ± 1.2	44.8 ± 2.6	8.0 ± 1.2
70+	1,631 (7,310,268)	16.9 ± 1.7	36.4 ± 1.7	26.1 ± 1.7	20.6 ± 1.8	22.7 ± 1.5	14.1 ± 1.3	55.8 ± 1.8	22.4 ± 1.1
P value[c]		< 0.0001	0.57	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0003	< 0.0001
Among men who never had prostate surgery									
60–69	1,163 (8,181,653)	28.1 ± 2.2	42.4 ± 2.2	20.0 ± 1.9	9.5 ± 1.0	16.2 ± 1.5	10.0 ± 1.4	44.8 ± 2.8	—
70+	1,245 (5,671,346)	17.3 ± 2.0	37.0 ± 2.2	25.5 ± 2.0	20.2 ± 2.0	22.0 ± 1.5	14.0 ± 1.6	56.8 ± 1.9	—
P value[c]		< 0.0001	0.04	0.02	< 0.0001	0.003	0.03	0.0002	—

Key: NHANES III, Third National Health and Nutrition Examination Survey.

Data presented as the percentage ± standard error, unless otherwise noted.

[a]Estimates are based on civilian non-institutionalized participants who were not observed in bed or in a wheelchair/stretcher or with leg paralysis/paresis and who gave a response to at least one lower urinary tract symptom or surgery question. Proxy respondents were excluded.

[b]Question not asked of men 30 to 59 years old.

[c]Where symptom prevalences are presented for more than two age groups, reported one-sided P values are for a test of increasing prevalence with age. Where symptoms are presented for only two age groups, reported one-sided P values are for a test of higher prevalence in the older men compared with the younger men and were calculated from a two-sample normal test with unequal variances.

SOURCE: Reprinted from Urology, 59, Platz EA, Smit E, Curhan GC, Nyberg LM, Giovannucci E, Prevalence of and racial/ethnic variation in lower urinary tract symptoms and noncancer prostate surgery in US men, 877–883, Copyright 2002, with permission from Elsevier.

Table 3. Prevalence of clinical benign prostatic hyperplasia at follow-up, by age category (Massachusetts Male Aging Study)

	Total	Age at Baseline (yrs) 40–49		50–59		60–70		P-Value for Trend Across Age[a]
Total	1019	394		353		272		–
Clinical diagnosis of BPH[b]	185	33	8.4%	71	20.1%	81	29.8%	0.001
Underwent TURP for BPH	42	3	0.8%	16	4.5%	23	8.5%	0.001
Clinical diagnosis or TURP for BPH[c]	198	33	8.4%	74	21.0%	91	33.5%	0.001
On medication for enlarged or swollen prostate	48	4	1.0%	23	6.5%	21	7.7%	0.001
On medication or history of TURP for BPH[d]	86	7	1.8%	36	10.2%	43	15.8%	0.001

[a]Mantel-Haenszel extension test.

[b]Either frequent or difficult urination and told by a health professional that they had an enlarged or swollen prostate.

[c]Clinical diagnosis or history of TURP = “clinical BPH.”

[d]On medication or history of TURP for BPH = “severe clinical BPH.”

SOURCE: Reprinted from Journal of Clinical Epidemiology, 54, Meigs JB, Mohr B, Barry MJ, Collins MM, McKinlay JB, Risk factors for clinical benign prostatic hyperplasia in a community-based population of healthy aging men, 935–944, Copyright 2001, with permission from Elsevier Science.

Table 4. Frequency of benign prostatic hyperplasia[a] listed as a diagnosis in male VA patients seeking outpatient care, rate[b]

	1999		2000		2001	
	Primary Diagnosis	Any Diagnosis	Primary Diagnosis	Any Diagnosis	Primary Diagnosis	Any Diagnosis
Total	6,098	10,654	5,705	11,650	4,811	11,406
Age						
40–44	955	1,339	965	1,426	808	1,280
45–54	2,420	3,707	2,318	3,938	1,966	3,703
55–64	5,748	9,419	5,247	9,652	4,275	8,821
65–74	8,427	15,075	7,650	16,102	6,210	15,231
75–84	9,293	17,068	8,328	18,300	6,799	17,556
85+	9,109	16,223	8,563	17,663	7,136	17,199
Race/ethnicity						
White	7,663	13,055	6,993	13,688	5,889	12,809
Black	6,677	10,061	6,143	10,101	5,126	9,140
Hispanic	7,683	10,978	7,779	11,940	6,131	11,123
Other	5,900	9,459	5,128	9,201	4,302	8,681
Unknown	3,846	7,846	3,858	9,629	3,481	10,466
Region						
Midwest	6,348	11,220	5,766	12,225	4,890	11,996
Northeast	6,406	11,078	6,046	12,154	5,158	12,114
South	6,047	10,497	5,720	11,604	4,695	11,078
West	5,499	9,724	5,171	10,390	4,484	10,379
Insurance status						
No insurance/self-pay	4,837	8,034	4,525	8,451	3,747	8,008
Medicare/Medicare supplemental	9,040	16,754	7,938	17,533	6,557	16,682
Medicaid	4,830	7,942	5,034	8,466	4,359	7,936
Private insurance/HMO/PPO	5,977	10,420	5,354	11,046	4,319	10,544
Other insurance	4,844	8,286	4,451	8,217	3,778	7,808
Unknown	5,834	8,370	4,534	6,946	1,675	4,691

HMO, health maintenance organization; PPO, preferred provider organization.

[a]Represents diagnosis codes for BPH alone (no bladder stones).

[b]Rate is defined as the number of unique patients with each condition divided by the base population in the same fiscal year x 100,000 to calculate the rate per 100,000 unique outpatients.

NOTE: Race/ethnicity data from clinical observation only, not self-report; note large number of unknown values.

Source: Outpatient Clinic File (OPC), VA Austin Automation Center, FY1999–FY2001.

prevalence ranged from 8.4% in men 40 to 49 years of age to 33.5% in men aged 60 to 70 (Table 3).

These trends are further supported by 2001 data from the Veterans Health Administration (VA), in which the prevalence of BPH listed as the primary diagnosis during outpatient visits ranged from 808 per 100,000 in men aged 40 to 44 to 7,136 per 100,000 in men older than 85 (Table 4). The rate for all men 45 and older more than doubled when BPH was listed as any diagnosis. Between 1999 and 2001, the number of male veterans with outpatient visits for BPH as a primary diagnosis decreased, while the number of visits with BPH listed as any diagnosis increased. That these rates are lower than those reported in the MMAS suggests that older male veterans may also access care for their BPH outside the VA system. Nonetheless, the VA data support the association with age that has been observed in other populations.

The Olmsted County Study (OCS) and the Flint Men's Health Study have been used to produce a variety of estimates regarding the prevalence, incidence, and natural history of BPH. The initial OCS cohort was randomly selected from a sample stratified on age and residence (City of Rochester vs balance of Olmsted County); the sampling frame was constructed from the Rochester Epidemiology Project. This sampling frame identified approximately 95% of the residents (according to the 1990 census) and included only Caucasian males. The Flint cohort was closely modeled after the OCS and included a probability sample of African American men selected from households or group dwelling units located in Flint, Michigan, and from selected census tracts in neighboring Genessee County. Prior history of prostate cancer or prior operations on the prostate gland were exclusion criteria for both the Flint Men's Health Study and the OCS. Eligible men were stratified into ten-year age groups: 40 to 49, 50 to 59, 60 to 69, and 70 to 79. Comprehensive interviews were performed to obtain information on potential personal and environmental risk factors for prostate cancer; the AUASI; family history of cancer; health behaviors such as smoking, drinking, and physical activity; occupational or other exposures to selected chemicals; general health condition; history of chronic illnesses; sexual activity; health services utilization; and demographic characteristics. Subjects were invited to complete a clinical examination that included serum

Table 5. Urinary symptom frequency (percentage of men with urinary symptoms occurring more than rarely)

	Age Group (yrs)			
	40–49	50–59	60–69	70+
Total number of patients	800	612	436	271
% with symptoms showing strong age relation				
Nocturia	16	29	42	55
Weak stream	25	34	39	49
Stopping or starting	18	25	29	32
Feeling cannot wait	28	32	42	46
Feeling bladder not empty	16	17	23	23
% with symptoms not showing age relation				
Frequent urination (within 2 hrs)	34	34	36	35
Pain or burning	5	6	4	7
Strain or push	12	15	13	15
Repeat within 10 mins	12	11	18	11
Dribbling	37	43	44	36
Difficulty starting	14	18	20	19
Wet clothing	23	25	24	22
Obstructive score[a]				
% with score greater than 7	16	24	27	30
Corrected[b]	15	21	24	29
Median score	3	4	4	4
Corrected[c]	2	3	4	4
AUA score:				
% with score greater than 7	26	33	41	46
Corrected[d]	24	31	36	44
Median score	4	5	6	7

[a]Obstructive score is the sum of weak stream, stopping and starting, dribbling, hesitancy, and incomplete emptying.

[b]Corrected proportion is the age-stratified, weighted mean of dichtomous (0 and 1) variables with weights n/N (responders) and (N-n)/N (initial nonresponders), where N corresponds to the total number of randomly selected eligible and invited men, and n is the number of participants in the main study cohort, within the age decade.

[c]Corrected median scores were calculated by replicating nonresponder questionnaire data to simulate all nonresponders and calculating the median of the combined data for respondents and initial nonresponders. This approach assumes that initial nonresponders for whom data were obtained are representative of all refusals.

[d]AUA composite symptom frequency score not available from the nonresponder study. Corrected proportions were obtained by decreasing the study cohort proportions by the percentage reduction observed for AUA bother score, assuming a similar relationship would apply to the frequency score. Calculation of corrected AUA score median is not practical.

SOURCE: Reprinted from Chute CG, Panser LA, Girman CJ, Oesterling JE, Guess HA, Jacobsen SJ, Lieber MM, The prevalence of prostatism: a population-based survey of urinary symptoms, Journal of Urology, 150, 85–89, Copyright 1993, with permission from Lippincott Williams & Wilkins.

Table 6. Clinical correlates of benign prostatic hyperplasia (Flint Men's Health Study)

		Age Group (yrs)				p Value	
	Overall	40–49	50–59	60–69	70–79	ANOVA	Trend
Mean prostate vol ± SE (cc)	26.6 ± 0.5	23.3 ± 0.7	26.7 ± 0.8	32.9 ± 1.6	32.8 ± 2.0	0.0001	0.0001
Mean peak ow ± SE (cc/sec)	22.3 ± 0.9	25.6 ± 1.7	20.5 ± 1.2	18.2 ± 1.3	15.4 ± 1.5	0.0002	0.0001
Mean symptom score ± SE	7.3 ± 0.4	6.4 ± 0.6	7.5 ± 0.6	9.0 ± 0.7	7.7 ± 1.1	0.08	0.03
Mean bothersomeness score ± SE	4.0 ± 0.3	2.9 ± 0.5	4.4 ± 0.6	5.4 ± 0.6	5.4 ± 1.0	0.01	0.0001
% symptom score greater than 7	39.6	31.7	43.2	51.7	38.6	0.04	0.07
% bothersomeness score greater than 3	35.0	25.0	36.0	52.9	50.0	0.0004	0.0001

SOURCE: Reprinted from Wei JT, Schottenfeld D, Cooper K, Taylor JM, Faerber GJ, Velarde MA, Bree R, Montie JE, Cooney KA, The natural history of lower urinary tract symptoms in black American men: relationships with aging, prostate size, ow rate and bothersomeness, Journal of Urology, 165, 1521–1525, Copyright 2001, with permission from Lippincott Williams & Wilkins.

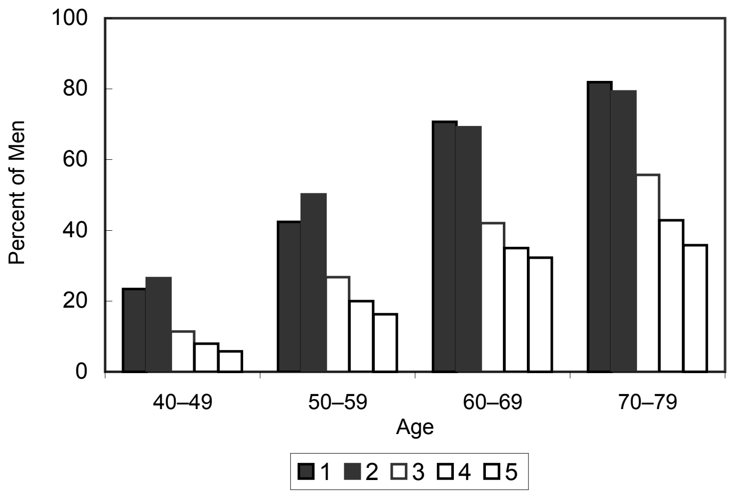


Figure 2. Age-specific prevalence of benign prostatic hyperplasia.
Note: Bar 1, prevalence of pathologically defined benign prostatic hyperplasia from a compilation of five autopsy studies (*n* = 1,075); bars 2 and 3, clinical prevalence in the Baltimore Longitudinal Study of Aging (*n* = 1,075); bar 2 is based on history and physical examination and bar 3 is based on the presence of an enlarged prostate on manual rectal examination; bar 4, prevalence is based on an enlarged prostate on manual rectal examination from a compilation of life insurance examinations (*n* = 6,975); bar 5, community prevalence in Rochester, Minnesota, based on case definition using symptoms, prostate size, and urinary ow rates (*n* = 457).

SOURCE: Adapted from Guess HA, Benign Prostatic hyperplasia: antecedents and natural history, Epidemiologic Reviews, 1992, 14, 131–153, with permission of Oxford University Press.

Table 7. Incidence of acute urinary retention, by baseline age and lower urinary tract symptom severity

	None-to-Mild Symptoms (AUASI ≤ 7)		Moderate-to-Severe Symptoms (AUASI > 7)	
Age	Incidence/1,000 Person-Years	(95% CI)	Incidence/1,000 Person-Years	(95% CI)
40–49	2.6	(0.8–6.0)	3.0	(0.4–10.8)
50–59	1.7	(0.3–4.8)	7.4	(2.7–16.1)
60–69	5.4	(2.0–11.6)	12.9	(6.2–23.8)
70–79	9.3	(3.4–20.3)	34.7	(20.2–55.5)

Total person-years 8344.4, median years of follow-up (25th, 75th percentile) 4.2 (3.6, 4.7).

SOURCE: Reprinted from Jacobsen SJ, Jacobson DJ, Girman CJ, Roberts RO, Rhodes T, Guess HA, Lieber MM, Natural history of prostatism: risk factors for acute urinary retention, Journal of Urology, 158, 481–487, Copyright 1997, with permission from Lippincott Williams & Wilkins.

prostate specific antigen (PSA), as well as transrectal ultrasonography and uroflowmetry. These studies captured a broader range of LUTS than was possible in NHANES-III (6). In the OCS, moderate-to-severe LUTS, defined as AUASI greater than 7, ranged from 26% in men 40 to 49 years of age to 46% in men 70 and older (Table 5) (8, 9).

Using the OCS definition to identify cases, the Flint Men's Health Study found moderate to severe LUTS in 39.6% of African American men, also with a strong age association (Table 6) (10). In autopsy series, the prevalence of histological BPH is even more common (Figure 2) (11). Clinical samples based on men presenting for care allow for more detailed data but may be biased by type and severity of symptoms.

Collectively, all these studies illustrate the great prevalence of LUTS and document the burden of it that occurs with increasing age. As noted above, moderate-to-severe LUTS, defined as AUASI greater than 7, ranged from 26% in the fifth decade of life to 46% in the eighth decade. NHANES-III found no racial/ethnic variation in the prevalence of obstructive symptoms; however, overall LUTS (including irritative symptoms) appear to occur with greater severity in African American men.

NATURAL HISTORY

The natural history of BPH/LUTS is more accurately estimated in community-based cohorts than in self-selected patients seeking medical attention. The former are more likely to represent the full spectrum of illness and less likely to be biased by socioeconomic factors such as access to health care. Longitudinal data from the OCS suggest an annual prostate growth rate of 1.6% diagnosed by transrectal ultrasonography (12) and an average annual increase of 0.2 AUASI point (13). Over a median follow-up period of 42 months in the OCS, the proportion of men reporting moderate-to-severe LUTS increased from 33% to 49% (13).

Urinary retention, considered to represent the final symptomatic stage of progressive BPH, occurred in the OCS at an overall incidence of 6.8 episodes per 1,000 person-years of follow-up; subset analyses revealed 34.7 episodes per 1,000 person-years of follow-up in men in their seventies who had moderate-to-severe symptoms (Table 7) (14). These rates are comparable to data subsequently reported in the Health Professionals Followup Study, in which men 45 to 83 years of age were followed from 1992 to 1997. A total of 82 men developed acute urinary retention during 15,851 person-years of follow-up (15). Both studies showed that age, more severe symptoms, and larger prostate size were associated with an increase in the risk of urinary retention.

RISK FACTORS

OCS data revealed that age, prostate volume, and peak urinary flow rate were each significantly associated with AUASI scores but accounted for only 13% of symptom variability. The odds of moderate to severe symptoms increased with age after the fifth decade of life, from 1.9, to 2.9, to 3.4 for men in the sixth, seventh and eighth decades, respectively. Even after adjusting for age, the odds of moderate-to-severe symptoms were 3.5 times greater for men

Table 8. Association between baseline measures of lower urinary tract dysfunction and risk of any treatment during follow-up

	Unadjusted[a]		Unadjusted (clinic cohort)[b]		Adjusted[c]		Adjusted[d]	
Baseline Characteristic	**Relative Risk**	**95% CI**	**Relative Risk**	**95% CI**	**Relative Risk**	**95% CI**	**Relative Risk**	**95% CI**
Age:								
40–49[e]	1.0		1.0		1.0		1.0	
50–59	4.4	2.5–7.7	5.1	1.5–17.9	3.3	0.9–12.0	4.2	1.2–14.8
60–69	7.7	4.4–13.3	10.8	3.2–37.0	3.7	1.0–14.0	4.0	1.1–14.8
70–79	8.7	4.8–15.6	10.1	2.8–36.9	3.2	0.8–12.7	3.1	0.8–12.3
Symptom severity (score)								
None-to-mild (7 or less)[e]	1.0		1.0		1.0		1.0	
Moderate-to-severe (greater than 7)	5.0	3.6–7.0	8.4	4.0–17.5	5.3	2.5–11.1	5.6	2.6–11.9
Peak urinary ow rate (ml/sec)								
Greater than 12[e]	1.0		1.0		1.0		1.0	
12 or Less	3.7	2.7–5.0	5.2	2.9–9.6	2.7	1.4–5.3	2.8	1.4–5.5
Prostate volume (ml)								
30 or Less[e]			1.0		1.0			
Greater than 30			4.2	2.2–8.2	2.3	1.1–4.7		
Serum PSA (ng/ml)								
1.4 or less[e]			1.0				1.0	
Greater than 1.4			4.0	2.2–7.3			2.1	1.1–4.2

Association qualified as relative risk with associated 95% CI.

[a]Bivariate (crude) models based on entire cohort.

[b]Bivariate (crude) models based on subset randomly selected with clinical examination.

[c]Multivariate models adjusting for all factors simultaneously, including prostate volume, based on subset with clinical examination.

[d]Multivariate models adjusting for all factors simultaneously, including serum PSA, based on subset with clinical examination.

[e]Reference category.

SOURCE: Reprinted from Jacobsen SJ, Jacobsen DJ, Girman CJ, Roberts RO, Rhodes T, Guess HA, Lieber MM, Treatment for benign prostatic hyperplasia among community dwelling men: The Olmstead County study of urinary symptoms and health status, Journal of Urology, 162, 1301–1306, Copyright 1999, with permission from Lippincott Williams & Wilkins.

Table 9. Use of imaging tests in evaluation of benign prostatic hyperplasia and/or lower urinary tract symptoms in the male Medicare population, count[a], rate[b]

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total	217,760	14,977	133,580	8,107	76,380	5,101
Intravenous pyelogram	56,280	3,871	25,400	1,542	14,760	986
Ambulatory surgery center	6,600	454	3,460	210	1,560	104
Inpatient	8,120	558	2,760	168	2,080	139
Hospital outpatient	920	63	520	32	260	17
Physician office	40,640	2,795	18,660	1,132	10,860	725
Transrectal ultrasound	150,960	10,382	99,560	6,042	52,360	3,497
Ambulatory surgery center	5,760	396	4,940	300	4,060	271
Inpatient	3,880	267	1,660	101	1,440	96
Hospital outpatient	900	62	620	38	440	29
Physician office	140,420	9,657	92,340	5,604	46,420	3,100
CT scan abdomen/pelvis with contrast	5,700	392	5,200	316	5,220	349
Ambulatory surgery center	320	22	160	9.7	140	9.3
Inpatient	2,660	183	2,460	149	3,040	203
Hospital outpatient	80	5.5	100	6.1	60	4.0
Physician office	2,640	182	2,480	151	1,980	132
CT scan abdomen/pelvis without contrast	2,420	166	1,680	102	2,460	164
Ambulatory surgery center	140	9.6	60	3.6	100	6.7
Inpatient	1,160	80	920	56	1,440	96
Hospital outpatient	20	1.4	0	0.0	20	1.3
Physician office	1,100	76	700	42	900	60
CT scan abdomen/pelvis with and without contrast	1,900	131	1,520	92	1,460	97
Ambulatory surgery center	180	12	140	8.5	80	5.3
Inpatient	560	39	660	40	620	41
Hospital outpatient	20	1.4	60	3.6	0	0.0
Physician office	1,140	78	660	40	760	51
CT scan abdomen, contrast use unspecified						
Inpatient	500	35	220	13	120	8.0

[a]Unweighted counts multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 men with benign prostatic hyperplasia.

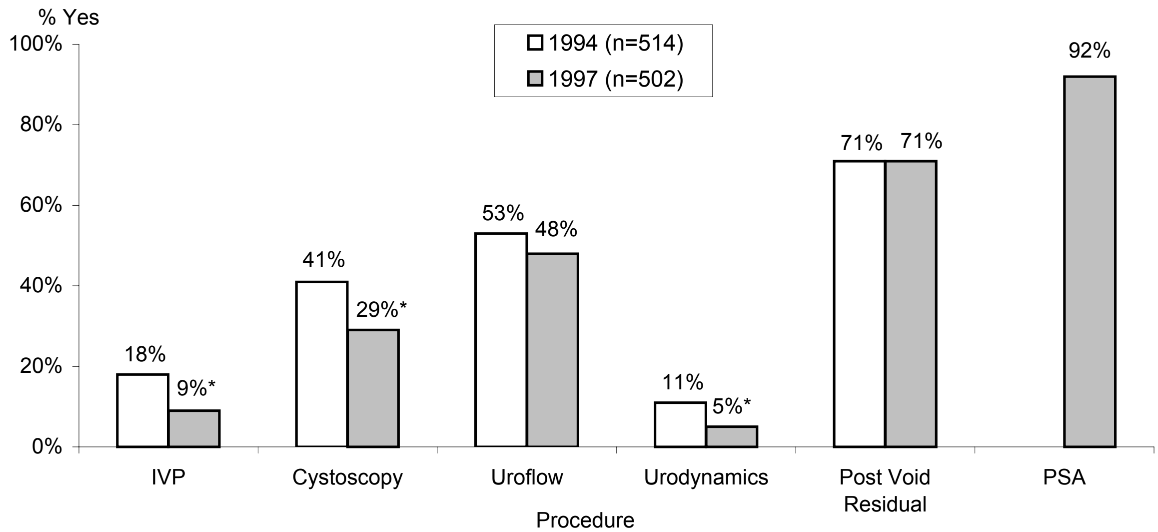
NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, 5% file, 1992, 1995, 1998.

Table 10. Diagnostic studies for lower urinary tract symptoms in elderly male Medicare beneficiaries (5% sample, 1991 to 1995)

	1991	1992	1993	1994	1995
Uro owmetry					
Complex	6,717	7,575	8,528	8,687	8,607
Simple	1,059	936	802	608	535
Cystometrogram					
Complex	2,146	2,081	1,905	1,978	1,917
Simple	622	535	463	450	414
Pressure ow study					
Bladder	274	324	354	492	514
Intra-abdominal	183	226	238	329	343

SOURCE: Reprinted from Baine WB, Yu W, Summe JP, Weis KA, Epidemiologic trends in the evaluation and treatment of lower urinary tract symptoms in elderly male Medicare patients from 1991 to 1995, Journal of Urology, 160, 816–820, Copyright 1998, with permission from Lippincott Williams & Wilkins.



***Significantly less than in 1994 (p<0.05).**
Figure 3. Tests routinely ordered in diagnostic evaluation of patients with BPH.

SOURCE: Adapted from Journal of Urology, 160, Gee WF, Holtgrewe HL, Blute ML, Miles BJ, Naslund MJ, Nellans RE, O'Leary MP, Thomas R, Painter MR, Meyer JJ, Rohner TJ, Cooper TP, Blizzard R, Fenninger RB, Emmons L, 1997 American Urological Assocation Gallup Survey: changes in diagnosis and management of prostate cancer and benign prostatic hyperplasia, and other practice trends from 1994 to 1997, 1804–1807, copyright 1998, with permission from Lippincott Williams & Wilkins.

with prostates larger than 50 cc (as determined by transrectal ultrasonography) than for men with smaller prostates. In addition, a peak urinary flow of less than 10 ml/sec was associated with a 2.4-fold risk of moderate-to-severe symptoms (14).

OCS data also showed age to be associated with an increased risk of acute urinary retention. After adjusting for baseline symptom severity and peak urinary flow rate, the relative risk of urinary retention increased after the fifth decade of life, from 0.9, to 2.1, to 4.8 for men in the sixth, seventh, and eighth decades, respectively. Men with baseline AUASI greater than 7 and peak flow rates of 12 ml/sec or less were 2.3 and 2.1 times more likely to develop urinary retention, respectively (14). After multivariate adjustment, increasing age, presence of moderate-to-severe LUTS, decreased peak flow rate, and prostate size (or PSA) were associated with an increased likelihood of receiving treatment for BPH (Table 8).

CLINICAL EVALUATION

Traditionally, intravenous pyelogram (IVP) and transrectal ultrasound have been the most commonly employed imaging examinations for BPH, even though the AHCPR BPH guidelines do not recommend their routine use (16). As expected, following the dissemination of the BPH guidelines in 1994, the use of IVP and TRUS in the Medicare population decreased consistently (Table 9). By 1998, the utilization rates for IVP and TRUS were only 986 per 100,000 and 3,497 per 100,000, representing 75% and 66% decreases from 1992, respectively. CT scans were uncommon in the evaluation of men with BPH.

Other commonly used methods for assessing lower urinary tract function include uroflowmetry, cystometrogram, and pressure flow studies. Medicare claims data indicate that between 1991 and 1995, use of complex uroflowmetry and pressure flow studies increased, while the use of cystometrograms decreased modestly (Table 10). Independent validation of these observations appeared in the 1997 American Urological Association (AUA) Gallup Poll survey of practicing urologists in the United States (5). This survey noted a decrease in the utilization of IVP, uroflowmetry, and urodynamic studies but also noted very high utilization rates for measurement of post-void bladder residual and serum PSA in men with BPH—71% and 92%, respectively (Figure 3).

TRENDS IN HEALTH CARE RESOURCE UTILIZATION

Inpatient and Outpatient Care

Historically, transurethral resection of the prostate (TURP) was the second most commonly performed operation in the United States (cataract surgery was the most common). However, since the introduction of effective alternative approaches in the 1990s, urologists have increasingly recommended pharmacological therapy and minimally invasive procedures (5). Coincident with the increased popularity of these approaches was an increase in the rate of outpatient visits for BPH: from 10,116 per 100,000 in 1994 to 14,473 per 100,000 in 2000 (Table 11). BPH-related visits to emergency rooms declined from 330 per 100,000 in 1994 to 218 per 100,000 in 2000 (Table 12), although the overlapping confidence intervals around these rates should lead to caution in interpretation.

Pharmaceutical Management

Alpha blockers and 5-alpha reductase inhibitors have become first-line therapy for men with symptomatic BPH. The AUA Gallup Poll surveys from 1994 to 1997 found that 88% of urologists recommended alpha blockers for men with moderate urinary symptoms and evidence of prostate enlargement of less than 40 cc. The use of alpha blockers for men with prostates larger than 40 cc was still highly prevalent at 69% (5).

The Medical Therapy of Prostatic Symptoms (MTOPS) Study, a multicenter, randomized controlled trial sponsored by the National Institute of Diabetes and Digestive and Kidney Diseases, evaluated whether treatment with doxazosin (an alpha blocker) and finasteride (a 5-alpha reductase inhibitor) in combination was more effective than either drug alone in preventing the clinical progression of BPH. Clinical progression was defined as either a worsening in the AUASI score of 4 points or more, acute urinary retention, incontinence, renal insufficiency, or recurrent urinary tract infection. Results from MTOPS suggest that combination therapy was twice as effective as monotherapy in reducing the risk of

Table 11. National physician office visits and hospital outpatient visits for benign prostatic hyperplasia and/or lower urinary tract symptoms, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Primary reason	2,899,300	6,371 (5,495–7,248)	3,658,367	7,484 (6,294–8,675)	3,990,359	7,754 (6,281–9,226)	4,418,425	8,201 (6,765–9,637)
Any reason	4,603,426	10,116 (8,826–11,406)	6,112,287	12,505 (10,856–14,153)	6,443,185	12,520 (10,531–14,508)	7,797,781	14,473 (12,406–16,540)

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US male civilian non-institutionalized population, 40 years and older.

SOURCES: National Hospital Ambulatory Medical Care Survey — Outpatient File, 1994, 1996, 1998, 2000; National Ambulatory Medical Care Survey, 1994, 1996, 1998, 2000.

Table 12. National emergency room visits by adult males with benign prostatic hyperplasia and/or lower urinary tract symptoms listed as primary diagnosis, count, rate[a] (95% CI)

	Count	Rate
1994	150,377	330 (201–460)
1996	117,716	241 (130–352)
1998	155,923	303 (194–412)
2000	117,413	218 (117–319)

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US male civilian non-institutionalized population, 40 years and older.

SOURCE: National Hospital Ambulatory Medical Care Survey — ER File, 1994, 1996, 1998, 2000.

progression (66% risk reduction for combination, 39% for doxazosin, and 34% for finasteride) (17).

Additional details on the medications prescribed to treat men with LUTS are available from the National Ambulatory Medical Care Survey (NAMCS) (Table 13). In 1994 and 1996, terazosin was the primary pharmacological agent used for BPH, being prescribed in 14% to 15% of BPH visits. However, with the introduction of more specific selective agents, terazosin was replaced by doxazosin and tamsulosin, which in 2000 constituted 23% of the prescriptions written at BPH-related outpatient visits. The prescription of finasteride in 6.5% and 7.3% of BPH visits in 1994 and 2000, respectively, suggests that it is used in a specific subset of men with BPH.

Surgical Management

The advent of pharmacotherapy was associated with a dramatic decline in hospitalizations for TURP throughout the 1990s (Figures 4 and 5 and Table 14) (18), most notably between 1992 and 1995 (Table 15). This decline is consistent with published literature that demonstrates that the use of TURP peaked during the 1980s but declined between 1991 and 1997 by 50% among Caucasian men and 40% among African American men suffering from BPH (19). Table 16 presents Medicare data illustrating that surgery for BPH declined across almost all age, racial/ethnic, and geographic strata of patients. Overall, surgical visits by Medicare beneficiaries declined from 491 per 100,000 in 1992 to 372 per 100,000 in 2000. There was a slight increase in the rate of BPH surgeries in the West between 1992 and 1995, but the rate remained stable in 1998. Among those who were hospitalized

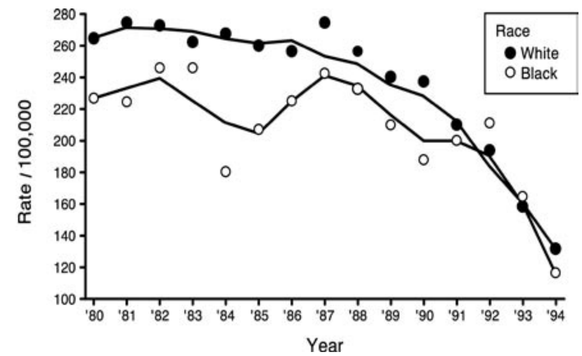


Figure 4. **Annual age-adjusted discharge rate for prostatectomy, 1980 to 1994, by race. Data from: National Hospital Discharge Survey.**

SOURCE: Reprinted with permission from Urology, 53, Xia Z, Roberts RO, Schottenfeld D, Lieber MM, Jacobsen SJ, Trends in prostatectomy for benign prostatic hyperplasia among black and white men in the United States: 1980 to 1994, 1154–1159, 1999, with permission from Elsevier Science.

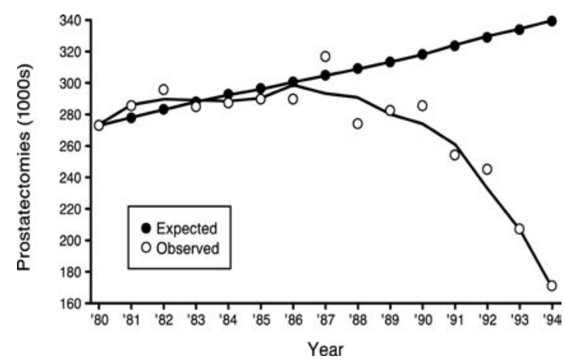


Figure 5. **Observed and expected number of discharges for prostatectomy, 1980 to 1994; expected number based on 1980 discharge rates. Data from: National Hospital Discharge Survey.**

SOURCE: Reprinted with permission from Urology, 53, Xia Z, Roberts RO, Schottenfeld D, Lieber MM, Jacobsen SJ, Trends in prostatectomy for benign prostatic hyperplasia among black and white men in the United States: 1980 to 1994, 1154–1159, 1999, with permission from Elsevier Science.

Table 13. National count of prescriptions written at physicians' offices during visits for benign prostatic hyperplasia and/or lower urinary tract symptoms

Medicine	1992		1994		1996		1998		2000	
	# of Rx	% of Visits for BPH at Which This Rx Was Given	# of Rx	% of Visits for BPH at Which This Rx Was Given	# of Rx	% of Visits for BPH at Which This Rx Was Given	# of Rx	% of Visits for BPH at Which This Rx Was Given	# of Rx	% of Visits for BPH at Which This Rx Was Given
Terazosin/Hytrin®	*	*	688,717	15	830,314	14	*	*	*	*
Doxazosin/Cardura®	*	*	*	*	*	*	*	*	819,043	11
Tamsulosin/Flomax®	*	*	*	*	*	*	*	*	870,889	12
Oxybutynin/Ditropan®	*	*	*	*	*	*	*	*	*	*
Detrol®	*	*	*	*	*	*	*	*	*	*
Detrol SA®	*	*	*	*	*	*	*	*	*	*
Finasteride/Proscar®	*	*	289,070	6.5	*	*	*	*	552,483	7.3
Ditropan XL®	*	*	*	*	*	*	*	*	*	*

Rx, prescription.
*Figure does not meet standard for reliability or precision.
SOURCE: National Ambulatory Medical Care Survey, 1992, 1994, 1996, 1998, 2000.

Table 14. Use of inpatient surgical procedures to treat symptoms of benign prostatic hyperplasia

Surgical Procedure	1994	1996	1998	2000
Open prostatectomy	5,648	4,617	4,341	4,354
TURP	136,377	103,644	88,907	87,407
Balloon dilatation	279	161	148	161
Laser prostatectomy	0	10,616	3,019	2,045
TUNA	0	0	0	35
TUMT	0	0	0	14

TURP, transurethral resection of the prostate; TUNA, transurethral needle ablation; TUMT, transurethral microwave therapy.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 15. Inpatient stays by male Medicare beneficiaries with benign prostatic hyperplasia and/or lower urinary tract symptoms listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	154,320	1,048 (1,043–1,053)	82,060	539 (535–543)	59,760	413 (409–416)
Total < 65	5,420	175 (171–180)	3,240	94 (91–97)	2,600	76 (73–79)
Total 65+	148,900	1,280 (1,273–1,286)	78,820	669 (665–674)	57,160	518 (513–522)
Age						
65–74	78,240	1,081 (1,073–1,089)	37,600	523 (518–528)	25,380	395 (390–400)
75–84	57,800	1,637 (1,623–1,650)	33,580	918 (908–928)	25,340	692 (684–701)
85–94	12,560	1,589 (1,562–1,617)	7,420	875 (855–894)	6,320	730 (712–748)
95+	300	386 (343–430)	220	268 (233–304)	120	137 (113–161)
Race/ethnicity						
White	135,820	1,095 (1,089–1,101)	72,260	556 (552–560)	52,600	430 (426–434)
Black	10,380	815 (799–830)	6,820	493 (481–504)	4,180	313 (304–323)
Asian	…	…	180	247 (211–283)	560	408 (375–442)
Hispanic	…	…	1,080	544 (512–576)	1,240	369 (349–390)
N. American Native	…	…	60	298 (224–373)	120	429 (354–504)
Region						
Midwest	39,400	1,062 (1,052–1,073)	21,440	556 (549–564)	16,920	458 (451–464)
Northeast	35,780	1,128 (1,117–1,140)	17,540	551 (543–560)	10,960	394 (387–402)
South	55,840	1,066 (1,057–1,075)	28,020	511 (505–517)	21,600	402 (397–408)
West	20,740	923 (911–936)	13,080	564 (554–574)	9,180	410 (402–419)

… data not available.

[a]Unweighted counts were multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, MedPAR and 5% Carrier Files, 1992, 1995, 1998.

Table 16. Visits to ambulatory surgery centers by male Medicare beneficiaries for benign prostatic hyperplasia and/or lower urinary tract symptoms listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	72,260	491 (487–494)	62,520	411 (408–14)	53,900	372 (369–375)
Total < 65	3,340	108 (104–112)	3,720	108 (105–111)	3,480	101 (98–105)
Total 65+	68,920	592 (588–597)	58,800	499 (495–503)	50,420	457 (453–461)
Age						
65–74	41,080	568 (562–573)	33,380	464 (460–469)	26,660	415 (410–420)
75–84	23,940	678 (669–686)	21,680	593 (585–601)	19,540	534 (526–541)
85–94	3,780	478 (463–493)	3,580	422 (408–436)	4,120	476 (461–490)
95+	120	155 (128–182)	160	195 (165–226)	100	114 (92–137)
Race/ethnicity						
White	62,580	505 (501–509)	54,820	422 (418–425)	47,220	386 (383–390)
Black	5,700	447 (436–459)	5,620	406 (395–416)	4,220	316 (307–326)
Asian	…	…	280	384 (339–429)	400	292 (263–320)
Hispanic	…	…	480	242 (220–263)	1,020	304 (285–323)
N. American Native	…	…	…	…	…	…
Region						
Midwest	24,840	670 (661–678)	19,480	505 (498–512)	17,420	471 (464–478)
Northeast	18,640	588 (579–596)	12,900	406 (399–413)	11,480	413 (406–421)
South	24,660	471 (465–477)	24,960	455 (449–461)	20,040	373 (368–379)
West	4,100	182 (177–188)	5,040	217 (211–223)	4,880	218 (212–224)

… data not available.

[a]Unweighted counts were multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

for BPH surgery, lengths of stay (LOS) were shorter, consistent with trends following widespread adoption of prospective payment and managed care systems (Table 17). By 2000, the mean LOS was less than 3 days in all but the most elderly patients.

In the 1990s, several minimally invasive surgical therapies (MIST) were introduced. These include laser ablation, transurethral needle ablation (TUNA), transurethral microwave therapy (TUMT), high-energy focused ultrasound (HIFU), and hot-water thermotherapy. The 1997 AUA Gallup Poll of practicing urologists indicated that while 95% had performed TURP in the prior year, only 26% had performed a laser prostatectomy. Only 3% had performed TUNA or TUMT (5). Use of minimally invasive therapies is highly dependent on the availability and cost of special instrumentation. As a result, not all MIST procedures have survived. According to data from the Healthcare Cost and Utilization Project (HCUP), of the MIST procedures performed in the inpatient setting, only TUNA and TUMT increased by the end of the decade (Table 14). Data from Medicare indicate that the majority of TUNA and TUMT procedures were performed in the ambulatory surgery center setting or physician office, as opposed to the inpatient setting, as expected given their minimally invasive nature (Table 18). BPH procedures in ambulatory surgery centers on commercially insured men 65 to 74 years of age increased substantially toward the end of the decade, from 264 per 100,000 in 1998 to 352 per 100,000 in 2000 (Table 19).

Age-adjusted data from NHANES-III revealed no difference in the odds of BPH surgery by racial/

Table 17. Trends in mean inpatient length of stay (days) for adult males hospitalized with benign prostatic hyperplasia and/or lower urinary tract symptoms listed as primary diagnosis

	Length of Stay			
	1994	1996	1998	2000
All	3.8	3.1	3.1	2.8
Age				
40–44	3.3	2.2	2.8	3.3
45–54	3.1	2.6	2.6	2.1
55–64	3.2	2.6	2.8	2.4
65–74	3.5	2.9	2.9	2.7
75–84	4.2	3.4	3.3	3.0
85+	5.3	4.4	4.3	4.0
Race/ethnicity				
White	3.7	3.1	3.1	2.8
Black	4.5	3.5	3.6	3.6
Asian/Pacific Islander	2.9	2.9	3.1	3.1
Hispanic	3.9	3.4	3.7	2.9
Other	4.5	2.9	3.2	3.1
Region				
Midwest	3.8	3.3	3.2	2.9
Northeast	4.8	3.7	3.7	3.2
South	3.6	3.0	2.9	2.8
West	2.7	2.4	2.7	2.4
MSA				
Rural	3.7	3.1	3.0	2.8
Urban	3.8	3.1	3.1	2.8

MSA, metropolitan statistical area.
SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

ethnic group, education, geographic region, or urban/rural area; however, never-married men were 70% less likely to have undergone BPH surgery (6).

Nursing Home Care

The aging of the US population has increased the number of men with BPH. Curiously, this phenomenon is not reflected in data from the National Nursing Home Survey, which indicates the presence of BPH in only 5,760 to 6,034 per 100,000 male nursing home residents (Table 20). The lower than expected number of cases identified may reflect administrative undercoding of BPH as a comorbid condition.

ECONOMIC IMPACT

The economic burden of BPH can be stratified into three areas: (1) direct medical costs associated with treatment; (2) indirect costs associated with absenteeism, work limitations, and premature mortality; and (3) intangible costs associated with pain, suffering, and grief.

Direct Costs

We estimate the direct cost of medical services provided at hospital inpatient and outpatient settings, emergency departments, and physicians' offices to treat BPH in the United States in 2000 to have been approximately $1.1 billion (Table 21). This estimate does not include the costs of outpatient prescriptions and nonprescription medications or alternative medicine visits reported by a small percentage of men with BPH. After adjusting for inflation (data not shown), total medical spending for BPH has declined over time, particularly among the Medicare population (Tables 21 and 22). This reduction in spending is largely attributable to a dramatic decline in inpatient expenditures. Total hospitalization spending for BPH fell by more than half among Medicare beneficiaries age 65 and over, from $743 million in 1992 to $315 million in 1998 (in nominal $).

Spending on outpatient prescription drugs for the treatment of BPH in 1996–1998 was $194 million annually, according to estimates from the Medical Expenditure Panel Survey (MEPS). The majority of the prescriptions and pharmacy spending were for Hytrin®, followed by Cardura® and Proscar® (Table 23).

To examine the incremental medical costs associated with a diagnosis of BPH, we used data from 280,000 primary beneficiaries aged 18 to 64 with employer-provided insurance coverage in 1999. We estimated medical expenditures for persons with and without a primary diagnosis of BPH in 1999, controlling for differences in insurance coverage (medical and drug benefits), patient demographics, and health status (medical comorbidities). These data estimate the incremental direct annual medical costs for BPH to be $2,577 (Table 24). The average annual cost for men without a BPH claim was $3,138, while the claim for those with BPH was $5,715.

Table 18. Surgical procedures used to treat symptoms of benign prostatic hyperplasia among male adult Medicare beneficiaries, count[a], rate[b]

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total	174,260	11,986	122,860	7,456	95,340	6,366
Open prostatectomy	6,420	442	3,760	228	2,880	192
Ambulatory surgery center	0	0.0	0	0.0	0	0.0
Inpatient	6,380	439	3,740	227	2,860	191
Hospital outpatient	0	0.0	0	0.0	0	0.0
Physician office	40	2.8	20	1.2	20	1.3
Balloon dilation	1,080	74	200	12	320	21
Ambulatory surgery center	440	30	40	2.4	180	12
Inpatient	600	41	140	8.5	140	9.3
Hospital outpatient	20	1.4	0	0.0	0	0.0
Physician office	20	1.4	20	1.2	0	0.0
TUNA	0	0.0	0	0.0	420	28
Ambulatory surgery center	0	0.0	0	0.0	360	24
Inpatient	0	0.0	0	0.0	0	0.0
Hospital outpatient	0	0.0	0	0.0	0	0.0
Physician office	0	0.0	0	0.0	60	4.0
TURP	165,880	11,409	105,560	6,406	79,800	5,329
Ambulatory surgery center	1,720	118	8,620	523	7,660	512
Inpatient	162,560	11,180	96,000	5,826	71,360	4,765
Hospital outpatient	0	0.0	140	8.5	140	9.3
Physician office	1,600	110	800	49	640	43
Laser prostatectomy	0	0.0	12,600	765	7,720	516
Ambulatory surgery center	0	0.0	7,560	459	4,720	315
Inpatient	0	0.0	4,860	295	2,820	188
Hospital outpatient	0	0.0	160	10	100	6.7
Physician office	0	0.0	20	1.2	80	5.3
TUIP	880	61	740	45	860	57
Ambulatory surgery center	260	18	220	13	380	25
Inpatient	620	43	460	28	480	32
Hospital outpatient	0	0.0	20	1.2	0	0.0
Physician office	0	0.0	40	2	0	0.0
TUMT	0	0.0	0	0.0	3,340	223
Ambulatory surgery center	0	0.0	0	0.0	2,760	184
Inpatient	0	0.0	0	0.0	40	2.7
Hospital outpatient	0	0.0	0	0.0	20	1.3
Physician office	0	0.0	0	0.0	520	35

TUNA, transurethral needle ablation; TURP, transurethral resection of the prostate; TUIP, transurethral incision of the prostate; TUMT, transurethral microwave therapy.

[a]Unweighted counts multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 male adult Medicare beneficiaries with a diagnosis of benign prostatic hyperplasia and/or lower urinary tract symptomsrate is per 100,000 Medicare beneficiaries with a diagnosis of BPH/LUTS.

SOURCE: Centers for Medicare and Medicaid Services, 5% File, 1992, 1995, 1998.

Table 19. Visits to ambulatory surgery centers for benign prostatic hyperplasia and/or lower urinary tract symptoms procedures listed as primary procedure by males having commercial health insurance, count[a], rate[b]

	1998		2000	
	Count	Rate	Count	Rate
Total	254	58	434	83
Age				
40–44	12	*	13	*
45–54	48	24	81	35
55–64	130	128	233	190
65–74	46	264	78	352
75–84	15	*	26	*
85+	3	*	3	*

*Figure does not meet standard for reliability or precision.
[a]Counts less than 30 should be interpreted with caution.
[b]Rate per 100,000 based on member months of enrollment in calendar year for males in the same demographic stratum.
SOURCE: Center for Health Care Policy and Evaluation, 1998, 2000.

Table 20. Male nursing home residents with an admitting or current diagnosis of benign prostatic hyperplasia and/or lower urinary tract symptoms, count, rate[a] (95% CI)

	1995		1997		1999	
	Count	Rate	Count	Rate	Count	Rate
Total[b]	23,576	5,760 (4,762–6,759)	28,492	6,626 (5,526–7,727)	26,929	6,034 (4,986–7,082)
Age						
40–84	13,966	5,056 (3,912–6,199)	16,877	5,649 (4,420–6,878)	13,747	4,551 (3,439–5,663)
85+	9,611	7,222 (5,273–9,172)	11,615	8,852 (6,581–11,122)	13,182	9,141 (6,897–11,384)
Race						
White	19,142	5,756 (4,645–6,867)	25,535	7,364 (6,080–8,649)	24,195	6,759 (5,521–7,998)
Other	4,268	5,707 (3,402–8,012)	2,930	3,659 (1,686–5,632)	2,734	3,174 (1,473–4,875)

[a]Rate per 100,000 nursing home residents in the same demographic stratum.
[b]Persons of unspecified race are included in the totals.
SOURCE: National Nursing Home Survey, 1995, 1997, 1999.

Indirect Costs

Work lost by men with BPH was measured by MarketScan in 1999 and is shown in Tables 25 and 26. One-tenth of the men with BPH missed work, losing an average of 7.3 hours annually. Each visit for outpatient care was associated with an average work loss of 4.7 hours. Because this dataset does not provide the proportion of working men who have BPH, it is impossible to gauge the aggregate extent of indirect costs as missed work from MarketScan analyses. Inclusion of indirect costs greatly increases estimates of the overall economic burden of BPH.

FUTURE DIRECTIONS

The substantial amount of data documenting the prevalence of BPH and its therapies attests to the tremendous impact of this condition on the health and quality of life of American men. One of the most basic and yet most difficult tasks facing the medical community will be to standardize the definition of clinical BPH, recognizing that the diagnosis is rarely histologically confirmed. Standardization of the clinical definition would allow for consistency among studies and would facilitate research on the prevention, diagnosis, and treatment of this condition.

Table 21. Expenditures for benign prostatic hyperplasia (in millions of $) and share of costs, by site of service

	Year			
	1994	1996	1998	2000
Total[a]	1,067.1	1,045.8	1,036.2	1,099.5
Share of total				
Inpatient	740.6 (69.4%)	633.8 (60.6%)	566.8 (54.7%)	579.4 (52.7%)
Physician office	278.5 (26.1%)	365.0 (34.9%)	409.3 (39.5%)	472.8 (43.0%)
Hospital outpatient	23.5 (2.2%)	26.1 (2.5%)	29.0 (2.8%)	22.0 (2.0%)
Emergency room	24.5 (2.3%)	20.9 (2.0%)	31.0 (3.0%)	25.3 (2.3%)

[a]Total unadjusted expenditures exclude spending on outpatient prescription drugs for the treatment of BPH. Average drug spending for BPH-related conditions is estimated at $194 million annually for the period 1996 to 1998.

NOTE: Percentages may not add to 100% because of rounding.

SOURCES: National Ambulatory and Medical Care Survey; National Hospital and Ambulatory Medical Care Survey; Healthcare Cost and Utilization Project; Medical Expenditure Panel Survey, 1994, 1996, 1998, 2000.

Table 22. Expenditures for Medicare beneficiaries age 65 and over for treatment of benign prostatic hyperplasia (in millions of $) (% of total)

	Year		
	1992	1995	1998
Total	1,132.0	861.3	776.0
Inpatient	743.1 (65.6%)	408.4 (47.4%)	315.0 (40.6%)
Outpatient			
Physician office	291.2 (25.7%)	322.5 (37.4%)	327.5 (42.2%)
Hospital outpatient	8.7 (0.8%)	11.9 (1.4%)	13.4 (1.7%)
Ambulatory surgery	73.4 (6.5%)	100.0 (11.6%)	100.3 (12.9%)
Emergency room	15.5 (1.4%)	18.5 (2.1%)	19.8 (2.6%)

NOTE: Percentages may not add to 100% because of rounding.

SOURCE: Centers for Medicare and Medicaid Services, 1992, 1995, 1998.

Increasingly, BPH therapy trends indicate a move away from the gold-standard operative options toward less-invasive pharmacologic or MIST options. The use of medication for BPH has had the most obvious impact, with the proliferation of newer agents that specifically act on the prostate and bladder. Analogous to TURP, the use of most MIST procedures for BPH has declined, with the exception of TUNA and TUMT, which increased during the final years of the 1990s. Ongoing reevaluation of these trends will be necessary as newer therapies are made available and to determine the proportion of men initially started on pharmacologic agents who eventually go on to have more invasive therapy.

Although this chapter summarizes a number of important trends, others, including evolving technologies and the use of complementary and alternative therapies for BPH, remain poorly characterized. These options have garnered a great deal of public interest, but their efficacy, particularly in relation to established therapies, remains largely undetermined. Moreover, these trends will undoubtedly have a major impact on health care costs. Similarly, measures of the indirect costs of BPH care are poorly quantified, and the cost-effectiveness of pharmacologic and surgical interventions for BPH remains uncertain. Efforts to examine the cost implications of new therapies should be undertaken as a prerequisite for widespread adoption.

Future efforts must also address the underlying etiology of BPH. Clinical epidemiological studies that focus on the effects of sociodemographic factors

Table 23. Average annual spending and use of selected outpatient prescription drugs for treatment of benign prostatic hyperplasia, 1996–1998[a]

Drug Name	Number of Rx Claims	Mean Price ($)	Total Expenditures ($)
Hytrin®	1,923,054	67.39	129,594,632
Cardura®	605,744	49.26	29,838,949
Proscar®	518,038	66.77	34,589,375
Total			194,022,956

Rx, prescription.

[a]Estimates include prescription drug claims with a corresponding diagnosis of BPH and exclude drugs for which number of claims could not be reliably estimated due to data limitations. Including expenditures for excluded prescription drugs for which the number of claims could not be reliably estimated would increase total drug spending by approximately 2%, to $198.6 million.

SOURCE: Medical Expenditure Panel Survey, 1996–1998.

Table 24. Estimated annual expenditures of privately insured male workers with and without a medical claim for benign prostatic hyperplasia in 1999[a]

	Annual Expenditures (per person)			
	Persons without BPH (N=270,431)	Persons with BPH (N=8,483)		
	Total	Total	Medical	Rx Drugs
All	3,138	5,715	4,544	1,170
Age				
45–54	3,227	5,550	4,440	1,109
55–64	3,293	5,765	4,573	1,170
Region				
Midwest	3,018	6,339	5,221	1,117
Northeast	3,035	5,080	3,977	1,102
South	3,327	6,405	5,153	1,252
West	3,169	7,023	5,624	1,399

[a]The sample consists of primary beneficiaries ages 18 to 64 having employer-provided insurance who were continuously enrolled in 1999. Estimated annual expenditures were derived from multivariate models that control for age, gender, work status (active/retired), median household income (based on zip code), urban/rural residence, medical and drug plan characteristics (managed care, deductible, co-insurance/co-payments), and 26 disease conditions.

SOURCE: Ingenix, 1999.

Table 25. Average annual work loss of persons treated for benign prostatic hyperplasia (BPH) and/or lower urinary tract symptoms (LUTS) (95% CI)

	Number of Workers[a]	% Missing Work	Average Work Absence (hrs)		
			Inpatient	Outpatient	Total
BPH/LUTS	2,013	10%	0.2 (0.1–0.3)	7.1 (4.6–9.6)	7.3 (4.8–9.8)

[a]Individuals with an inpatient or outpatient claim for BPH/LUTS and for whom absence data were collected.

Work loss is based on reported absences contiguous to the admission and discharge dates of each hospitalization or the date of the outpatient visit.

SOURCE: MarketScan, 1999.

Table 26. Average work loss associated with a hospitalization or an ambulatory care visit for benign prostatic hyperplasia (BPH) and/or lower urinary tract symptoms (LUTS) (95% CI)

	Inpatient Care		Outpatient Care	
	Number of Hospitalizations[a]	Average Work Absence (hrs)	Number of Outpatient Visits	Average Work Absence (hrs)
BPH/LUTS	*	*	3,036	4.7 (3.3–6.1)

*Figure does not meet standard for reliability or precision.

[a]Unit of observation is an episode of treatment. Work loss is based on reported absences contiguous to the admission and discharge dates of each hospitalization or the date of the outpatient visit.

SOURCE: MarketScan, 1999.

such as race/ethnicity and access to health care on BPH prevalence and the relationship between LUTS and other conditions such as diabetes and sexual dysfunction have the potential to improve care. Given the dramatic trends of the past 10 years and the persistent variation in the management of BPH, quality of care delivered for BPH should be evaluated. The delivery of high-quality care should be the goal of all clinicians, and that goal goes hand in hand with the dissemination of evidence-based guidelines (2).

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CHAPTER 3

Urinary Incontinence in Women

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SUMMARY

Urinary incontinence affects from 15% to 50% of community-dwelling women of all ages. It is one of the most prevalent chronic diseases, although it is often not recognized by the US health care system. The direct cost of urinary incontinence for women in the United States was $12.4 billion in 1995 dollars (1). Approximately one in ten women in the United States undergoes surgery for urinary incontinence or pelvic organ prolapse, and a sizable minority of women bear the cost of pads, medications, and nonsurgical therapies.

INTRODUCTION

Population-based studies estimate that a large proportion of adult women report the symptom of urinary incontinence. As many as three-fourths of US women report at least some urinary leakage and studies consistently find that 20 to 50% report more-frequent leakage. While some authors have interpreted this to mean that nearly half of American women "suffer" from incontinence, others point out that many women with occasional incontinence are not sufficiently bothered by it to seek care. Of greater clinical relevance is an improved understanding of the number of women with severe or more-frequent leakage, estimated fairly uniformly at 7% to 10% by various researchers. Currently, there is little understanding of the number of women whose lives are truly impacted by urinary incontinence or of its true burden on American women. Indeed, the demarcation between incontinence as a symptom and incontinence as a disease is far from clear. For example, 25% of female college varsity athletes lose urine when doing provocative exercise, and most do not consider it a problem; indeed, most experts would agree that these young women do not have a major health problem. Conversely, most experts would agree that middle-aged women who lose urine throughout the day, wear pads, curtail desired activities because of leakage, and truly suffer have a disease and would benefit from treatment.

Studies that inquire about the presence of "any" or "occasional" incontinence may overestimate the actual burden of incontinence on the health care system, but available data on incontinence treatment underestimate the actual burden, given that many women with bothersome leakage do not seek care. While readily available information about incontinence treatment in adult women in the United States indicates only the lowest possible burden urinary incontinence presents to the health care system, it does provide a foundation on which to base future studies and to project future care. This chapter uses data from various sources to begin defining not only the prevalence of incontinence, but also its impact on the US health care system. At this time, equally important information about the burden of disease on women who are not seeking treatment is not available. The impact of incontinence on the women themselves, their families, their work, and society is also not yet well defined in the literature.

Table 1. Codes used in the diagnosis and management of female urinary incontinence

Females 18 years or older, with one the following ICD-9 diagnosis codes, but not a coexisting 952.xx or 953.xx code:	
596.51	Hypertonicity of bladder
596.52	Low bladder compliance
596.59	Other functional disorder of bladder
599.8	Other specified disorders of urethra and urinary tract
599.81	Urethral hypermobility
599.82	Intrinsic (urethral) sphincter deficiency (ISD)
599.83	Urethral instability
599.84	Other specified disorders of urethra
625.6	Stress incontinence, female
788.3	Urinary incontinence
788.30	Urinary incontinence unspecified
788.31	Urge incontinence
788.33	Mixed incontinence, male, female
788.34	Incontinence without sensory awareness
788.37	Continuous leakage
Fistulae	
596.1	Intestinovesical fistula
596.2	Vesical fistula not elsewhere classified
619.1	Digestive-genital tract fistula, female
619.0	Urinary-genital tract fistula, female
Spinal cord injury-related incontinence	
(When associated with other ICD-9 diagnosis codes for spinal cord injury 952.xx or 953.xx)	
344.61	Cauda equina syndrome with neurogenic bladder
596.51	Hypertonicity of bladder (specified as overactive bladder in 2001; included if associated with diagnosis code 952.xx)
596.52	Low compliance bladder
596.54	Neurogenic bladder, NOS
596.55	Detrusor sphincter dyssynergia
596.59	Other functional disorder of bladder
599.8	Other specified disorders of urethra and urinary tract
599.84	Other specified disorders of urethra
625.6	Stress incontinence female
788.3	Urinary incontinence
788.30	Urinary incontinence, unspecified
788.31	Urge incontinence
788.32	Stress incontinence male
788.33	Mixed incontinence, male and female
788.34	Incontinence without sensory awareness
788.37	Continuous leakage
788.39	Other urinary incontinence

DEFINITION AND DIAGNOSIS

Urinary incontinence is defined by the International Continence Society as "the complaint of any involuntary leakage of urine" (2). This supplants the group's previous long-held definition, in which the diagnosis of incontinence required that the leakage be a social or hygienic problem. The less restrictive definition is likely to capture more individuals who experience incontinence, including the many women who may leak daily but do not describe leakage as a social or hygienic problem. A diagnosis of urinary incontinence can be based on the patient's symptoms, the sign of incontinence noted during physical examination, or diagnostic urodynamic testing. Table 1 lists ICD-9 codes commonly used to identify urinary incontinence.

The International Continence Society further categorizes types of incontinence, as well as other bladder symptoms. *Stress urinary incontinence* is the complaint of involuntary leakage on effort or exertion or on sneezing or coughing. Stress urinary incontinence also describes the sign, or observation, of leakage from the urethra synchronous with coughing or exertion. When stress incontinence is confirmed during urodynamic testing by identifying leakage from the urethra coincident with increased abdominal pressure (for example, during a cough or sneeze) but in the absence of a bladder contraction, the diagnosis of *urodynamic stress incontinence* is made.

Urge urinary incontinence is the complaint of involuntary leakage accompanied by or immediately preceded by an urge to urinate and may be further defined with urodynamic investigation. Conventional urodynamic studies take place in a laboratory and involve filling the bladder with a liquid, then assessing bladder function during filling and emptying. If during urodynamic testing the patient demonstrates either spontaneous or provoked involuntary detrusor contractions while filling, she is said to have *detrusor overactivity*. If a relevant neurologic condition exists, the detrusor overactivity is further categorized as *neurogenic*; when no such condition is identified, the overactivity is termed *idiopathic*. These terms replace the previously used *detrusor hyperre exia* and *detrusor instability*. Many women with urge incontinence do not manifest detrusor overactivity on urodynamic testing. This may be due in part to the fact that such testing, which lasts approximately an hour, is merely a snapshot of the patient's overall bladder function. Ambulatory urodynamic studies can also be performed to document the patient's leakage during everyday activities; such studies identify more detrusor contractions during filling than do conventional ones. Nonetheless, treatment for urge incontinence is often based on implicit clinical assessment because of the low predictive value of a negative test.

Other diagnostic tests may be used to help characterize incontinence and its severity. A pad test quantifies the volume of urine lost by weighing a perineal pad before and after some type of leakage provocation. This type of test has also been used in attempts to distinguish continent from incontinent women. Pad tests can be divided into short-term tests, usually performed under standardized office conditions, and long-term tests, usually performed at home for 24 to 48 hours. Short-term pad tests are generally performed with a symptomatically full bladder or with a certain volume of saline instilled into the bladder before the patient begins a series of exercises.

A voiding diary, or bladder chart, is a record maintained by the patient of her urinary frequency and leakage, voided volumes, and fluid intake over a 3- to 7-day period. This noninvasive test provides useful information about bladder capacity, type of incontinence symptoms, diurnal versus nocturnal voiding patterns, and appropriateness of fluid intake.

INCIDENCE AND PREVALENCE

As noted above, a wide range in the prevalence of urinary incontinence has been reported. One compilation of such studies (3) indicates that approximately 50% of adults report "any" incontinence, while 5% to 25% note leakage at least weekly, and 5 to 15% note it daily or most of the time (Table 2). Rates of incontinence severity patterns are depicted in Figure 1. The rate of urge incontinence tends to rise with age, while the rate of stress incontinence decreases somewhat in the oldest age groups, possibly due to lower activity levels (Figure 2). In a large population of Norwegian women, the rate of stress incontinence peaked at approximately 60% in women 40 to 49 years of age; urge incontinence

Table 2. Prevalence of urinary incontinence by frequency and gender in older adults, proportion (counts)

Study	Age	Frequency	Prevalence: Women		Prevalence: Men		F/M Ratio
Thomas, 1980	65 +	“ever”	25.80%	(403/1562)	15.30%	(169/1102)	1.7
Rekers, 1992	65–79	“ever”	19.70%	(50/254)			
Hellstrom, 1990	85 +	“ever”	34.70%	(191/551)	18.40%	(49/266)	1.9
Milsom, 1993	66 +	“ever”	22.70%	(962/4238)			
Brockelhurst, 1993	60 +	“ever”	16.80%	(141/840)	12.80%	(90/701)	1.3
Lara, 1994	50 +	“ever”	50.70%	(71/140)			
Sommer, 1990	60–79	“ever”	44.90%	(62/138)			
Sandvik, 1993 & Saim, 1995	60 +	“ever”	31.5%*	(NR)			
Wetle, 1995	65 +	“ever difficulty”	44.40%	(1045/2360)	34.10%	(494/1449)	1.3
Nygaard, 1996	65 +	“ever difficulty”	55.10%	(1116/2025)			
Diokno, 1986	60+	1+ / 12 months	37.70%	(434/1150)	18.90%	(152/805)	2.0
Yarnell, 1979	65 +	1+ / 12 months	16.90%	(37/219)	10.70%	(18/169)	1.6
Yarnell, 1981	65 +	1+ / 12 months	49.60%	(89/180)			
Holst, 1988	65 +	1+/12 months	36.50%	(66/181)			
Milne, 1972 & Milne, 1971	62 +	“current”	41.50%	(114/272)	25.10%	(54/215)	1.7
Campbell, 1985	80 +	“current”	22.10%	(64/290)	21.60%	(29/134)	1.0
Hunter, 1996	50 +	“current”			6.00%	(120/2002)	
Nakanishi, 1997	65 +	“occasionally or more often”	9.70%	(82/842)	9.80%	(55/563)	1.0
Brockelhurst, 1993	60 +	1+ / 2 months	10.20%	(86/840)	5.30%	(37/701)	1.9
Diokno, 1986	60 +	1+ / month	21.70%	(250/1150)	10.40%	(84/805)	2.0
Brown, 1996	65 +	1+ / month	41.30%	(3285/7949)			
Thomas, 1980	65 +	2+ / month	11.40%	(178/1562)	6.90%	(76/1102)	1.7
Brockelhurst, 1993	60 +	2+ / month	10.20%	(86/840)	5.30%	(37/701)	1.9
Holst, 1988	65 +	2+ / month	21.50%	(39/181)			
Diokno, 1986	60 +	1+ / week	12.60%	(145/1150)	5.50%	(44/805)	2.4
Brockelhurst, 1993	60 +	1+ / week	8.30%	(70/840)	3.70%	(26/701)	2.2
Hellstrom, 1990	85 +	1+ / week	27.00%	(149/551)	15.00%	(40/266)	1.8
Rekers, 1992	65–79	1+ / week	6.30%	(16/254)			
Kok, 1992	60 +	2+ / week	22.90%	(164/715)			
Campbell, 1986	80 +	3+ / week	5.10%	(15/290)	3.70%	(5/134)	1.4
Wetle, 1995	65 +	“most or all of the time”	8.80%	(208/2360)	5.80%	(84/1449)	1.5
Sommer, 1990	60–79	“often or always”	8.70%	(12/138)			
Nygaard, 1996	65 +	“most or all of the time	8.30%	(168/2025)			
Diokno, 1986	60 +	1+ / day	5.20%	(60/1150)	1.70%	(14/805)	3.1
Hellstrom, 1990	85 +	1+ / day	16.70%	(92/551)	10.50%	(28/266)	1.5
Kok, 1992	60 +	1+ / day	14.00%	(NR)			
Brown, 1996	65 +	1+ / day	14.20%	(1130/7949)			
Nakanishi, 1997	65 +	1+ / day	2.50%	(21/842)	2.10%	(12/563)	1.2

NR, not reported; F, female; M, male.

*Mean of prevalence by 10-year age groups.

SOURCE: Adapted from Thom D, Variation in estimates of urinary incontinence prevalence in the community: effects of differences in definition, population characteristics, and study type, Journal of the American Geriatrics Society, 46, 473–4801, Copyright 1998, with permission from the American Geriatrics Society.

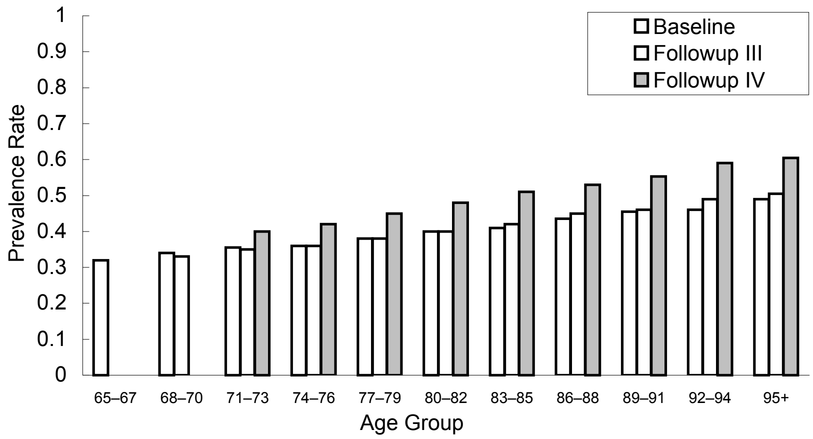

Figure 1. Estimated urge incontinence prevalence rates by age and interview.
Follow-ups III and IV include responses 3 and 6 years after baseline, respectively.

SOURCE: Adapted from Nygaard IE, Lemke JH, Urinary incontinence in rural older women: prevalence, incidence, and remission, Journal of American Geriatrics Society, 44, 1049–1054, Copyright 1996, with permission from the American Geriatrics Society.

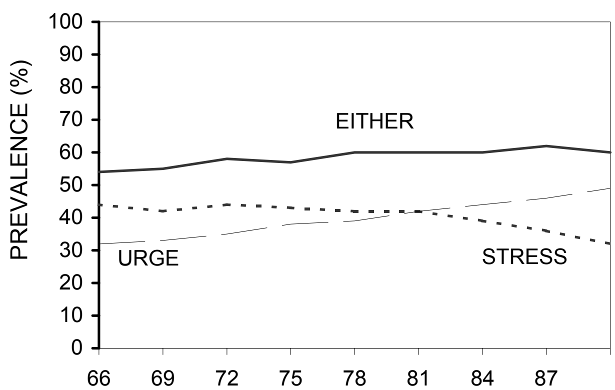

Figure 2. Prevalence of incontinence by age groups at baseline.
Each age represents the midpoint of a 3-year age range. Because of the small number of women above age 90, the graph ends with age range 86-88. "Urge" and "stress" refer to women who answered affirmatively to the urge and stress incontinence questions, respectively. "Either" refers to women who reported any incontinence (either urge or stress).

SOURCE: Adapted from Nygaard IE, Lemke JH, Urinary incontinence in rural older women: prevalence, incidence, and remission, Journal of American Geriatrics Society, 44, 1049–1054, Copyright 1996, with permission from the American Geriatrics Society.

Table 3. Prevalence of difficulty controlling bladder among adult women

		Difficulty Controlling Bladder		
	Total	Yes	No	Refused to Answer or Don't Know
All	23,477,726	8,929,543 (38%)	14,449,905 (62%)	98,278 (0%)
Age at screening				
60–64	5,699,785	2,168,863 (38%)	3,530,922 (62%)	0 (0%)
65–69	4,895,878	1,785,380 (36%)	3,110,498 (64%)	0 (0%)
70–74	4,505,164	1,683,804 (37%)	2,818,651 (63%)	2,709 (0%)
75–79	3,453,472	1,515,900 (44%)	1,873,616 (54%)	63,956 (2%)
80–84	2,981,558	989,003 (33%)	1,967,390 (66%)	25,165 (1%)
85+	1,941,869	786,593 (41%)	1,148,828 (59%)	6,448 (0%)
Race/ethnicity				
Non-Hispanic white	18,729,539	7,662,444 (41%)	11,041,930 (59%)	25,165 (0%)
Non-Hispanic black	1,941,269	386,480 (20%)	1,554,789 (80%)	0 (0%)
Mexican American	649,003	230,567 (36%)	409,279 (63%)	9,157 (1%)
Other Hispanic	1,576,419	468,823 (30%)	1,107,596 (70%)	0 (0%)
Other race	581,496	181,229 (31%)	336,311 (58%)	63,956 (11%)
Education				
Less than high school	8,374,762	2,692,649 (32%)	5,682,113 (68%)	0 (0%)
High school	7,692,149	3,484,970 (45%)	4,207,179 (55%)	0 (0%)
High school+	7,212,158	2,725,611 (38%)	4,461,382 (62%)	25,165 (0%)
Refused	103,678	26,313 (25%)	13,409 (13%)	63,956 (62%)
Don't know	87,647	0 (0%)	85,822 (98%)	1,825 (2%)
Missing	7,332	0 (0%)	0 (0%)	7,332 (100%)
Poverty income ratio[a]				
PIR=0	111,440	31,876 (29%)	79,564 (71%)	0 (0%)
PIR<1	3,145,548	1,116,508 (35%)	2,026,331 (64%)	2,709 (0%)
1.00<=PIR<=1.84	5,520,548	2,193,641 (40%)	3,326,907 (60%)	0 (0%)
PIR>1.84	9,649,331	3,538,606 (37%)	6,085,560 (63%)	25,165 (0%)
Refused	2,090,410	759,112 (36%)	1,331,298 (64%)	0 (0%)
Don't know	1,560,474	741,618 (48%)	817,031 (52%)	1,825 (0%)
Missing	1,399,975	548,182 (39%)	783,214 (56%)	68,579 (5%)

[a]See glossary for definition of poverty income ratio.

The data in this table are based on question KIQ.040: " In the past 12 months, have you had difficulty controlling your bladder, including leaking small amounts of urine when you cough or sneeze?" (Do not include bladder control difficulties during pregnancy or recovery from childbirth.)

SOURCE: National Health and Nutrition Examination Survey, 1999–2000.

Table 4. Frequency of bladder control problems among those who responded "yes" to difficulty controlling bladder

		Frequency of Bladder Control Problems				
	All	Every Day	Few per Week	Few per Month	Few per Year	Don't Know
All	8,929,543	3,255,587 (36%)	2,408,421 (27%)	2,016,715 (23%)	1,082,624 (12%)	166,196 (2%)
Age at screening						
60–64	2,168,863	686,213 (32%)	429,351 (20%)	563,017 (26%)	490,282 (23%)	0 (0%)
65–69	1,785,380	475,030 (27%)	511,356 (29%)	479,229 (27%)	172,781 (10%)	146,984 (8%)
70–79	1,683,804	663,681 (39%)	536,511 (32%)	338,233 (20%)	145,379 (9%)	0 (0%)
75–79	1,515,900	575,823 (38%)	448,955 (30%)	286,739 (19%)	204,383 (13%)	0 (0%)
80–84	989,003	456,355 (46%)	233,503 (24%)	258,379 (26%)	21,554 (2%)	19,212 (2%)
85+	786,593	398,485 (51%)	248,745 (32%)	91,118 (12%)	48,245 (6%)	0 (0%)
Race/ethnicity						
Non-Hispanic white	7,662,444	2,759,807 (36%)	1,914,582 (25%)	1,909,818 (25%)	912,041 (12%)	166,196 (2%)
Non-Hispanic black	386,480	212,544 (55%)	74,408 (19%)	45,752 (12%)	53,776 (14%)	0 (0%)
Mexican American	230,567	89,173 (39%)	73,734 (32%)	26,952 (12%)	40,708 (18%)	0 (0%)
Other Hispanic	468,823	77,927 (17%)	315,040 (67%)	7,880 (2%)	67,976 (14%)	0 (0%)
Other Race	181,229	116,136 (64%)	30,657 (17%)	26,313 (15%)	8,123 (4%)	0 (0%)
Education						
Less than high school	2,692,649	1,381,281 (51%)	566,047 (21%)	463,584 (17%)	281,737 (10%)	0 (0%)
High school	3,484,970	1,104,097 (32%)	730,106 (21%)	1,040,720 (30%)	510,224 (15%)	99,823 (3%)
High school+	2,725,611	770,209 (28%)	1,112,268 (41%)	486,098 (18%)	290,663 (11%)	66,373 (2%)
Refused	26,313	0 (0%)	0 (0%)	26,313 (100%)	0 (0%)	0 (0%)
Poverty income ratio[a]						
PIR=0	31,876	0 (0%)	0 (0%)	31,876 (100%)	0 (0%)	0 (0%)
PIR<1	1,116,508	541,675 (49%)	182,029 (16%)	241,012 (22%)	151,792 (14%)	0 (0%)
1.00<=PIR<=1.84	2,193,641	810,902 (37%)	668,567 (30%)	394,473 (18%)	265,876 (12%)	53,823 (2%)
PIR>1.84	3,538,606	988,094 (28%)	1,110,863 (31%)	952,372 (27%)	374,904 (11%)	112,373 (3%)
Refused	759,112	274,391 (36%)	150,098 (20%)	143,238 (19%)	191,385 (25%)	0 (0%)
Don't know	741,618	325,985 (44%)	140,318 (19%)	186,751 (25%)	88,564 (12%)	0 (0%)
Missing	548,182	314,540 (57%)	156,546 (29%)	66,993 (12%)	10,103 (2%)	0 (0%)

[a]See glossary for definition of poverty income ratio.

The data in this table are based on question KIQ.060: "How frequently does this (referring to KIQ.040) occur? Would you say this occurs…every day, a few times a week, a few times a month, or a few times a year?"

SOURCE: National Health and Nutrition Examination Survey, 1999–2000.

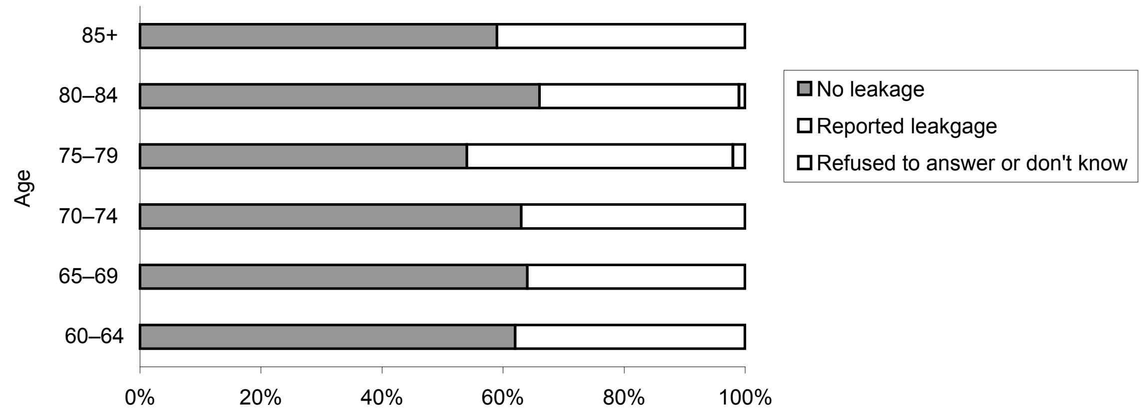

Figure 3a. Difficulty controlling bladder among female responders.

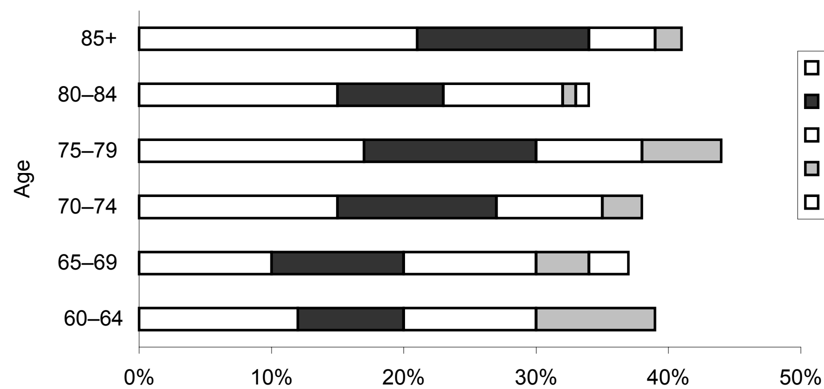

Figure 3b. Frequency of bladder control problems among female responders who answered "yes" to difficulty controlling bladder.

SOURCE: National Health and Nutrition Examination Survey, 1999–2001.

began to rise in women 50 to 59 years of age and peaked at roughly 20% in women between 80 and 89 years of age (4). Reasons for the divergence of estimates include variations in definitions, sampling methodologies, response rates, and question formats (5).

Consistent with the Norwegian study, the National Health and Nutrition Examination Survey (NHANES) asked a national sample of community-dwelling adults, "In the past 12 months, have you had difficulty controlling your bladder, including leaking small amounts of urine when you cough or sneeze (exclusive of pregnancy or recovery from childbirth)?" NHANES found the overall prevalence of urinary incontinence in women, as defined in this question, to be 38% in 1999–2000 (Table 3). When broken down by frequency of episodes, 13.7% of all women in NHANES reported daily incontinence, and an additional 10.3% reported weekly incontinence (Table 4). Prevalence was higher in non-Hispanic whites (41%) than in non-Hispanic blacks (20%) or Mexican Americans (36%). The prevalence of daily incontinence increased with age, ranging from 12.2% in all women 60 to 64 years of age to 20.9% in those 85 years of age and over (Figure 3). Women with less than a high school education reported incontinence

Table 5. Racial differences in urodynamic diagnoses and measures

	African American (n = 183)	Caucasian (n = 132)	P value
Diagnosis			
GSI (%)	41 (22)	60 (46)	0.001
Detrusor instability (%)	54 (30)	17 (13)	0.001
Mixed incontinence (%)	29 (16)	14 (11)	0.244
Other (%)	59 (32)	41 (31)	0.902
Measures (mean ± SE)			
Full volume (mL)	279 ± 11	326 ± 14	0.009
MCC (mL)	458 ± 14	536 ± 17	0.001
MUCP (cm H_2O)	68 ± 3	55 ± 3	0.001
MUCP <20 cm H_2O (%)	15 (8)	30 (23)	0.001

GSI, genuine stress incontinence; full volume, volume noted at fullness during filling cystometry; MCC, maximum cystometric capacity; MUCP, maximum urethral closure pressure. Racial comparison of diagnoses by chi^2 or Fisher exact test.

Racial comparison of measures by student t test.

SOURCE: Reprinted from American Journal of Obstetrics and Gynecology, 185, Graham CA, Mallet VT, Race as a predictor of urinary incontinence and pelvic organ prolapse, 116–120, Copyright 2001, with permission from Elsevier.

less often than did those with at least a high school education.

Other large population-based studies have also reported higher rates of urinary incontinence among non-Hispanic whites than in other ethnic or racial groups. In a large cohort of 50- to 69- year-old women enrolled in the Health and Retirement Survey, non-Hispanic blacks and Hispanics were both 60% less likely to have severe incontinence than were non-Hispanic whites, after adjusting for various comorbidities (6). Similarly, baseline data from the Heart and Estrogen/Progestin Replacement Study showed that non-Hispanic whites were 2.8 times more likely to have weekly stress incontinence than were non-Hispanic blacks, after adjusting for relevant factors (7). This epidemiologic trend appears consistent with laboratory findings as well. Graham and colleagues noted that among women presenting for incontinence treatment, stress incontinence was diagnosed more frequently in Caucasian women, and detrusor overactivity was seen more often in African American women (8). These diagnoses were also consistent with the study's finding that Caucasian women had lower urethral closure pressures than did African American women, while African American women had a lower bladder capacity than Caucasian women (Table 5). A recent analysis of data from the Study of Women's Health Across the Nation (SWAN), which included 3,302 women 42 to 52 years of age provided a closer look at nuances related to race/ethnicity and urinary incontinence (9). African American women with leiomyomata had a 1.81-fold higher risk of urinary incontinence than did Caucasian women, while African American women without fibroids had a decreased risk of urinary incontinence (OR 0.31). Hispanic and Japanese women had a lower risk than did Caucasian women (OR 0.44 and 0.58, respectively). In Chinese women, the risk of incontinence was modified by educational status; the OR of those with less than a college education was 0.35 relative to that of Caucasian women, and 2.53 for those with at least a college education.

Data from the Veterans Health Administration (VA) were used to estimate the utilization of outpatient care for urinary incontinence among female veterans accessing VA health services. Of all women who received outpatient care in the VA system, urinary incontinence as a percentage of any diagnosis was 2.7% in 1999, 3.6% in 2000, and 3.8% in 2001 (Table 6). These proportions are substantially lower than the rates of daily incontinence reported in population-based surveys, suggesting that the majority of women with incontinence do not seek medical care for it. As expected, the prevalence of medically recognized urinary incontinence increased with age, with the most marked increase occurring between the 25- to 34- year-olds and the 45- to 54- year-olds. Incontinence was more than twice as common among non-Hispanic whites as it was among African Americans and approximately 50% more common among non-Hispanic whites than among Hispanics. Incontinence was most common in the Western region of the United States and least common in the Eastern region, except in 2001, although these differences were not adjusted for differences in age or race/ethnicity.

Less is known about incontinence incidence, remission, and natural history. In prospective cohort studies using a survey design, 10% to 20% of women report remission or recurrence of incontinence over a 1- to 2-year-period (10). Whether this reflects the

Table 6. Frequency of urinary incontinence[a] listed as any diagnosis in female VA patients seeking outpatient care, count[b], rate[c]

	1999		2000		2001	
	Count	Rate	Count	Rate	Count	Rate
Total	3,780	2,679	5,426	3,597	6,196	3,757
Age						
18–24	23	387	20	348	22	378
25–34	213	796	223	839	237	888
35–44	777	1,882	1,020	2,449	1,052	2,489
45–54	968	3,262	1,531	4,374	1,817	4,440
55–64	469	4,194	697	5,506	827	5,600
65–74	401	4,405	543	5,858	637	5,744
75–84	849	5,412	1,261	6,927	1,440	6,828
85+	80	5,416	131	7,503	164	7,257
Race/ethnicity						
White	2,378	4,212	3,343	5,496	3,665	5,565
Black	406	2,152	511	2,491	562	2,518
Hispanic	83	3,257	102	3,608	117	3,767
Other	31	4,010	42	4,953	45	4,950
Unknown	882	1,412	1,428	2,169	1,807	2,485
Region						
Midwest	715	2,574	1,084	3,713	1,169	3,808
Northeast	672	2,338	862	2,842	1,036	3,162
South	1,354	2,584	2,083	3,682	2,294	3,606
West	1,039	3,228	1,397	4,020	1,697	3,162
Insurance status						
No insurance/self-pay	2,186	2,204	2,978	2,902	3,345	3,084
Medicare/Medicare supplemental	849	5,425	1,467	7,347	1,715	6,819
Medicaid	8	2,614	14	3,070	20	3,697
Private insurance/HMO/PPO	662	2,806	875	3,490	998	3,675
Other insurance	69	3,064	89	3,427	112	3,512
Unknown	6	4,196	3	2,239	6	1,435

HMO, health maintenance organization; PPO, preferred provider organization.

[a]Represents diagnosis codes for female urinary incontinence (including stress incontinence and fistulae).

[b]The term count is used to be consistent with other UDA tables; however, the VA tables represent the population of VA users and thus are not weighted to represent national population estimates.

[c]Rate is defined as the number of unique patients with each condition divided by the base population in the same fiscal year x 100,000 to calculate the rate per 100,000 unique outpatients.

NOTE: Race/ethnicity data from clinical observation only, not self-report; note large number of unknown values.

SOURCE: Outpatient Clinic File (OPC), VA Austin Automation Center, FY1999–FY2001.

natural history of incontinence, active intervention, or decreased physical activity (relevant to stress incontinence) is not clear.

HIGH-RISK GROUPS AND RISK FACTORS

Most data on risk factors for urinary incontinence come from clinical trials or cross-sectional studies using survey designs. Some risk factors have been more rigorously studied than others. Hence, the available information has limited generalizability and causality cannot be inferred from it. Bearing these limitations in mind, the literature does suggest that age, pregnancy, childbirth, obesity, functional impairment, and cognitive impairment are associated with increased rates of incontinence or incontinence severity. Some factors pertain more to certain age groups than to others. For example, in older women, childbirth disappears as a significant risk factor, possibly due to increased comorbidities and other intervening factors, such as diabetes, stroke, and spinal cord injury. Other factors about which less is known or findings are contradictory include hysterectomy, constipation, occupational stressors, smoking, and genetics.

TREATMENT

Fewer than half of the women with urinary incontinence report seeking medical care (11). Johnson and colleagues (12) found that the incontinent people most likely to contact a medical doctor are those who use pads, those who have large volume accidents, those who have impairment in activities of daily living; also, men are more likely to seek medical care than women are (Table 7). Many incontinent people practice behavioral modifications such as limiting trips, fluids, and routine activities. These restrictions are particularly striking in women with concomitant fecal incontinence (Table 8).

Most treatment for urge incontinence is nonsurgical. Common therapeutic modalities

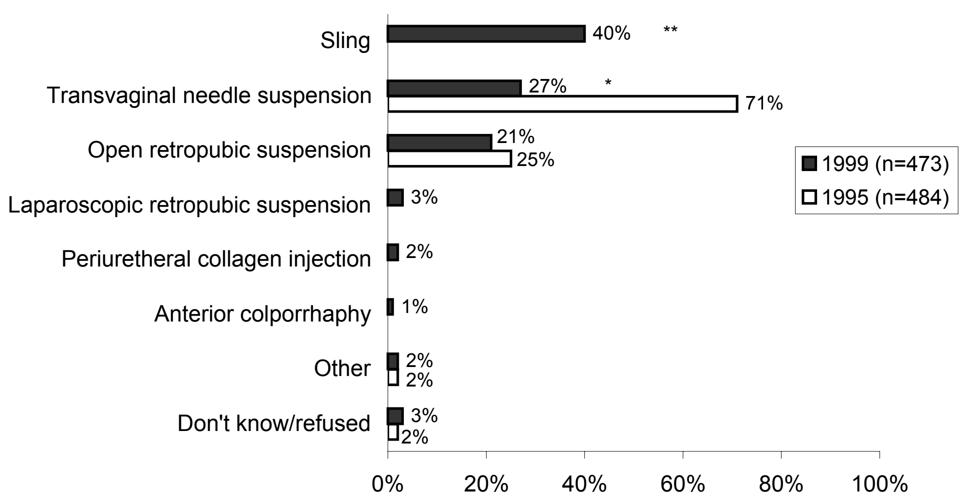

Figure 4. Most common surgical treatments in women with stress urinary incontinence associated with hypermobility, as indicated by practitioners treating females with urinary incontinence.

SOURCE: Adapted from O'Leary MP, Gee WF, Holtgrewe HL, Blute ML, Cooper TP, Miles BJ, Nellans RE, Thomas R, Painter MR, Meyer JJ, Naslund MJ, Gormley EA, Blizzard R, Fenninger RB, 1999 American Urological Association Gallup Survey: changes in physician practice patterns, treatment of incontinence and bladder cancer, and impact of managed care, Journal of Urology, 164, 1311–1316, Copyright 2000, with permission from Lippincott Williams & Wilkins.

Table 7. Relationship between disposable pad use and contacting an MD among subjects reporting urinary incontinence

	Contacting MD	
Factor	**Bivariate Odds Ratio (95% CI)**	**Multivariate Odds Ratio (95% CI)**
Disposable Pad Usage		
Non-user	1.0	1.0
User	2.81 (2.05–3.85)	3.02 (1.87–4.87)
Gender		
Female	1.0	1.0
Male	1.73 (1.28–2.36)	2.51 (1.58–4.01)
Age group		
70–79	1.0	1.0
80–89	1.12 (0.84–3.28)	1.12 (0.71–1.78)
90+	1.50 (1.00–2.24)	0.83 (0.46–1.51)
Severity of urinary incontinence		
Mild-Mod	1.0	
Severe	2.77 (2.00–3.86)	NS
How often have difficulty holding		
Less than 1/wk	1.0	
More than 1/wk	1.60 (1.42–1.81)	NS
Ever leak/lose urine with cough/laugh		
No	1.0	
Yes	1.05 (0.76–1.44)	NS
How often lose urine completely		
Never	1.0	1.0
Sometimes	1.99 (1.42–2.80)	1.90 (1.18–3.07)
Often	3.53 (2.01–6.19)	2.45 (1.00–6.00)
Mobility ADL		
No impairment	1.0	
Impairment	3.48 (2.28–5.29)	NS
Instrumental ADL		
Not impaired	1.0	1.0
Impairment	3.07 (2.08–4.54)	3.22 (1.83–5.68)
Basic ADL		
Not impaired	1.0	1.0
Impairment	1.48 (1.00–2.18)	0.38 (0.19–0.78)
Bowel incontinence		
None	1.0	
Weekly	2.77 (2.00–3.86)	NS

NS, not significant; ADL, activity of daily living.

95% confidence intervals for age and gender may include 1.0 for odds ratio. In the case of bivariate analysis, the criterion was to include variables significant at $\alpha = 0.10$.

For multivariate analysis, age and gender variables were forced into all final models because they were the stratification variables of the sample.

SOURCE: Reprinted from Johnson TM, Kincade JE, Bernard SL, Busby-Whitehead J, DeFriese GH, Self-care practices used by older men and women to manage urinary incontinence: Results from the national follow-up survey on self-care and aging, Journal of the American Geriatrics Society, 48, 894–902, Copyright 2000, with permission from the American Geriatrics Society.

Table 8. National estimates of self-care practice for those with urinary incontinence, by presence of fecal incontinence, severity of urinary incontinence, and gender

	All UI (95% CI)	UI without Fecal Incontinence[a] (95% CI)	UI with Fecal Incontinence (95% CI)	Mild or Moderate UI (95% CI)	Severe UI (95% CI)	Women with UI (95% CI)	Men with UI (95% CI)
In the last 12 months have you used:							
Disposable pads	36.8% (31.0–42.7)	33.6% (28.2–38.9)	45.2% (19.6–70.9)	27.7% (22.4–32.9)	60.1% (45.9–74.3)	44.5% (36.9–52.1)	15.1% (8.1–22.1)
Laundry service	2.3% (0.8–3.8)	2.5% (0.7–4.1)	1.7% (0.0–4.4)	1.7% (0.4–3.1)	3.9% (0.0–8.5)	1.6% (0.4–2.8)	4.2% (0.0–8.8)
Plastic sheets	11.2% (7.3–15.1)	9.5% (6.1–12.8)	39.6% (19.3–59.9)	7.1% (3.0–11.2)	20.6% (10.4–30.8)	11.3% (7.1–15.4)	11.0% (5.0–17.0)
Changed day-to-day routine activities:							
Limited trips	27.6% (19.6–35.5)	21.4% (16.7–26.0)	56.2% (37.5–74.9)	15.2% (10.6–19.9)	55.8% (40.4–71.2)	25.6% (17.0–34.2)	33.0% (22.4–43.7)
Limited uids	36.6% (30.3–43.0)	32.6% (27.9–37.2)	57.6% (40.3–74.9)	29.3% (24.2–34.4)	55.3% (39.6–71.0)	39.4% (31.7–47.0)	28.5% (19.5–37.6)
Bladder exercise	11.7% (7.8–15.5)	12.5% (8.7–16.3)	8.1% (0.0–20.0)	10.4% (7.0–13.9)	15.9% (6.1–25.8)	14.2% (9.7–18.9)	4.3% (1.0–7.7)
Contacted an MD	39.8% (32.2–47.4)	34.5% (29.0–40.2)	62.9% (43.6–82.2)	31.2% (25.3–37.0)	59.2% (44.8–73.6)	37.1% (28.9–45.6)	47.4% (35.8–59.0)
Has someone helped you manage by:							
Changing disposable pads	15.3% (8.3–22.3)	11.3% (5.0–17.7)	60.1% (26.2–93.9)	12.9% (5.0–20.8)	16.4% (3.1–29.7)	11.4% (4.8–18.0)	47.6% (20.8–74.3)
Any assistance[b]	23.2% (18.4–28.0)	21.2% (17.1–25.4)	63.8% (43.6–84.2)	18.8% (13.7–24.0)	34.3% (20.6–47.9)	21.1% (15.6–26.7)	31.7% (22.7–40.6)

[a] Excludes all subjects reporting fecal incontinece. All other categories may include those with dual incontinence (maximum of 8% of total sample).

[b] Any assistance includes receiving diet and exercise advice, help with changing bedding, help with doing laundry, assistance in using the bathroom, help with a bedpan or urinal.

SOURCE: Reprinted from Johnson TM, Kincade JE, Bernard SL, Busby-Whitehead J, DeFriese GH, Self-care practices used by older men and women to manage urinary incontinence: Results from the national follow-up survey on self-care and aging, Journal of the American Geriatrics Society, 48, 894–902, Copyright 2000, with permission from the American Geriatrics Society.

Table 9. Age-specific incidence[a] (annual procedure rate) of surgically managed prolapse and incontinence per 1000 woman-years

Age Group (y)	Population of Women at Risk	All Cases (n = 384)	POP Only (n = 152)	UI Only (n = 138)	POP + UI (n = 82)
20–29	23,770	0.08	0.04	0.04	
30–39	30,358	0.96	0.30	0.43	0.23
40–49	35,828	2.68	0.87	1.23	0.59
50–59	24,242	3.30	1.24	1.24	0.83
60–69	16,231	5.24	2.28	1.60	1.36
70–79	12,236	6.62	3.43	1.72	1.47
≥ 80	6,889	1.60	0.73	0.44	0.44
Total	149,554	2.63			

POP, pelvic organ prolapse; UI, urinary incontinence.

[a]Includes primary and repeat procedures.

SOURCE: Reprinted with permission from the American College of Obstetricians and Gynecologists (Obstetrics and Gynecology, 1997, 89, 501–506).

include pharmacologic treatment, physiotherapy, biofeedback, bladder retraining, and electrical stimulation. For women with intractable, severe urge incontinence, direct neuromodulation of the sacral spinal cord is an increasingly popular option. Surgical therapy designed to increase bladder capacity and decrease contractility is rarely used.

In contrast, surgery is a mainstay of therapy for stress urinary incontinence. Surgeries performed frequently for stress incontinence in the past —anterior colporrhaphies and needle suspension procedures — have more recently been supplanted by retropubic urethropexies, pubovaginal slings (using various types of sling materials), and collagen injections. Based on available evidence that the long-term (3 to 5 years) success rate of anterior colporrhaphy and needle suspension procedures is significantly lower than that of the other two procedures, the Agency for Healthcare Research and Quality (AHRQ), (13) and the American Urological Association (14) have both taken the position that retropubic urethropexies and pubovaginal slings are the procedures of choice for stress incontinence. This trend is seen clearly in a study describing the trends in surgical management by American urologists between 1995 and 1999 (15) (Figure 4).

Nonsurgical therapies are also prominent in the treatment of women with stress urinary incontinence. The primary modality used is pelvic muscle rehabilitation ("Kegel exercises"). Vaginal and urethral devices, bladder training, and biofeedback are also frequently used. In the near future, new pharmacologic agents will be available as well.

While nonsurgical therapies for urge and stress urinary incontinence render only a minority of women completely dry, more than half of the women who participate in trials that assess such therapies report at least a 50% improvement in incontinence episodes. There is Level 1 evidence to support the use of pelvic muscle rehabilitation, bladder training, and anticholinergic therapy in women with some types of urinary incontinence. However, the literature on large, well-designed trials that are generalizable to the population seeking care is limited. Data are lacking on the long-term follow-up of nonsurgical treatment.

TRENDS IN HEALTH CARE RESOURCE UTILIZATION

Inpatient Care

Surgical Treatment

Surgical treatment for urinary incontinence can be more easily tracked in existing databases than can non-surgical management. Surgical therapy accounts for a considerable proportion of the cost related to incontinence. Although only a small fraction of all women with urinary incontinence seek surgical intervention, the number of women treated with surgery is substantial. Using a large managed-care database, Olsen and colleagues (1997) reported an 11.1% lifetime risk of undergoing a single operation for urinary incontinence or pelvic organ prolapse by age 80 (Table 9) (16). Using data from the 1998 National Hospital Discharge Survey and the 1998 National Census, Waetjen and colleagues (2003) calculated that approximately 135,000 women in the United States had inpatient surgery for stress urinary incontinence in 1998 (17).

Data from the Healthcare Cost and Utilization Project (HCUP) indicate that the annual rate of hospitalizations for a primary diagnosis of urinary incontinence remained stable at 51 to 54 per 100,000 between 1994 and 1998, then dropped to 44 per 100,000 in 2000 (Table 10). It is unclear whether this drop reflects an actual trend, potentially attributable to newer ambulatory surgical techniques. The annual rate of hospitalizations was higher for women 45 to 84

Table 10. Inpatient hospital stays[a] by adult females with urinary incontinence listed as primary diagnosis, count, rate[b] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[c,d]	49,338	51 (48–54)	54,527	54 (51–58)	53,226	52 (48–56)	46,470	44 (41–47)
Age								
18–24	211	1.7 (1.1–2.3)	*	*	*	*	*	*
25–34	2,312	11 (10–13)	2,112	10 (8.9–12)	2,176	11 (10–12)	1,770	9.2 (8.0–10)
35–44	8,828	43 (39–47)	9,442	43 (40–47)	9,104	41 (37–44)	8,480	37 (34–41)
45–54	12,880	88 (81–94)	15,481	95 (89–102)	14,589	84 (77–90)	12,365	66 (61–71)
55–64	10,187	96 (88–104)	10,952	100 (92–107)	11,975	103 (95–112)	10,213	83 (76–90)
65–74	10,665	108 (99–117)	11,328	113 (104–121)	10,419	105 (97–114)	8,735	90 (81– 98)
75–84	3,908	67 (60–73)	4,585	72 (64–79)	4,322	64 (58–70)	4,360	63 (56–71)
85+	347	18 (14–23)	518	27 (19–34)	486	25 (20–31)	444	21 (16–26)
Race/ethnicity								
White	34,245	47 (44–50)	37,576	50 (47–53)	35,716	47 (44–51)	30,434	40 (37–43)
Black	1,266	11 (8.4–14)	1,426	12 (9–14)	1,483	12 (9.4–14)	1,119	8.7 (7.3–10)
Asian/Pacific Islander	260	9.5 (6.6–12)	220	6.5 (4.4–8.5)	307	8.1 (5.5–11)	276	6.8 (4.7–9.0)
Hispanic	1,965	24 (20–28)	2,510	28 (22–34)	2,262	23 (19–27)	2,869	27 (23–31)
Region								
Midwest	12,123	53 (46–59)	11,916	51 (45–57)	11,999	50 (44–57)	10,420	44 (37–50)
Northeast	6,809	34 (29–38)	8,839	44 (38–50)	8,380	41 (34–49)	8,051	39 (32–46)
South	18,024	55 (49–61)	22,237	62 (56–69)	21,300	59 (52–65)	17,741	48 (43–53)
West	12,381	61 (53–69)	11,535	55 (47–62)	11,547	53 (45–60)	10,258	44 (37–51)
MSA								
Rural	8,272	34 (29–40)	9,356	41 (36–47)	9,961	43 (37–50)	7,307	32 (27–37)
Urban	40,810	57 (53–61)	44,881	58 (54–62)	42,906	54 (50–58)	39,095	48 (44–52)
Discharge Status								
Routine	46,483	48 (45–51)	51,370	51 (48–55)	50,372	49 (46–53)	44,518	42 (39–46)
Short-term	*	*	*	*	*	*	*	*
Skilled nursing facility	255	0.3 (0.2–0.4)	294	0.3 (0.2–0.4)	…	…	…	…
Intermediate care	*	*	*	*	…	…	…	…
Other facility	*	*	*	*	579	0.6 (0.4–0.7)	347	0.3 (0.2–0.4)
Home health care	2,202	2.3 (1.9–2.6)	2,571	2.6 (2.2–3.0)	2,184	2.1 (1.8–2.5)	1,518	1.4 (1.2–1.7)
Against medical advice	*	*	*	*	*	*	*	*
Died	*	*	*	*	*	*	*	*

… data not available.

*Figure does not meet standard of reliability or precision.

MSA, metropolitan statistical area.

[a]Excludes hospitalizations associated with a primary gynecological diagnosis (e.g., pelvic organ prolapse).

[b]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US female adult civilian non-institutionalized population.

[c]Counts may not add to totals because of rounding.

[d]Persons of other races, missing or unavailable race and ethnicity, and missing MSA are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 11. Inpatient stays by female Medicare beneficiaries with urinary incontinence listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	16,160	82 (80–83)	19,840	98 (97–100)	17,700	93 (92–94)
Total < 65	1,240	52 (49–55)	2,520	94 (90–97)	2,520	91 (87–94)
Total 65+	14,920	86 (84–87)	17,320	99 (98–100)	15,180	93 (92–95)
Age						
65–74	9,780	106 (104–109)	11,300	126 (123–128)	9,320	118 (116–120)
75–84	4,380	74 (72–76)	5,220	87 (85–90)	5,100	87 (85–90)
85–94	760	37 (34–39)	740	33 (31–36)	700	31 (29–34)
95+	0	0.0	60	21 (16–26)	60	19 (15–24)
Race/ethnicity						
White	14,820	88 (87–90)	18,520	107 (105–108)	16,540	102 (101–104)
Black	460	27 (25–30)	640	35 (32–38)	600	34 (31–37)
Asian	…	…	20	21 (12–31)	120	68 (56–80)
Hispanic	…	…	160	80 (67–92)	260	71 (62–79)
N. American Native	…	…	20	124 (68–179)	40	153 (107–199)
Region						
Midwest	4,940	98 (96–101)	5,200	101 (98–104)	4,780	97 (94–100)
Northeast	2,020	45 (43–47)	2,640	59 (57–61)	2,340	60 (57–62)
South	5,840	84 (81–86)	7,880	109 (107–111)	7,540	107 (105–110)
West	3,300	116 (112–120)	3,880	136 (131–140)	2,980	110 (106–114)

… data not available.
[a]Unweighted counts multiplied by 20 to arrive at values in the table.
[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.
[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.
NOTE: Counts less than 600 should be interpreted with caution.
SOURCE: Centers for Medicare and Medicaid Services, MedPAR and 5% Carrier File, 1992, 1995, 1998.

years of age, peaking in the 65 to 74 age group at 108 per 100,000 (Figure 5). Hospitalizations were most common in women residing in the South and West and least common in women living in the Northeast. Women living in urban areas had a higher rate of hospitalizations than did those in rural areas. Most of the hospitalizations for urinary incontinence were probably for surgical treatments.

The number of hospitalizations in Table 10 represents roughly one-half of the number of incontinence procedures reported by Waetjen, et. al. This is most likely due to the fact that Waetjen included inpatient stays in which the primary diagnosis was gynecological (such as pelvis organ prolapse) and in whom an incontinence procedure was done in concert with other procedures to repair the primary gynecological problem. Future analyses will address this issue.

Similar trends for older women were found in Medicare (Table 11) and HCUP (Table 10). The rate of inpatient stays for urinary incontinence for older women enrolled in Medicare (those 65+) ranged from 86 to 99 per 100,000 annually, with women between 65 and 74 more likely than the other age groups to be hospitalized. Geographic and racial/ethnic distributions were similar to those found in HCUP and significant differences among racial/ethnic groups were also noted.

Among women with commercial health insurance, the rate of inpatient hospitalizations for incontinence procedures (primary or any procedure) ranged from 123 per 100,000 women in 1994 to 114 per 100,000 in 2000 (Table 12). Most of these procedures were performed in conjunction with other surgical procedures and are thus listed as any procedure. Hospitalizations for incontinence surgeries as primary

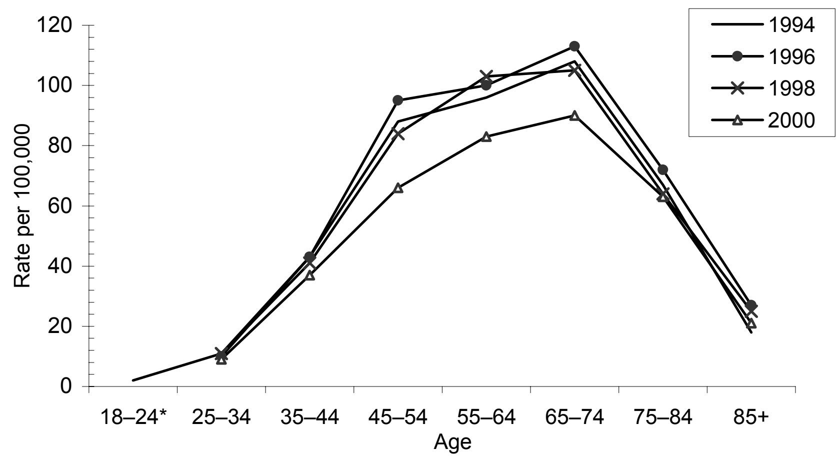

Figure 5. National inpatient hospital stays by females with urinary incontinence listed as primary diagnosis, by age and year.

SOURCE: Healthcare Cost and Utilization Project, 1994, 1996, 1998, 2000.

Table 12. Inpatient procedures for females with urinary incontinence having commercial health insurance, count[a], rate[b]

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
	As Primary Procedure							
Total	230	59	307	53	355	40	334	33
Age								
18–24	0	*	2	*	0	*	0	*
25–34	18	*	16	*	14	*	25	*
35–44	62	54	66	39	100	39	77	27
45–54	97	120	134	106	136	66	116	47
55–64	42	112	79	138	94	95	96	79
65–74	9	*	9	*	10	*	18	*
75–84	1	*	1	*	1	*	2	*
85+	1	*	0	*	0	*	0	*
	As Any Procedure							
Total	483	123	749	130	1,034	115	1,167	114
Age								
18–24	0	*	3	*	2	*	0	*
25–34	38	38	48	34	72	35	74	33
35–44	170	147	253	151	319	125	348	124
45–54	187	232	301	238	407	197	443	180
55–64	72	191	123	214	203	205	249	204
65–74	14	*	18	*	26	*	49	264
75–84	1	*	3	*	5	*	3	*
85+	1	*	0	*	0	*	1	*

*Figure does not meet standard for reliability or precision.
[a]Counts less than 30 should be interpreted with caution.
[b]Rate per 100,000 based on member months of enrollment in calendar years for females in the same demographic stratum.
SOURCE: Center for Health Care Policy and Evaluation, 1994, 1996, 1998, 2000.

Table 13. Trends in mean inpatient length of stay (days) for adult females hospitalized with urinary incontinence listed as primary diagnosis

	Length of Stay			
	1994	1996	1998	2000
All	3.1	2.6	2.4	2.1
Age				
18–24	2.7	*	*	*
25–34	2.9	2.5	2.2	2.1
35–44	3.0	2.4	2.3	2.1
45–54	3.1	2.5	2.3	2.1
55–64	3.0	2.5	2.3	2.1
65–74	3.3	2.7	2.5	2.1
75–84	3.7	2.9	2.7	2.7
85+	3.9	3.5	2.7	2.9
Race/ethnicity				
White	3.2	2.6	2.3	2.1
Black	3.2	2.7	2.5	2.3
Asian/Pacific Islander	2.7	2.7	2.1	2.2
Hispanic	3.1	2.6	2.5	2.4
Other	3.3	2.5	2.5	2.1
Region				
Midwest	3.1	2.6	2.4	2.1
Northeast	3.7	2.8	2.3	2.0
South	3.2	2.6	2.4	2.2
West	2.7	2.3	2.4	2.2
MSA				
Rural	3.4	2.6	2.3	2.4
Urban	3.1	2.5	2.4	2.1
Discharge status				
Routine	3.1	2.5	2.3	2.1
Short-term	*	*	*	*
Skilled nursing facility	5.0	4.5	…	…
Immediate care	*	*	…	…
Other facility	*	*	5.4	6.6
Home health care	3.9	3.3	3.0	2.8
Against medical advice	*	*	*	*
Died	*	*	*	*

….data not available.

*Figure does not meet standard for reliability or precision.

MSA, metropolitan statistical area.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

procedures ranged from 59 per 100,000 women in 1994 to 33 per 100,000 in 2000. These data suggest a trend toward decreasing numbers of inpatient surgeries for incontinence; if this trend is substantiated in future years, it may reflect either the increased emphasis on nonsurgical treatment for urinary incontinence that followed the dissemination of the AHRQ guidelines or increased utilization of ambulatory incontinence surgeries.

Consistent with decreasing lengths of inpatient stay for other conditions during the past decade, length of stay for women with urinary incontinence as their primary discharge diagnosis decreased steadily, from 3.1 days in 1994 to 2.1 days in 2000 (Table 13). Women in the oldest age groups were hospitalized longer than were those younger than 75. For example, in 2000, length of stay remained stable at 2.1 days in women between 18 and 74 years of age, and varied from 2.7 to 2.9 days in women older than 75. Length of stay was similar across racial/ethnic groups and regions of the country.

Surgical Procedures

In 1998, the most commonly performed surgical procedures for female urinary incontinence were collagen injections, pubovaginal slings, and anterior urethropexies (Table 14). Because anterior colporrhaphies may be performed for either urinary incontinence (a condition for which they are not a currently recommended treatment) or anterior pelvic organ prolapse (cystocele), rates for this procedure are not described. A striking decrease was seen in both Raz and Peyrera needle suspension procedures between 1992 and 1998: Raz procedures decreased from 4,364 per 100,000 women in 1992 to 1,564 per 100,000 in 1998, while Peyrera procedures were done too infrequently by 1998 to be detected in the data. Concomitantly, pubovaginal slings increased from 621 per 100,000 women in 1995 to 2,776 per 100,000 in 1998. The number of women undergoing anterior urethropexy decreased, though less dramatically, from 3,941 per 100,000 women in 1992 to 2,364 per 100,000 in 1998.

Despite an increase in cesarean deliveries and complex laparoscopic pelvic surgeries (two major sources of urogenital fistulae) during the time frame studied, national hospitalization data showed no increase in hospitalizations for urinary incontinence

Table 14. Surgical procedures used to treat urinary incontinence among female adult Medicare beneficiaries, count[a], rate[b]

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total	18,820	10,475	32,880	13,096	36,400	11,033
Anterior urethropexy, (e.g., MMK)	7,080	3,941	8,180	3,258	7,800	2,364
Ambulatory surgery center	160	89	360	143	580	176
Inpatient	6,720	3,740	7,740	3,082	7,200	2,182
Hospital outpatient	60	33	0	0.0	0	0.0
Physician office	140	78	80	32	20	6
Raz-type suspension	7,840	4,364	10,540	4,198	5,160	1,564
Ambulatory surgery center	360	200	600	239	720	218
Inpatient	7,400	4,119	9,780	3,895	4,400	1,333
Hospital outpatient	20	11	0	0.0	0	0.0
Physician office	60	33	160	64	40	12
Laparoscopic repair	0	0.0	0	0.0	0	0.0
Ambulatory surgery center	0	0.0	0	0.0	0	0.0
Inpatient	0	0.0	0	0.0	0	0.0
Hospital outpatient	0	0.0	0	0.0	0	0.0
Physician office	0	0.0	0	0.0	0	0.0
Collagen injection	0	0.0	9,300	3,704	12,040	3,649
Ambulatory surgery center	0	0.0	7,900	3,146	9,120	2,764
Inpatient	0	0.0	220	88	140	42
Hospital outpatient	0	0.0	300	119	360	109
Physician office	0	0.0	880	350	2,420	733
Hysterectomy with colpo-urethropexy	1,920	1,069	2,220	884	1,480	449
Ambulatory surgery center	0	0.0	0	0.0	0	0.0
Inpatient	1,920	1,069	2,220	884	1,480	449
Hospital outpatient	0	0.0	0	0.0	0	0.0
Physician office	0	0.0	0	0.0	0	0.0
Pubovaginal sling	640	356	1,560	621	9,160	2,776
Ambulatory surgery center	80	45	140	56	1,240	376
Inpatient	540	301	1,400	558	7,800	2,364
Hospital outpatient	0	0.0	0	0.0	0	0.0
Physician office	20	11	20	8	120	36
Peyrera procedure	1,280	712	820	327	540	164
Ambulatory surgery center	0	0.0	20	8	60	18
Inpatient	1,280	712	800	319	480	145
Hospital outpatient	0	0.0	0	0.0	0	0.0
Physician office	0	0.0	0	0.0	0	0.0
Kelly plication	60	33	260	104	220	67
Ambulatory surgery center	0	0.0	0	0.0	0	0.0
Inpatient	60	33	260	104	220	67
Hospital outpatient	0	0.0	0	0.0	0	0.0
Physician office	0	0.0	0	0.0	0	0.0

[a]Unweighted counts multiplied by 20 to arrive at values in the table.
[b]Rate per 100,000 female adult Medicare beneficiaries with a diagnosis of urinary incontinence.
NOTE: Confidence intervals could not be calculated because of multiple data sources.
SOURCE: Centers for Medicare and Medicaid Services, 5% File, 1992, 1995, 1998.

Table 15. Inpatient hospital stays for adult females with urinary incontinence caused by urinary fistulae listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	6,689	6.9 (6.4–7.5)	7,589	7.6 (7.0–8.1)	6,813	6.7 (6.2–7.2)	7,031	6.7 (6.2–7.2)
Age								
18–24	294	2.4 (1.6–3.1)	217	1.7 (1.2–2.3)	186	1.5 (0.9–2.0)	*	*
25–34	1,133	5.5 (4.7–6.4)	1,037	5.1 (4.2–5.9)	787	4.0 (3.2–4.7)	791	4.1 (3.4–4.8)
35–44	1,054	5.2 (4.1–6.2)	1,278	5.9 (4.9–6.8)	1,186	5.3 (4.5–6.1)	1,268	5.6 (4.9–6.3)
45–54	732	5.0 (4.0–6.0)	894	5.5 (4.5–6.6)	922	5.3 (4.4–6.2)	1,216	6.5 (5.5–7.5)
55–64	828	7.8 (6.5–9.1)	948	8.6 (7.2–10)	852	7.4 (6.1–8.6)	895	7.3 (6.1–8.5)
65–74	1,257	13 (11–14)	1,424	14 (12–16)	1,204	12 (10–14)	1,133	12 (10–13)
75–84	1,021	17 (15–20)	1,366	21 (18–24)	1,194	18 (15–20)	1,131	16 (14–19)
85+	370	20 (15–24)	425	22 (17–27)	483	25 (19–31)	452	22 (17–26)
Race/ethnicity								
White	4,312	5.9 (5.4–6.4)	4,932	6.6 (6.0–7.1)	4,048	5.4 (4.8–5.9)	4,071	5.3 (4.8–5.8)
Black	482	4.2 (3.2–5.1)	675	5.6 (4.3–6.9)	533	4.3 (3.3–5.3)	565	4.4 (3.5–5.3)
Asian/Pacific Islander	*	*	*	*	*	*	*	*
Hispanic	253	3.1 (2.1–4.0)	331	3.7 (2.3–5.0)	331	3.4 (2.2–4.6)	361	3.4 (2.5–4.3)
Region								
Midwest	1,861	8.1 (6.9–9.3)	2,038	8.7 (7.2–10)	1,701	7.2 (5.8–8.6)	1,676	7.0 (6.1–8.0)
Northeast	1,380	6.8 (5.8–7.8)	1,500	7.5 (6.4–8.6)	1,177	5.8 (4.9–6.7)	1,488	7.2 (6.1–8.3)
South	2,246	6.8 (6.0–7.7)	2,842	8.0 (7.0–8.9)	2,768	7.6 (6.8–8.4)	2,617	7.0 (6.2–7.9)
West	1,202	5.9 (4.8–7.0)	1,208	5.7 (4.8–6.7)	1,167	5.3 (4.4–6.2)	1,250	5.4 (4.6–6.2)

*Figure does not meet standard of reliability or precision.

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US female adult civilian non-institutionalized population.

[b]Persons of other races and missing or unavailable race and ethnicity are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 16. Total national physician office visits by adult females with urinary incontinence, count, rate[a] (95% CI)

	Primary Diagnosis		Any Diagnosis	
Year	Count	Rate	Count	Rate
1992	451,704	468 (252–683)	815,832	845 (480–1,210)
1994	549,827	571 (388–753)	1,048,115	1,088 (791–1,384)
1996	937,275	934 (600–1,267)	1,402,830	1,398 (992–1,803)
1998	1,332,053	1,302 (899–1,705)	2,004,851	1,960 (1,424–2,495)
2000	1,159,877	1,107 (722–1,490)	1,932,768	1,845 (1,313–2,375)

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US female adult civilian non-institutionalized population.

SOURCE: National Ambulatory Medical Care Survey, 1992, 1994, 1996, 1998, 2000.

due to fistulae (Table 15). This rate remained steady at 6.7 to 7.6 per 100,000 women between 1994 and 2000. However, although the rate is low, 7,000 hospitalizations for incontinence due to fistulae are estimated to occur each year nationwide, suggesting that further attention should be paid to prevention.

Outpatient Care

Outpatient and Emergency Room Visits

While the rate of hospitalizations for incontinence surgeries decreased, outpatient visits for urinary incontinence more than doubled between 1992 and 2000 for women both with and without Medicare. Physician visits with urinary incontinence listed as any reason for the visit climbed from 845 per 100,000 women in 1992 to 1,845 per 100,000 in 2000, according to National Ambulatory Medical Care Survey (NAMCS) data (Table 16). Similarly, visits for which incontinence was the primary reason rose from 468 per 100,000 in 1992 to 1,107 per 100,000 in 2000. Office visits for incontinence by women ages 65 and over enrolled in Medicare rose from 1,371 per 100,000 in 1992 to 2,937 per 100,000 in 1998 (Table 17). While the reason for this increase is unknown, at least two potentially related events occurred. AHRQ published its first clinical practice guidelines on urinary incontinence in 1992; these were widely promulgated and may have led to more visits. Second, several new anticholinergic medications for urge incontinence were approved during the late 1990s. The releases of the first new medications for incontinence in several decades were accompanied by major direct-to-consumer advertising campaigns. Thus visits may also have increased because more women became aware that treatment existed. However, this illustrates the difficulty in comparing rates across data sets. Table 3 shows that 38% of elderly women report having UI. Table 8 suggests that 40% of women with UI report seeing a physician. However, in 1998, only 3% of Medicare female beneficiaries had a physician visit for UI. Thus it would appear that people over-report seeing a doctor, UI is under-reported on billing data, or some combination of the two.

Not surprisingly, given the nonemergent nature of urinary incontinence, few women seek emergency room care for it. Only 11 per 100,000 women ages 65 and older enrolled in Medicare were evaluated in emergency room settings for this disorder in 1998.

Ambulatory Surgery

Ambulatory surgical center visits for female urinary incontinence also increased, particularly in women younger than 65. Among those with commercial health insurance, the rate of such visits increased from 15 per 100,000 in 1994 to 34 per 100,000 in 2000 (Table 18). A steady increase was seen in middle-aged women; the rate of ambulatory surgical visits by women 55 to 64 years of age increased from 61 per 100,000 in 1996 to 69 per 100,000 in 1998 and 77 per 100,000 in 2000. Older women also had more ambulatory surgical visits; the rate of such visits by women 65 and older enrolled in Medicare in 1998 was 142 per 100,000 (Table 19). The increased rate of ambulatory surgery is probably due to the

Table 17. Physician office visits by female Medicare beneficiaries with urinary incontinence listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	257,740	1,301 (1,296–1,306)	393,680	1,951 (1,945–1,957)	522,240	2,741 (2,733–2,748)
Total < 65	18,780	786 (775–797)	32,280	1,201 (1,188–1,214)	44,200	1,591 (1,577–1,606)
Total 65+	238,960	1,371 (1,366–1,377)	361,400	2,066 (2,059–2,073)	478,040	2,937 (2,928–2,945)
Age						
65–74	118,140	1,285 (1,278–1,293)	177,840	1,976 (1,967–1,985)	214,960	2,720 (2,709–2,732)
75–84	93,340	1,583 (1,572–1,593)	139,240	2,326 (2,314–2,338)	200,720	3,436 (3,421–3,451)
85–94	26,640	1,283 (1,268–1,299)	42,260	1,901 (1,883–1,918)	59,820	2,689 (2,668–2,710)
95+	840	326 (304–348)	2,060	728 (696–759)	2,540	819 (787–850)
Race/ethnicity						
White	236,320	1,408 (1,402–1,414)	363,440	2,094 (2,088–2,101)	480,900	2,972 (2,964–2,981)
Black	11,020	654 (641–666)	16,520	898 (884–912)	23,040	1,306 (1,289–1,323)
Asian	…	…	1,260	1,335 (1,262–1,408)	2,660	1,503 (1,447–1,560)
Hispanic	…	…	3,120	1,553 (1,499–1,607)	7,160	1,948 (1,903–1,993)
N. American Native	…	…	320	1,980 (1,764–2,197)	300	1,150 (1,020–1,281)
Region						
Midwest	66,100	1,317 (1,307–1,327)	99,840	1,936 (1,924–1,948)	134,480	2,726 (2,712–2,740)
Northeast	50,440	1,113 (1,103–1,123)	74,920	1,667 (1,655–1,679)	89,600	2,287 (2,272–2,302)
South	94,740	1,356 (1,347–1,364)	149,500	2,069 (2,059–2,080)	206,340	2,940 (2,928–2,953)
West	45,000	1,578 (1,564–1,593)	66,900	2,336 (2,319–2,354)	88,700	3,264 (3,243–3,285)

… data not available.

[a]Unweighted counts multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

Table 18. Visits to ambulatory surgery centers for urinary incontinence procedures listed as any procedure by adult females having commercial health insurance, count[a], rate[b] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total	60	15	185	32	278	31	351	34
Age								
18–24	0	*	1	*	1	*	0	*
25–34	3	*	7	*	15	*	19	*
35–44	17	*	45	27	71	28	91	32
45–54	25	*	80	63	103	50	128	52
55–64	11	*	35	61	68	69	94	77
65–74	3	*	11	*	17	*	14	*
75–84	0	*	2	*	3	*	4	*
85+	1	*	4	*	0	*	1	*

*Figure does not meet standard for reliability or precision.

[a]Counts less than 30 should be interpreted with caution.

[b]Rate per 100,000 based on member months of enrollment in calendar year for adult females in the same demographic stratum.

SOURCE: Center for Health Care Policy and Evaluation, 1994, 1996, 1998, 2000.

Table 19. Visits to ambulatory surgery centers by female Medicare beneficiaries with urinary incontinence listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	11,580	58 (57–60)	24,680	122 (121–124)	25,820	135 (134–137)
Total < 65	1,140	48 (45–50)	2,260	84 (81–88)	2,740	99 (95–102)
Total 65+	10,440	60 (59–61)	22,420	128 (126–130)	23,080	142 (140–144)
Age						
65–74	5,900	64 (63–66)	11,880	132 (130–134)	10,780	136 (134–139)
75–84	3,800	64 (62–66)	8,420	141 (138–144)	9,680	166 (162–169)
85–94	720	35 (32–37)	2,080	94 (90–98)	2,500	112 (108–117)
95+	20	7.8 (4.3–11)	40	14 (9.9–18)	120	39 (32–45)
Race/ethnicity						
White	10,460	62 (61–64)	23,120	133 (132–135)	24,480	151 (149–153)
Black	600	36 (33–38)	900	49 (46–52)	860	49 (46–52)
Asian	…	…	60	64 (48–79)	80	45 (35–55)
Hispanic	…	…	60	30 (22–37)	240	65 (57–73)
N. American Native	…	…	40	248 (173–322)	…	…
Region						
Midwest	4,100	82 (79–84)	8,620	167 (164–171)	8,360	169 (166–173)
Northeast	2,400	53 (51–55)	4,500	100 (97–103)	4,820	123 (120–126)
South	4,120	59 (57–61)	9,580	133 (130–135)	10,160	145 (142–148)
West	960	34 (32–36)	1,960	68 (65–71)	2,480	91 (88–95)

… data not available.

[a]Unweighted counts multiplied by 20 to arrive at values in the table.

[b]Rate per 100,0000 Medicare beneficiaries in the same demographic stratum.

[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

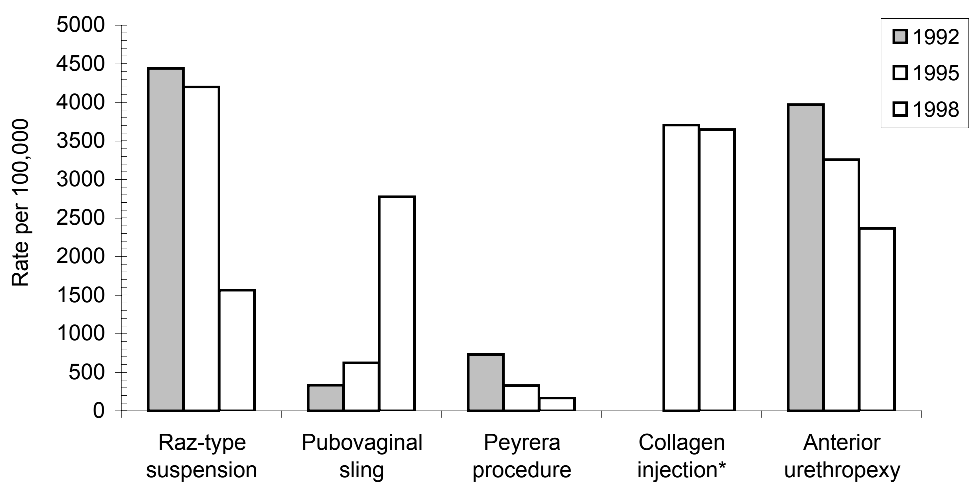

Figure 6. Rate of surgical procedures used to treat urinary incontinence among female Medicare beneficiaries. *Collagen injection introduced in 1993.

SOURCE: Centers for Medicare and Medicaid Services, 1992, 1995, 1998.

wider use of endoscopic injections such as collagen to treat urinary incontinence in women. Collagen for this purpose was not available in 1992, but by 1995 3,704 per 100,000 women enrolled in Medicare were undergoing this therapy. This rate has since plateaued (Table 14 and Figure 6).

Nursing Home Care

Incontinence is particularly a problem in the frail elderly and is exacerbated by dementia, functional limitations, and comorbid conditions. In the United States, identification of incontinence by the Minimum Data Set (developed by the US Health Care Financing Administration) within 14 days of nursing home admission is mandated (18).

According to data collected by the National Nursing Home Survey (NNHS), the rate of women in nursing homes with an admitting or current diagnosis of urinary incontinence has remained fairly stable; the most recent estimate (for 1999) is 1,366 per 100,000. The rate is very similar across age groups of nursing home residents (Table 20). Few female nursing home residents with urinary incontinence have indwelling urethral catheters or ostomies (9,495 per 100,000 in 1999) (Table 21); however, fully half require another person's assistance when using the toilet.

Urinary incontinence is regarded as an important risk factor for nursing home admission. Research has indicated that a significant proportion of those admitted to nursing homes are incontinent of urine at the time of their admission (19, 20). After adjustment for age, cohort factors, and comorbid conditions, Thom found that the relative risk of admission to a nursing home is two times greater for incontinent women (21).

The sharp divergence of the NNHS data from published studies on the prevalence of incontinence in nursing homes compels us to pay particular attention to the method of collecting information on incontinence in nursing home residents. According to NNHS data, only 1% to 2% of nursing home patients have an admitting or current diagnosis of urinary incontinence, a finding that highlights the limitations of using administrative data to study the prevalence of incontinence. When queries about bladder function are expanded to include assistance needed from nursing home staff, a high prevalence of bladder dysfunction becomes apparent. Over half of all female nursing home residents are reported to have "difficulty controlling urine," and over half need assistance in using the toilet (Table 22). Thus, when interpreting incontinence prevalence rates, great care must be taken to clarify the definition of incontinence used.

ECONOMIC IMPACT

Medical expenditures for urinary incontinence among female Medicare beneficiaries (65 years of age and older) nearly doubled between 1992 and 1998 from $128.1 million to $234.4 million, primarily due to increased aggregate costs for physician office visits and ambulatory surgery (Table 23). At the same time, inpatient costs increased only modestly between 1992

Table 20. Female nursing home residents with an admitting or current diagnosis of urinary incontinence, count, rate[a] (95% CI)

	1995		1997		1999	
	Count	Rate	Count	Rate	Count	Rate
Total	13,915	1,237 (949–1,524)	20,679	1,789 (1,435–2,143)	15,979	1,366 (1,050–1,681)
Age						
≤74	2,443	1,435 (605–2,265)	2,408	1,334 (610–2,058)	2,627	1,389 (588–2,190)
75–84	4,159	1,131 (662–1,601)	9,029	2,428 (1,679–3,176)	5,668	1,540 (972–2,107)
85+	7,313	1,245 (846–1,644)	9,242	1,531 (1,085–1,978)	7,685	1,254 (823–1,685)
Race						
White	13,397	1,340 (1,022–1,658)	17,962	1,779 (1,403–2,155)	15,075	1,509 (1,148–1,869)
Other	518	421 (0–905)	2,717	1,969 (858–3,080)	904	554 (58–1,051)

[a]Rate per 100,000 nursing home residents in the same demographic stratum.
SOURCE: National Nursing Home Survey, 1995, 1997, 1999.

Table 21. Special needs of female nursing home residents with urinary incontinence, count, rate[a] (95% CI)

	1995		1997		1999	
Category	**Count**	**Rate**	**Count**	**Rate**	**Count**	**Rate**
Has an indwelling foley catheter or ostomy						
Yes	1,435	10,316 (2,864–17,768)	2,423	11,718 (5,311–18,125)	1,517	9,495 (2,892–16,099)
No	12,479	89,684 (82,232–97,136)	18,256	88,282 (81,875–94,689)	14,462	90,505 (83,901–97,108)
Requires assistance using the toilet						
Yes	9,847	70,766 (59,831–81,702)	14,237	68,846 (59,267–78,424)	8,898	55,684 (43,783–67,586)
No	2,475	17,789 (8,437–27,141)	2,794	13,511 (6,777–20,245)	3,234	20,238 (10,842–29,634)
Question skipped for allowed reason	1,592	11,444 (3,978–18,910)	3,405	16,464 (8,416–24,513)	3,847	24,077 (13,340–34,814)
Question left blank	0	0	244	1,179 (0–3,513)	0	0
Requires assistance from equipment when using the toilet						
Yes	3,214	23,095 (12,895–33,295)	4,464	21,587 (13,465–29,709)	2,821	17,653 (9,041–26,266)
No	6,472	46,513 (34,604–58,422)	9,056	43,793 (33,744–53,842)	5,876	36,771 (25,354–48,188)
Question skipped for allowed reason	4,068	29,234 (18,298–40,169)	6,199	29,976 (20,499–39,452)	7,081	44,316 (32,414–56,217)
Question left blank	161	1,159 (0–3,472)	960	4,644 (134–9,154)	201	1,260 (0–3,771)
Requires assistance from another person when using the toilet						
Yes	9,619	69,132 (58,007–80,256)	14,000	67,698 (58,032–77,365)	8,675	54,292 (42,379–66,205)
No	227	1,635 (0–4,884)	0	0	223	1,393 (0–4,164)
Question skipped for allowed reason	4,068	29,234 (18,298–40,169)	6,199	29,976 (20,499–39,452)	7,081	44,316 (32,414–56,217)
Question left blank	0	0	481	2,326 (0–5,563)	0	0
Has difficulty controlling urine						
Yes	10,695	76,859 (66,543–87,176)	15,255	73,772 (64,947–82,597)	13,648	85,412 (77,364–93,460)
No	2,266	16,287 (7,085–25,489)	3,966	19,176 (11,322–27,031)	1,786	11,180 (3,928–18,432)
Question skipped for allowed reason	954	6,854 (895–12,812)	1,458	7,052 (1,886–12,217)	545	3,408 (0–7,333)

[a] Rate per 100,000 adult female nursing home residents with urinary incontinence in the NNHS for that year.
SOURCE: National Nursing Home Survey, 1995, 1997, 1999.

Table 22. Special needs of female nursing home residents regardless of continence status, count, rate[a] (95% CI)

	1995		1997		1999	
Category	**Count**	**Rate**	**Count**	**Rate**	**Count**	**Rate**
Has indwelling foley catheter or ostomy						
Yes	101,827	9,050 (8,281–9,819)	90,855	7,859 (7,151–8,566)	96,151	8,218 (7,484–8,951)
No	1,020,886	90,732 (89,954–91,510)	1,061,282	91,796 (91,072–92,520)	1,064,024	90,937 (90,162–91,712)
Question left blank	2,450	218 (89–347)	3,997	346 (182–510)	9,890	845 (571–1,120)
Requires assistance using the toilet						
Yes	659,035	58,572 (57,256–59,888)	652,615	56,448 (55,131–57,765)	670,006	57,262 (55,935–58,590)
No	286,946	25,503 (24,334–26,671)	280,242	24,240 (23,104–25,375)	273,104	23,341 (22,202–24,480)
Question skipped for allowed reason	173,839	15,450 (14,484–16,417)	216,408	18,718 (17,680–19,756)	218,971	18,714 (17,670–19,759)
Question left blank	5,343	475 (297–652)	6,870	594 (394–794)	7,983	682 (430–935)
Requires assistance from equipment when using the toilet						
Yes	182,812	16,248 (15,274–17,221)	180,518	15,614 (14,659–16,569)	178,305	15,239 (14,293–16,185)
No	460,230	40,903 (39,592–42,215)	433,640	37,508 (36,220–38,795)	467,351	39,942 (38,631–41,254)
Question skipped for allowed reason	460,785	40,953 (39,639–42,267)	496,649	42,958 (41,643–44,272)	492,075	42,055 (40,732–43,379)
Question left blank	21,336	1,896 (1,536–2,257)	45,327	3,921 (3,391–4,450)	32,334	2,763 (2,303–3,224)
Requires assistance from another person when using the toilet						
Yes	652,088	57,955 (56,636–59,274)	640,137	55,369 (54,048–56,689)	661,927	56,572 (55,242–57,901)
No	6,109	543 (345–741)	8,603	744 (511–977)	6,800	581 (384–779)
Question skipped for allowed reason	460,785	40,953 (39,639–42,267)	496,649	42,958 (41,643–44,272)	492,075	42,055 (40,732–43,379)
Question left blank	6,180	549 (357–741)	10,745	929 (681–1,178)	9,263	792 (527–1,056)
Has difficulty controlling urine						
Yes	633,123	56,269 (54,943–57,596)	672,699	58,185 (56,875–59,496)	685,747	58,608 (57,288–59,927)
No	424,287	37,709 (36,411–39,006)	422,839	36,574 (35,293–37,854)	422,162	36,080 (34,793–37,367)
Question skipped for allowed reason	64,822	5,761 (5,124–6,398)	57,080	4,937 (4,370–5,504	55,713	4,761 (4,201–5,322)
Question left blank	2,931	260 (114–407)	3,517	304 (154–454)	6,444	551 (323–778)

[a]Rate per 100,000 adult female nursing home residents in the NNHS for that year.

SOURCE: National Nursing Home Survey, 1995, 1997, 1999.

and 1995, then decreased slightly in 1998 (Figure 7). Table 24 illustrates that, as with Medicare, during the 1990s expenditures in the general population shifted to the outpatient setting. This change in venue probably reflects the general shift of surgical procedures to the outpatient setting, as well as the advent of new procedures, such as periurethral collagen injections, which do not require hospital admission. In addition, the increase in awareness of incontinence and the marketing of new drugs for its treatment may have increased the number of office visits.

While claims-based costs are substantial, others have projected the aggregate cost of UI to be even higher. In one estimation model that included women and men, the aggregate cost of urinary incontinence in the United States in 1995—including diagnostic testing, medical and surgical therapy, medications, routine care, hospitalization, skin irritation, related infections and falls, and other factors—was estimated to be $26.3 billion, almost one-fourth of which was borne by patients themselves as part of routine care (22) (Table 25).

Using diagnostic algorithms, disease prevalence data, reimbursement costs, and sensitivity analyses, Wilson et al. (1) estimated the annual direct cost of urinary incontinence in women to be $12.4 billion in 1995 (Table 26). The largest cost category was routine care, which accounted for 70% of all costs.

In a multivariate analysis controlling for age, gender, work status, median household income, urban vs rural residence, medical and drug plan characteristics, and comorbid conditions, the presence of urinary incontinence was associated with more than twice the annual expenditures per person per

Table 23. Expenditures for female Medicare beneficiaries age 65 and over for treatment of urinary incontinence (in millions of $), (% of total)

	Year		
	1992	1995	1998
Total	128.1	198.7	234.4
Inpatient	90.5 (70.6%)	110.9 (55.8%)	110.1 (47.0%)
Outpatient			
Physician office	25.7 (20.1%)	46.4 (23.4%)	75.9 (32.4%)
Hospital outpatient	2.2 (1.7%)	3.5 (1.8%)	5.0 (2.1%)
Ambulatory surgery	9.3 (7.2%)	36.8 (18.5%)	42.8 (18.2%)
Emergency room	0.4 (0.3%)	1.1 (0.6%)	0.6 (0.2%)

NOTE: Percentages may not add to 100% because of rounding.

SOURCE: Centers for Medicare and Medicaid Services Claims, 1992, 1995, 1998.

Table 24. Expenditures for female urinary incontinence and share of costs, by type of service (in millions of $)

	Year			
	1994	1996	1998	2000
Total[a]	324.6	426.7	485.7	452.8
Share of total				
Inpatient	295.1 (90.9%)	346.0 (81.1%)	357.5 (73.6%)	329.2 (72.7%)
Physician office	29.5 (9.1%)	80.6 (18.9%)	128.2 (26.4%)	123.6 (27.3%)
Hospital outpatient	*	*	*	*
Emergency room	*	*	*	*

*Unweighted counts too low to yield reliable estimates.

[a]Total unadjusted expenditures exclude spending on outpatient prescription drugs for the treatment of urinary incontinence. Average drug spending for incontinence-related conditions (both male and female) is estimated at $82 million to $102 million annually for the period 1996 to 1998.

NOTE: Percentages may not add to 100% because of rounding.

SOURCES: National Ambulatory and Medical Care Survey, National Hospital Ambulatory Medical Care Survey, Healthcare Cost and Utilization Project, Medical Expenditure Panel Survey, 1994, 1996, 1998, 2000.

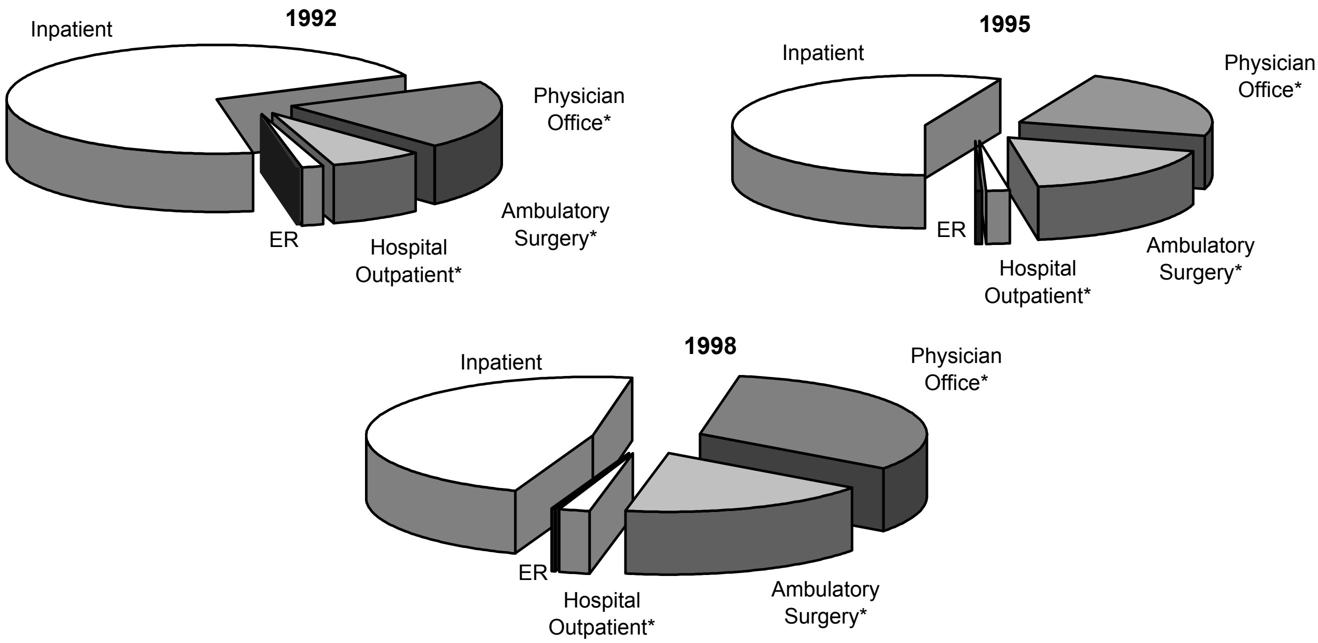

Figure 7. Expenditures for female Medicare benefiiciaries age 65 and over for the treatment of urinary incontinence (in millions of $).
***Constitute outpatient services.**

SOURCE: Centers for Medicare and Medicaid Services, 1992, 1995, 1998.

year compared to those without this condition (Table 27).

The indirect costs for urinary incontinence are estimated by measurements of work lost (Tables 28 and 29). Among all workers with urinary incontinence, 23% of women missed work, while only 8% of men did so. Average annual work absence for women totaled 28.7 hours for both inpatient (7.1 hours) and outpatient (21.6 hours) services. Although women and men had similar numbers of outpatient visits for urinary incontinence, average work loss associated with outpatient care was greater for women (Table 29), probably because of the availability of outpatient procedures for women.

RECOMMENDATIONS

Classification and Coding

Existing databases allow researchers to describe trends in incontinence surgery and hospitalization more accurately than trends in outpatient visits or treatment in nursing homes. Urinary incontinence may be coded as stress incontinence, urge incontinence, mixed incontinence, intrinsic sphincter deficiency, frequency, nocturia, or other terms. Visits during which patients return for follow-up after treatment are also often coded as visits for incontinence, even if the symptom has resolved. While providers can be urged to code more diligently, administrative databases alone will never yield the degree of clinical accuracy needed to create a comprehensive picture of urinary incontinence and its impact on women in the United States. Although hospitalizations are more rigorously coded, there is often a substantial lag between the adoption of new surgical procedures and the establishment of new reimbursement codes, making tracking of trends difficult. Further, surgical codes are often not specific enough for use in health services or clinical research. For example, many types of pubovaginal slings are represented by one code. Despite these limitations, administrative databases do allow investigators to paint broad-brush pictures of the overall picture of urinary incontinence in American women. More specific cohort studies are essential to provide the details.

Table 25. Costs of urinary incontinence in 1995 (in millions of $)

Cost Factor	
Diagnostic costs	
Community[a]	380.7
Institution[b]	12.8
Treatment Costs	
Behavioral	
Community	60.0
Institution	4.0
Pharmacologic	
Community	8.5
Institution	0.8
Surgical	
Community	613.8
Institution	41.2
Routine care costs	
Community	7,146.2
Institution	4,259.7
Incontinence consequences costs	
Skin irritation	
Community	282.8
Institution	136.3
Urinary tract infections	
Community	346.1
Institution	3,835.5
Falls	
Community	56.7
Institution	1.7
Additional admissions to institutions	2,172.1
Longer hospitalization periods	6,229.1
Total direct costs	25,588.0
Indirect costs (value of home care services)	704.4
Total costs of urinary incontinence	26,292.4
Cost per person with urinary incontinence	3,565.1

[a]Non-institutionalized older adults.

[b]Older adults living in an institution.

SOURCE: Reprinted from Urology, 51, Wagner TH, Hu T, Economic costs of urinary incontinence in 1995, 355–361, Copyright 1998, with permission from Elsevier Science.

Future Studies

Given the large number of women affected by urinary incontinence, future studies focusing on both prevention and treatment are vital. Longitudinal studies are needed to delineate the risk factors for urinary incontinence and fistulae in women in different age groups. Such long-term prospective cohort studies, as well as randomized trials, can help determine which factors are amenable to intervention and whether such intervention can change continence status. Well-designed studies are needed to evaluate the effect of child-bearing practices on urinary incontinence and other pelvic floor disorders, particularly in younger women. Many studies of urinary incontinence treatment have very narrow inclusion criteria and do not reflect the general population of incontinent women. More population-based studies are needed. In addition, the inclusion criteria should be broadened in future randomized trials, particularly those of pharmacologic agents, to make the trial results more relevant. Long-term follow-up studies are needed to improve understanding of the longevity of therapeutic effectiveness for incontinence, particularly in patients who have had surgery.

Table 26. Costs of urinary incontinence by age group, residence, and gender[a]

	Elderly[b]		Middle-Age[b]	Younger[b]	
Variable	Community Dwelling	Institutionalized	Community Dwelling		Total Cost
Total cost	5,269 (32)	5,500 (34)	2,518 (15)	2,964 (18)	16,252 (100)
Women	3,734 (30)	3,851 (31)	2,245 (18)	2,598 (21)	12,428 (76)
Men	1,535 (40)	1,650 (43)	273 (7)	366 (10)	3,824 (24)
Cost by category[c]					
Routine care	4,174 (79)	2,830 (51)	1,799 (71)	2,533 (85)	11,336 (70)
Women	2,922 (70)	1,981 (70)	1,576 (88)	2,199 (87)	8,678 (77)
Men	1,252 (30)	849 (30)	223 (12)	334 (13)	2,658 (23)
Nursing home admissions	0 (0)	2,410 (44)	0 (0)	0 (0)	2,410 (15)
Women	0 (0)	1,687 (70)	0 (0)	0 (0)	1,687 (70)
Men	0 (0)	723 (30)	0 (0)	0 (0)	723 (30)
Treatment	312 (6)	126 (2)	530 (21)	324 (11)	1,292 (8)
Women	274 (88)	88 (70)	503 (95)	306 (94)	1,171 (91)
Behavioral therapy	8 (3)	88 (100)	4 (1)	6 (2)	106 (9)
Surgery	224 (82)	0 (0)	476 (95)	268 (88)	968 (83)
Pharmacologic therapy	42 (15)	0 (0)	23 (4)	32 (10)	97 (8)
Men	38 (12)	38 (30)	27 (5)	19 (6)	122 (9)
Behavioral therapy	2 (5)	38 (100)	0.4 (1)	0.6 (3)	41 (34)
Surgery	24 (63)	0 (0)	25 (92)	15 (79)	64 (52)
Pharmacologic therapy	12 (32)	0 (0)	2 (7)	3 (16)	17 (14)
Complications	699 (13)	132 (4)	152 (4)	56 (1)	1,039 (7)
Women	479 (69)	93 (70)	134 (89)	49 (88)	755 (73)
Skin irritation	238 (50)	56 (60)	64 (47)	0 (0)	358 (47)
UTI	113 (23)	26 (28)	35 (26)	49 (100)	223 (30)
Falls	128 (27)	11 (12)	34 (25)	0 (0)	173 (23)
Men	220 (31)	39 (30)	19 (11)	7 (13)	285 (27)
Skin irritation	102 (46)	24 (62)	9 (47)	0 (0)	135 (47)
UTI	63 (28)	10 (26)	5 (26)	7 (13)	85 (30)
Falls	55 (25)	5 (13)	5 (26)	0 (0)	65 (23)
Diagnoses and evaluation	84 (2)	3 (0.1)	36 (1)	51 (1)	174 (1)
Women	59 (70)	2 (70)	32 (89)	44 (86)	137 (79)
Men	25 (30)	1 (30)	4 (11)	7 (14)	37 (21)

UTI, urinary tract infection.

[a]Costs presented in millions 1995 US dollars. Percents may not add to 100% because of rounding.

[b]Elderly includes people ≥ 65 years old; middle-age includes people 40-64 years old; younger includes people 15-39 years old.

[b]Results shown indicate costs and % of total cost by age group in major cost categories. Cost and % of major cost category are shown for gender, complication type, and/or treatment type.

SOURCE: Reprinted with permission from the American College of Obstetricians and Gynecologists (Obstetrics and Gynecology, 2001, 98, 398–406.

Table 27. Estimated annual expenditures of privately insured workers with and without a medical claim for urinary incontinence (UI) in 1999[a] (in $)

	Annual Expenditures (per person)			
	Persons without UI (N=277,803)	Persons with UI (N=1,147)		
	Total	Total	Medical	Rx Drugs
All	3,204	7,702	6,099	1,604
Age				
18–44	2,836	7,361	5,993	1,369
45–54	3,305	8,442	6,695	1,747
55–64	3,288	7,247	5,623	1,623
Gender				
Male	2,813	*	*	*
Female	3,933	*	*	*
Region				
Midwest	3,086	8,500	6,861	1,639
Northeast	3,085	7,236	5,502	1,734
South	3,416	8,329	6,851	1,477
West	3,237	8,082	7,118	964

Rx, prescription.

*Figure does not meet standard for reliability or precision.

[a]The sample consists of primary beneficiaries aged 18 to 64 with employer-provided insurance, who were continuously enrolled in 1999. Estimated annual expenditures were derived from multivariate models that control for age, gender, work status (active/retired), median household income (based on zip code), urban/rural residence, medical and drug plan characteristics (managed care, deductible, co-insurance/co-payments), and 26 disease conditions.

SOURCE: Ingenix, 1999.

Table 28. Average annual work loss of persons treated for urinary incontinence (95% CI)

			Average Work Absence (hrs)		
Gender	Number of Workers[a]	% Missing Work	Inpatient	Outpatient	Total
Male	51	8%	0.0	2.3 (0.0–5.0)	2.3 (0.0–5.0)
Female	319	23%	7.1 (1.7–12.6)	21.6 (11.3–31.9)	28.7 (14.9–42.5)

[a]Individuals with an inpatient or outpatient claim for urinary incontinence and for whom absence data were collected. Work loss is based on reported absences contiguous to the admission and discharge dates of each hospitalization or the date of the outpatient visit.

SOURCE: MarketScan, 1999.

Table 29. Average work loss associated with a hospitalization or an ambulatory care visit for treatment of urinary incontinence (95% CI)

	Inpatient Care		Outpatient Care	
Gender	Number of Hospitalizations[a]	Average Work Absence (hrs)	Number of Outpatient Visits	Average Work Absence (hrs)
Male	*	*	82	1.4 (0.1–2.7)
Female	*	*	625	11.0 (7.5–14.6)

*Figure does not meet standard for reliability or precision.

[a]Unit of observation is an episode of treatment. Work loss is based on reported absences contiguous to the admission and discharge dates of each hospitalization or the date of the outpatient visit.

SOURCE: MarketScan, 1999.

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CHAPTER 4

Urinary Incontinence in Men

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SUMMARY

While urinary incontinence (UI) is widely thought of as a condition affecting women, it also affects men of all ages, including 17% of an estimated 3.4 million men over the age of 60 in the United States. The prevalence of UI increases with advancing male age, and rose over time during the 1990s. Ethnicity plays less of a role in UI prevalence estimates for men than it does for women.

Risk factors for UI in both men and women include stroke, dementia, recurrent cystitis, bladder cancer, stool impaction, reduced mobility, diabetes, chronic cough, medications, and aging. However, specific to men is incontinence secondary to benign and malignant prostatic diseases and their treatments. Up to 30% of patients who have had a radical prostatectomy experience some degree of incontinence afterwards.

UI in elderly men creates a substantial burden on health care resources, the largest impact being felt in doctors' offices, followed by outpatient services and surgeries. During the 1990s, rates of physician office visits increased, but the burden of male UI is greatest in nursing homes, where more than half of the male residents report difficulty controlling their urine and require assistance using the toilet, either from equipment (14.8%) or from another person (52%).

The direct economic burden for UI in men is estimated to be $3.8 billion per year (1). The annual medical expenditures of persons with UI are more than twice those of persons without UI, $7,702 vs $3,204. Patients themselves bear a significant proportion of the direct costs of incontinence, including the costs of pads, condom drainage catheters, indwelling foley catheters, and external devices such as Cunningham clamps. Annual costs to all individuals living at home have been estimated to be $7.1 billion (2).

DEFINITION

Urinary incontinence is defined as the complaint of any involuntary leakage of urine (3). It is sometimes grouped with other voiding complaints known collectively as lower urinary tract symptoms (LUTS). LUTS are subjective in nature and hence can be voluntarily self-reported or elicited during a medical history.

Recognized clinical subtypes of UI are defined on the basis of their presumed underlying etiology. An international standard for definitions of incontinence subtypes was set by the International Continence Society (ICS) in 1990 (4) and was updated in 2003 (3).

Stress incontinence is the involuntary leakage of urine on effort or exertion, sneezing, or coughing. *Urge incontinence* is the involuntary leakage of urine accompanied by, or immediately preceded by, urgency. Patients describe this type of incontinence as difficulty in holding their urine until they are able to reach a toilet. *Mixed incontinence* involves components of both stress- and urgency-related leakage. *Continuous incontinence* is constant leakage, usually associated with a fistula; it occurs only rarely in males. *Enuresis* refers to any involuntary loss of urine and should be distinguished from *nocturnal enuresis,* or urinary loss during sleep.

Table 1. Codes used in the diagnosis and management of male urinary incontinence

Males 18 years or older, with any one of the following ICD-9 codes, but not a coexisting 952.xx or 953.xx code:

788.3	Urinary incontinence
788.3	Urinary incontinence unspecified
788.33	Mixed incontinence, male and female
788.34	Incontinence without sensory awareness
788.37	Continuous leakage
599.8	Other specified disorders of urethra and urinary tract
599.81	Urethral hypermobility
599.82	Intrinsic (urethral) sphincter deficiency (ISD)
599.83	Urethral instability
599.84	Other specified disorders of urethra
788.31	Urge incontinence
596.59	Other functional disorder of bladder
596.52	Low bladder compliance
596.51	Hypertonicity of bladder

Post-radical prostatectomy incontinence

Males 18 years or older, with at least one of the above codes and at least one of the following prostatectomy codes:

ICD-9 Procedure Code

60.5

CPT Codes

55840	Prostatectomy, retropubic radical, with or without nerve sparing
55842	Prostatectomy, retropubic radical, with or without nerve sparing
55845	Prostatectomy, retropubic radical, with or without nerve sparing

Spinal cord injury-related incontinence

Males 18 years or older, with a diagnosis code for spinal cord injury 952.xx or 953.xx and at least one of the following ICD-9 codes

344.61	Cauda equina syndrome with neurogenic bladder
596.51	Hypertonicity of bladder (specified as overactive bladder in 2001; included if associated with diagnosis code 952.xx)
596.52	Low compliance bladder
596.54	Neurogenic bladder, NOS
596.55	Detrusor sphincter dyssynergia
596.59	Other functional disorder of bladder
599.8	Other specified disorders of urethra and urinary tract
599.84	Other specified disorders of urethra
625.6	Stress incontinence, female
788.3	Urinary incontinence
788.31	Urge incontinence
788.32	Stress incontinence, male
788.33	Mixed incontinence, male and female
788.34	Incontinence without sensory awareness
788.37	Continuous leakage
788.39	Other urinary incontinence

Some of the 5-digit ICD-9 codes (Table 1) related to incontinence are based on the underlying mechanisms as demonstrated during urodynamic testing. In general, definitions are divided into those seen during filling and those seen during emptying, the two phases of the bladder cycle. Abnormalities during the filling phase include detrusor instability, detrusor hyperreflexia, and abnormalities of bladder compliance. The observation of involuntary detrusor contractions during filling cystometry is called *detrusor instability* in the absence of a neurologic lesion and *detrusor hyperre exia* in the presence of a neurologic lesion. *Detrusor sphincter dyssynergia* (DSD), an abnormality during the emptying phase of the bladder, refers to simultaneous contraction of the detrusor and involuntary contraction of the urethral and/or periurethral striated muscle in a patient with neurologic disease.

Recently, the terminology for urodynamic definitions associated with incontinence was modified to conform to the International Classification of Functioning, Disability and Health (ICFDH-2) and the ICD-10 (5). The terms *detrusor instability* and *detrusor hyperre exia* were replaced. When involuntary detrusor contractions occur during filling cystometry, they are classified as *detrusor overactivity*. If the patient has incontinence at the time of the detrusor overactivity, the term *detrusor overactivity incontinence* is used. If a relevant neurogenic condition is present, the more specific term neurogenic detrusor overactivity is used; otherwise, *idiopathic detrusor overactivity* is used.

CURRENT MEANS OF DIAGNOSIS

Urinary incontinence may be a sign or a symptom. As a symptom, UI may be self-reported or recorded by a third party such as a health care professional or researcher. On rare occasions, patients who report UI as a symptom do not actually have the condition. Perspiration, for example, may mimic UI in men. As such, determining the presence of incontinence by questioning alone is inherently problematical. Because patient reports of severity are subjective, the disorder is difficult to quantify unless specific, standardized questions are posed.

As a clinical sign, UI may be demonstrated during physical examination, cystoscopy, urodynamics, or videourodynamics, or by pad testing. In males, physical examination may reveal clues to the etiology of the underlying condition, but only rarely is the actual sign of incontinence seen. Indirect indicators include soiled clothing, the use of a variety of types of incontinence protection devices, and abnormalities presenting during the neurologic examination, which should include a careful digital rectal examination and assessment of anal sphincter tone. At the time of cystoscopy, abnormalities of the urethral sphincter may be seen in men who have previously undergone prostatectomy, but these abnormalities are not definitive for the diagnosis. Rarely, a urethrocutaneous or rectourethral fistula is observed. Both urodynamics and videourodynamics can provide definitive diagnoses and quantitative measures of the amount of urinary loss under standardized conditions, including volume of urine in the bladder, physical posture, and physical activity. Pad testing is performed by instilling a standardized volume of liquid into the bladder, placing an incontinence pad in the patient's undergarments, and having the patient undergo a standardized sequence of physical activities. The pad is then weighed to quantify the leakage.

A wide range of survey questions can be used to collect data concerning UI. General questions may be as simple as, "Do you have or have you ever had loss of urinary control?" More specific questions are used to elicit the underlying etiology of UI. An affirmative answer to the question, "Do you ever leak or lose urine when you cough, laugh, or sneeze?" may indicate stress incontinence; the answer to, "How often do you have difficulty holding your urine until you can get to a toilet?" may indicate urge incontinence (6).

PREVALENCE

Although the epidemiology of UI has not been investigated in men as thoroughly as in women, most studies show that the male-to-female ratio is about 1: 2. The type, age distribution, and risk factors differ greatly between the genders (7). Estimates of UI prevalence are obtained primarily from responses to survey questions, and the way the questions are worded affects the prevalence estimate (see above). Because UI can be an intermittent condition, the length of time the patient is asked to consider may alter response rates. For example, "Do you have or have you ever had UI?" may elicit a different response than "Over the last 12 months have you experienced loss of urinary control?" In-person interviews tend to yield higher prevalence rates than do self-reported questionnaires. The prevalence of UI varies by patient age, gender, and language.

When UI prevalence is estimated using ICD-9 codes, several additional issues should be kept in mind. The 5-digit ICD-9 codes used for the National Ambulatory Medical Care Survey (NAMCS), Medstat, Healthcare Care Utilization Project (HCUP), Medicare, and Ingenix datasets may be used to divide incontinence into five groups:

- detrusor instability / overactive bladder / urge incontinence,
- traumatic/iatrogenic incontinence (e.g., following radical prostatectomy),
- spinal-cord-related incontinence,
- nocturnal enuresis, and
- other (fistula, neuropathic bladder, nonorganic causes).

In addition, the following caveats should be noted when considering the data presented in this chapter:

1. There is no specific category for overflow incontinence secondary to outlet obstruction in men, related to prostate or urethral disease. The closest match for this subtype is 788.39 (overflow neurogenic, paradoxical).

2. To identify males with post-radical prostatectomy incontinence, one needs to use codes for incontinence and prostatectomy. In addition, a man may have stress incontinence due to traumatic injury or to prostatectomy for benign prostate disease. There is no specific code for these rare conditions.

3. Urodynamic testing would be required for certain 5-digit codes (e.g., 596.59 for detrusor instability); however, the clinical management of individual patients may not involve urodynamic testing.

4. Because the Medical Expenditure Panel Survey (MEPS) database uses only 3-digit ICD-9 codes, it lacks the specificity necessary to stratify by subtypes of UI.

5. Of all the urological conditions examined in this project, UI is among the least likely to result in a contact with the medical community. While 17% of aged men report some UI, medical care utilization rates are typically less than 1%.

Pooled data from 21 international population-based surveys (Table 2), stratified for age, gender, and frequency of incontinence, indicate that the prevalence of lifetime incontinence among older men is 11% to 34% (median 17%, pooled mean 22%), while the prevalence of daily incontinence is 2% to 11% (median 4%, pooled mean 5%). The prevalence of lifetime incontinence was significantly lower among middle-aged and younger men, ranging from 3% to 5% (median 4%, pooled mean, 5%) (8).

Langa et al. reported a prevalence of 13% in community-dwelling older people (9). These people responded affirmatively when asked, "During the last 12 months, have you lost any amount of urine beyond your control?" This time frame is similar to that in the NHANES question.

As in Thom's study, National Health and Nutrition Examination Survey (NHANES) data suggest that 17% of males older than 60 experience

Table 2. Summary prevalences of urinary incontinence (UI) by age, gender, and frequency

	Ever UI			Daily UI		
	Range	Median	Mean[a]	Range	Median	Mean[a]
Group	%	%	%	%	%	%
Older women	17 to 55	35	34	3 to 17	14	12
Older men	11 to 34	17	22	2 to 11	4	5
Younger women	12 to 42	28	25		no data available	
Younger men	3 to 5	4	5		no data available	

[a]Calculated using numerator and denominator data from each available study.

SOURCE: Reprinted from Thom D, Variation in estimates of urinary incontinence prevalence in the community: effects of differences in definition, population characteristics, and study type, Journal of American Geriatrics Society, 46, 473-480, Copyright 1998, with permission from the American Geriatrics Society.

Table 3. Prevalence of difficulty controlling bladder among adult men

		Difficulty Controlling Bladder		
	Total	Yes	No	Refused to Answer or Don't Know
All	18,231,934	3,131,814 (17%)	15,054,506 (83%)	45,614 (0%)
Age at screening				
60–64	5,037,678	546,559 (11%)	4,491,119 (89%)	0 (0%)
65–69	4,731,187	518,157 (11%)	4,213,030 (89%)	0 (0%)
70–74	3,320,840	630,898 (19%)	2,675,986 (81%)	13,956 (0%)
75–79	2,748,396	750,478 (27%)	1,988,932 (72%)	8,986 (0%)
80–84	1,478,414	399,774 (27%)	1,078,640 (73%)	0 (0%)
85+	915,419	285,948 (31%)	606,799 (66%)	22,672 (2%)
Race/ethnicity				
Non-Hispanic white	14,790,935	2,395,212 (16%)	12,395,723 (84%)	0 (0%)
Non-Hispanic black	1,436,582	296,022 (21%)	1,122,588 (78%)	17,972 (1%)
Mexican American	559,680	81,134 (14%)	478,546 (86%)	0 (0%)
Other race	429,299	142,015 (33%)	273,598 (64%)	13,686 (3%)
Other Hispanic	1,015,438	217,431 (21%)	784,051 (77%)	13,956 (1%)
Education				
Less than high school	6,072,264	1,214,224 (20%)	4,840,068 (80%)	17,972 (0%)
High school	4,516,092	698,919 (15%)	3,817,173 (85%)	0 (0%)
High school+	7,572,244	1,198,317 (16%)	6,373,927 (84%)	0 (0%)
Refused	25,054	11,368 (45%)	0 (0%)	13,686 (55%)
Don't know	46,280	8,986 (19%)	23,338 (50%)	13,956 (30%)
Poverty income ratio[a]				
Missing	631,305	111,353 (18%)	505,996 (80%)	13,956 (2%)
PIR=0	22,159	12,082 (55%)	10,077 (45%)	0 (0%)
PIR<1	1,806,996	440,261 (24%)	1,366,735 (76%)	0 (0%)
1.00<=PIR<=1.84	3,408,381	653,095 (19%)	2,755,286 (81%)	0 (0%)
PIR>1.84	9,404,848	1,458,110 (16%)	7,946,738 (84%)	0 (0%)
Refused	1,858,169	324,042 (17%)	1,511,455 (81%)	22,672 (1%)
Don't know	1,100,076	132,871 (12%)	958,219 (87%)	8,986 (1%)

[a]See glossary for definition of poverty income ratio.

The data in this table are based on question KIQ.040: "In the past 12 months, have you had difficulty controlling your bladder, including leaking small amounts of urine when you cough or sneeze?"

SOURCE: National Health and Nutrition Examination Survey, 1999–2000.

Table 4. Frequency of bladder control problems among those who responded "yes" to difficulty controlling bladder

	All	Every Day	Few per Week	Few per Month	Few per Year	Don't Know
All	3,131,814	1,307,755 (42%)	747,906 (24%)	577,835 (18%)	459,015 (15%)	39,303 (1%)
Age at screening						
60–64	546,559	187,452 (34%)	204,858 (37%)	48,555 (9%)	105,694 (19%)	0 (0%)
65–69	518,157	172,945 (33%)	153,221 (30%)	104,208 (20%)	87,783 (17%)	0 (0%)
70–74	630,898	299,011 (47%)	111,501 (18%)	118,464 (19%)	100,100 (16%)	1,822 (0%)
75–79	750,478	377,370 (50%)	101,664 (14%)	176,165 (23%)	86,293 (11%)	8,986 (1%)
80–84	399,774	137,186 (34%)	134,527 (34%)	60,591 (15%)	54,106 (14%)	13,364 (3%)
85+	285,948	133,791 (47%)	42,135 (15%)	69,852 (24%)	25,039 (9%)	15,131 (5%)
Race/ethnicity						
Non-Hispanic white	2,395,212	1,039,490 (43%)	505,540 (21%)	418,365 (17%)	403,322 (17%)	28,495 (1%)
Non-Hispanic black	296,022	111,731 (38%)	106,168 (36%)	35,532 (12%)	33,605 (11%)	8,986 (3%)
Mexican American	81,134	47,757 (59%)	17,210 (21%)	6,213 (8%)	8,132 (10%)	1,822 (2%)
Other race	142,015	37,697 (27%)	63,131 (44%)	41,187 (29%)	0 (0%)	0 (0%)
Other Hispanic	217,431	71,080 (33%)	55,857 (26%)	76,538 (35%)	13,956 (6%)	0 (0%)
Education						
Less than high school	1,214,224	423,490 (35%)	386,717 (32%)	244,357 (20%)	157,838 (13%)	1,822 (0%)
High school	698,919	245,562 (35%)	137,414 (20%)	184,242 (26%)	118,337 (17%)	13,364 (2%)
High school+	1,198,317	627,335 (52%)	223,775 (19%)	149,236 (12%)	182,840 (15%)	15,131 (1%)
Refused	11,368	11,368 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Don't know	8,986	0 (0%)	0 (0%)	0 (0%)	0 (0%)	8,986 (100%)
Poverty income ratio[a]						
PIR=0	12,082	0 (0%)	0 (0%)	12,082 (100%)	0 (0%)	0 (0%)
PIR<1	440,261	144,297 (33%)	112,216 (25%)	123,240 (28%)	58,686 (13%)	1,822 (0%)
1.00<=PIR<=1.84	653,095	262,660 (40%)	170,625 (26%)	116,420 (18%)	88,259 (14%)	15,131 (2%)
PIR>1.84	1,458,110	640,720 (44%)	356,276 (24%)	193,356 (13%)	254,394 (17%)	13,364 (1%)
Refused	324,042	156,956 (48%)	47,695 (15%)	72,079 (22%)	47,312 (15%)	0 (0%)
Don't know	132,871	86,722 (65%)	11,890 (9%)	14,909 (11%)	10,364 (8%)	8,986 (7%)
Missing	111,353	16,400 (15%)	49,204 (44%)	45,749 (41%)	0 (0%)	0 (0%)

[a]See glossary for definition of poverty income ratio.

The data in this table are based on question KIQ.060: "How frequently does this (referring to KIQ.040) occur? Would you say this occurs…every day, a few times a week, a few times a month, or a few times a year?"

SOURCE: National Health and Nutrition Examination Survey, 1999–2000.

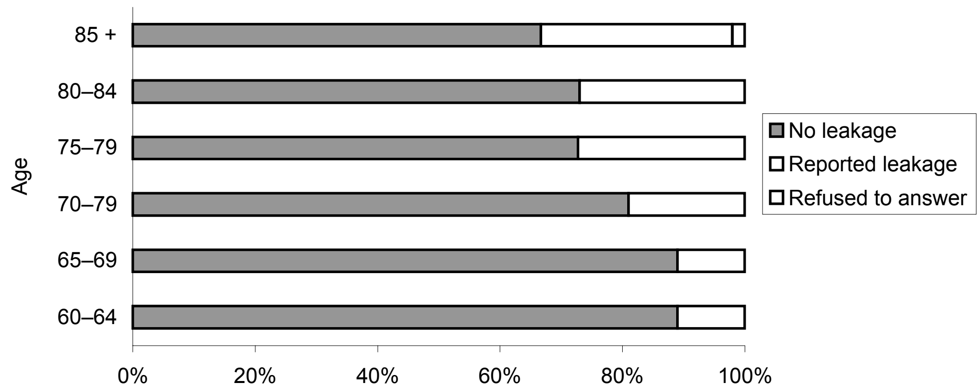

Figure 1a. **Difficulty controlling bladder among male responders.**

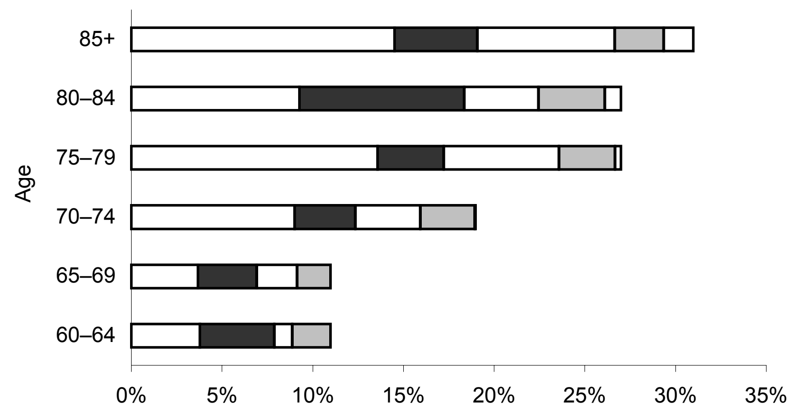

Figure 1b. **Frequency of bladder control problems among male responders who answered "yes" to difficulty controlling bladder.**

SOURCE: National Health and Nutrition Examination Survey, 1999–2001.

UI (Table 3 and Figure 1a). These men answered affirmatively when asked, "In the past 12 months, have you had difficulty controlling your bladder, including leaking small amounts of urine when you cough or sneeze?" NHANES data indicate a trend of increasing prevalence of UI with increasing age in males. Of the 17% of men reporting UI, 42% indicated that it occurred on a daily basis, while 24% indicated that it occurred weekly (Table 4 and Figure 1b). The 7% prevalence of daily UI in men over 60 (17% of 42%) is similar to the 4% of older men who reported daily episodes in the pooled data reported by Thom (8). The severity of UI based on the frequency of incontinence episodes among younger males is not well documented. The utilization data in this chapter are not entirely consistent with this citation.

Based on a prevalence rate of 17% (Table 3) and data from the 2001 US Census Bureau's intercensal population estimates, it is estimated that almost 3.4 million American men over the age of 60 have UI (US Census).

MORTALITY

In univariate analyses without adjustment for comorbidities or other potential confounding factors, UI is associated with an increased risk of death among elderly men living in both community and nursing home settings (10, 11). The magnitude of increased relative risk of death is variable and is related to the severity of the incontinence and the overall health and functional status of the patient. Applying univariate hazard ratios for mortality in large population studies revealed an increased risk of mortality in the elderly associated with the degree of incontinence: the relative risk of dying is 2.27 for mild UI, 2.96 for moderate UI, and 5.94 for severe UI, compared with continent controls over a 42-month period (11).

The association observed between UI and death is not likely to be causal because of the impact of advanced age, poor general health, and psychosocial factors. When population studies are subjected to more rigorous multivariate analysis and confounders are taken into consideration, the impact of mild to moderate incontinence on mortality is greatly reduced—in fact, it is statistically insignificant in some studies. However, severe incontinence remains as an independent risk factor for mortality. Specifically, elderly men with incontinence had 50% greater mortality than continent men after adjustment for age alone, but only a 20% greater risk of mortality after additional adjustment for comorbid conditions (12). Therefore, the relationship between mortality and UI is thought to be due in large part to a reduction in general health and increased frailty in the elderly. Daily preventive health measures and the use of routine health screenings are independent predictors of survival in elderly incontinent individuals after age, health status, and psychosocial factors have been controlled for (6).

While epidemiologic studies of mortality in the incontinent have focused on the elderly population, an important consideration is the relative overrepresentation in the younger male population of individuals with neurogenic bladders due to spinal cord injury. The relative risk of mortality in incontinent vs continent younger men is not well documented.

Risk Factors for Urinary Incontinence in Men

Physical Attributes	Pharmaceutical Agents
Age	Benzodiazepines
Obesity	Antidepressants
Race	Antipsychotics
Immobility	Diuretics
Previous transurethral surgery	Antiparkinsonian medications
Previous radical prostatectomy	Narcotic analgesics
	Alpha antagonists
Neurologic disease (e.g., stroke)	Alpha agonists
	Calcium channel blockers
Spinal cord injury	ACE inhibitors
Cognitive impairment	Antianxiety/hypnotics

Social Habits	Reversible Factors
Smoking	Urinary tract infection
Alcohol	Pharmaceuticals
Caffeine	Psychological
	Exessive urine production (polyuria or nocturia)
	Stool impaction

HIGH-RISK GROUPS AND RISK FACTORS

Continence in males results from a combination of factors, including appropriate function of the bladder and sphincter mechanisms. Since the function of these anatomic structures is neurologically regulated, diseases that affect the central or peripheral nervous systems may increase the risk of UI. Environmental factors, cognitive status, mobility, medications and social habits can also influence continence status. Risk factors for UI can be categorized as physical attributes, pharmaceutical agents, social habits, and reversible factors.

As noted above, the prevalence of UI increases with *increasing age*, particularly in those over 65. Age-related physical changes within the detrusor itself include more unstable bladder contractions, more residual urine, and less bladder contractility (13). Overall, the multifactorial elements of aging, including modified pharmacokinetics and associated physical comorbidities, may convert a continent patient to an incontinent one. For example, as men age, the prostate gland enlarges due to benign or malignant disease. Additional physical attributes such as age, mobility, previous prostatic surgery, neurologic disease, spinal cord injury, and delirium may also contribute to loss of continence. Obesity and race are cited as risk factors for UI in women, but data on these factors specific to men are lacking.

A history of prostate cancer treatment, including radiation or radical prostatectomy, is known to confer an increased risk of incontinence, as has been reported by many researchers since the mid-1990s. Radical prostatectomy involves extensive dissection near the bladder neck and external sphincter, both of which contribute to continence in men. Prostate radiation (external beam or brachytherapy) may affect the same structures and may also cause damage to the bladder itself, leading to incontinence from an overactive detrusor.

Restricted mobility (due, e.g., to bedrails, trunk restraints, or chair restraints) limits access to toilet facilities and hence increases the risk of UI (14).

Because the central nervous system has both excitatory and inhibitory effects on the bladder, a variety of central neurological diseases can cause incontinence. Most notably, stroke confers an increased risk of UI. In one large population-based study, nearly 50% of stroke patients had UI. This proportion falls to about 20% in patients surviving for at least six months after a stroke (15).

While somewhat controversial, alcohol and caffeine intake have been implicated as risk factors for UI, although almost no data on male subjects are available.

Because elderly patients have altered pharmacodynamics and pharmacokinetics, certain drugs that affect cognition may impact bladder function primarily or may lead to increased urine output, thus contributing to the risk of UI (14). For example, benzodiazepine use has been reported to increase the risk of UI by 45% (OR, 1.44; 95% CI, 1.12–1.83) (16). Selective serotonin reuptake inhibitors have been similarly implicated (17).

NATURAL HISTORY

Cross-sectional studies have found that the prevalence of UI in men increases with age in a roughly linear fashion. Most studies have found a predominance of urge incontinence (40%–80%), followed by mixed incontinence (10%–30%) and stress incontinence (<10%). Stress incontinence becomes more common as men age, probably as a result of surgery for prostate enlargement and prostate cancer. For example, up to 34% of men report persistent UI following a radical prostatectomy (18).

Relatively little information is available on the incidence of UI in men, but what there is suggests that it is a surprisingly dynamic condition. One population-based study of men and women 60 and older found the one-year incidence of new UI in men (most of which was classified as mild) to be 10%, (19). The annual rate of remission was about 30%. These figures probably reflect the important role of reversible causes of male UI, including benign prostatic hyperplasia, urinary tract infections, and constipation.

TRENDS IN HEALTH CARE RESOURCE UTILIZATION

Inpatient Care

Table 5 shows rates of inpatient hospitalizations among men having UI as the primary diagnosis. Data from the HCUP inpatient sample indicate that the overall rate was steady at 1.4 to 2.1 per 100,000,

Table 5. Inpatient hospital stays by males with urinary incontinence listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total	1,431	2.1 (1.4–1.9)	1,529	1.7 (1.4–2.0)	1,490	1.6 (1.4–1.8)	1,332	1.4 (1.2–1.6)
Region								
Midwest	397	2.1 (1.4–2.4)	285	1.3 (0.6–2.0)	435	2.0 (1.4–2.6)	334	1.5 (1.0–1.9)
Northeast	338	2.1 (1.3–2.5)	366	2.0 (1.4–2.6)	304	1.7 (1.2–2.2)	324	1.8 (1.2–2.4)
South	393	1.1 (0.9–1.7)	640	2.0 (1.4–2.6)	527	1.6 (1.2–1.9)	459	1.4 (1.0–1.7)
West	302	2.1 (0.8–2.3)	238	1.2 (0.8–1.6)	225	1.1 (0.8–1.4)	215	1.0 (0.6–1.4)

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US male civilian non-institutionalized population.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 6. Inpatient stays by male Medicare beneficiaries with urinary incontinence listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	1,520	10 (9.8–11)	1,680	11 (11–12)	1,620	11 (11–12)
Total < 65	60	1.9 (1.5–2.4)	160	4.6 (3.9–5.4)	140	4.1 (3.4–4.7)
Total 65+	1,460	13 (12–13)	1,520	13 (12–14)	1,480	13 (13–14)
Age						
65–74	700	9.7 (9.0–10)	640	8.9 (8.2–9.6)	620	9.6 (8.9–10)
75–84	580	16 (15–18)	640	17 (16–19)	760	21 (19–22)
85–94	160	20 (17–23)	200	24 (20–27)	100	12 (9.2–14)
95+	20	26 (14–37)	40	49 (34–63)	0	0.0
Race/ethnicity						
White	1,320	11 (10–11)	1,480	11 (11–12)	1,440	12 (11–12)
Black	120	9.4 (7.8–11)	80	5.8 (4.5–7.1)	120	9.0 (7.4–11)
Asian	…	…	0	0.0	0	0.0
Hispanic	…	…	60	30 (23–38)	40	12 (8.3–16)
N. American Native	…	…	0	0.0	0	0.0
Region						
Midwest	420	11 (10–12)	620	16 (15–17)	660	18 (16–19)
Northeast	320	10 (9.0–11)	120	3.8 (3.1–4.4)	280	10 (8.9–11)
South	420	8.0 (7.3–8.8)	700	13 (12–14)	500	9.3 (8.5–10)
West	340	15 (14–17)	200	8.6 (7.4–9.8)	160	7.2 (6.0–8.3)

… data not available.

[a]Unweighted counts multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]Persons of other race, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, MedPAR and 5% Carrier File, 1992, 1995, 1998.

with no meaningful change from 1994 through 2000. The rate remained low across all geographic regions. This is consistent with clinical experience that UI does not typically lead to hospital admission, except for surgical correction of the condition. Estimates of inpatient hospitalizations through the 1990s in the Medicare (CMS) population are presented in Table 6. The overall rate of inpatient hospital stays for men ≥65 years of age with UI was stable at 13 per 100,000 male Medicare beneficiaries. The rate for men <65 years of age in the Medicare population fluctuated more, probably as a result of peculiarities of data on the disabled population. Caucasian males had higher inpatient hospitalization rates than did African American males. Asian and Hispanic men were not identified as specific populations until 1995, and their relatively low counts make interpretation of the corresponding rates difficult.

Consistent with larger secular trends, lengths of stay (LOS) of men with UI as a primary diagnosis decreased between 1994 and 2000 (Table 7). Sample sizes for the non-whites and those younger than 55 were too small to produce reliable estimates for those demographic categories. LOS declined across all regions from 1994 to 1996, the shortest mean LOS being 2.0 days in the West. Increasing market pressure from managed care during that time may have contributed to this trend. There was wide variation in inpatient LOS for men with UI in rural areas. In 1994, mean LOS in rural hospitals (3.8 days) was similar to that in urban hospitals; in 1996, it increased to 4.2 days, then it declined to 2.3 days in 1998; it then increased to a high of 4.3 days in 2000, 1.3 days longer than for urban sites. In urban hospitals, there was a general downward trend in LOS, to 3.0 days in 2000. The diffusion of managed care from urban to rural areas through the 1990s may explain these observations.

Table 7. Trends in mean inpatient length of stay (days) for adult males hospitalized with urinary incontinence listed as primary diagnosis

	Length of Stay			
	1994	1996	1998	2000
All	3.7	2.8	3.0	3.2
Age				
18–24	*	*	*	*
25–34	*	*	*	*
35–44	*	*	*	*
45–54	*	*	*	*
55–64	2.8	2.1	3.0	2.8
65–74	3.3	2.3	2.0	2.9
75–84	4.3	3.6	3.4	3.2
85+	*	*	*	*
Race/ethnicity				
White	3.9	2.9	3.2	3.1
Black	*	*	*	*
Hispanic	*	*	*	*
Asian/Pacific Islander	*	*	*	*
Other	*	*	*	…
Region				
Midwest	3.2	2.2	3.1	3.3
Northeast	5.1	2.8	4.0	2.5
South	3.8	3.5	2.6	2.9
West	2.7	2.0	2.5	4.5
MSA				
Rural	3.8	4.2	2.3	4.3
Urban	3.7	2.7	3.2	3.0
Discharge status				
Routine	3.0	2.5	2.5	2.6
Skilled nursing facility	*	*	…	…
Intermediate care	*	*	…	…
Other facility	*	*	6.2	*
Home health	*	*	*	*
Against medical advice	*	*	*	*
Died	*	*	*	*

… data not available.

*Figure does not meet standard for reliability or precision.

MSA, metropolitan statistical area.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Outpatient Care

According to data from the National Hospital Ambulatory Medical Care Survey (NHAMCS) for 1994, 1996, 1998, and 2000 (Table 8), 0.1% of all hospital outpatient visits by men over the age of 18 were associated with UI as any listed diagnosis. Because the counts for this diagnosis were so low, the 1994, 1996, 1998, and 2000 data were collapsed to yield a rate of 90 per 100,000 for the four years combined (or 22.5 per 100,000 annually). Hospital outpatient visit rates for men with UI listed as the primary diagnosis were about 10 per 100,000 annually.

As expected, the rate of outpatient visits for men with UI (Table 9) is far greater than that for inpatient visits by men (Table 6) both under and over age 65. The rates increased for men in all groups from 1992 to 1998. Outpatient visits by men over age 65 with UI were 2.8 times more frequent than inpatient visits (hospitalizations) in 1992 and were 5.2 times more frequent by 1998. Men 75 to 84 years of age had the highest outpatient visit rates, 59 per 100,000 in 1992 and 85 per 100,000 in 1995. The difference in Medicare outpatient vs inpatient services for men with UI under age 65 is even more striking. Outpatient visits were 10 times more frequent than inpatient visits in 1992 and 11.4 times more frequent in 1998. Regional Medicare data indicate that outpatient visit rates in 1992 ranged from 2.9 to 4.4 times the rate of inpatient visits. By 1998, outpatient visit rates were 4.1 to 9.6 times higher than inpatient visit rates for all regions. In 1998 (the most recent year for which data are available), the South had the lowest rate of inpatient visits, 42 per 100,000. In the Midwest, both outpatient and inpatient visit rates increased to a high of 98 per 100,000 in 1998, more than double the rate in the South.

Interestingly, there was an inverse relationship between the rate of outpatient and inpatient services for African American males and that for Caucasian males. From 1992 to 1998, rates of inpatient visits were consistently higher for Caucasians, while rates of outpatient services were consistently higher for African Americans. The difference was greatest in 1995, when the ratio of outpatient visits for African American males was 2.4 times that for Caucasian males, narrowing to 1.5 in 1998. As with inpatient visits, Hispanic men had a markedly higher rate of outpatient visits—179 per 100,000 in 1998, twice

Table 8. National hospital outpatient visits by adult males with urinary incontinence, count (95% CI), number of visits, percentage of visits, rate (95% CI)

	4-Year Count (95% CI)	Total No. Visits by Men 18+, 1994–2000	% of Visits	4-Year Rate (95% CI)
Primary diagnosis	38,629 (3,361–73,897)	78,399,663	0.0	42 (4–80)
Any diagnosis	83,762 (29,850–137,674)	78,399,663	0.1	90 (32–149)

[a]Rate per 100,000 based on the sum of weighted counts in 1994, 1996, 1998, 2000 over the mean estimated base population across those four years. Population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US male adult civilian non-institutionalized population.

SOURCE: National Hospital Ambulatory Medical Care Survey, 1994, 1996, 1998, 2000.

Table 9. Outpatient hospital visits by male Medicare beneficiaries with urinary incontinence listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	5,080	34 (34–35)	8,300	55 (53–56)	9,420	65 (64–66)
Total < 65	900	29 (27–31)	1,620	47 (45–49)	2,040	59 (57–62)
Total 65+	4,180	36 (35–37)	6,680	57 (55–58)	7,380	67 (65–68)
Age						
65–74	1,840	25 (24–27)	2,900	40 (39–42)	2,960	46 (44–48)
75–84	2,080	59 (56–61)	3,120	85 (82–88)	3,080	84 (81–87)
85–94	240	30 (27–34)	620	73 (67–79)	1,300	150 (142–158)
95+	20	26 (14–37)	40	49 (34–63)	40	46 (32–59)
Race/ethnicity						
White	3,840	31 (30–32)	6,200	48 (47–49)	7,320	60 (58–61)
Black	900	71 (66–75)	1,580	114 (108–120)	1,160	87 (82–92)
Asian	…	…	20	27 (15–40)	100	73 (58–88)
Hispanic	…	…	240	121 (106–136)	600	179 (164–193)
N. American Native	…	…	40	199 (139–258)	0	0.0
Region						
Midwest	1,780	48 (46–50)	2,280	59 (57–62)	3,620	98 (95–101)
Northeast	1,260	40 (38–42)	1,880	59 (56–62)	1,920	69 (66–72)
South	1,060	20 (19–21)	2,260	41 (40–43)	2,280	42 (41–44)
West	980	44 (41–46)	1,880	81 (77–85)	1,580	71 (67–74)

… data not available.

[a]Unweighted counts multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, MedPAR and 5% Carrier File, 1992, 1995, 1998.

that of African Americans and three times that of Caucasians. These differences may follow from differences in the types of services provided. Surgical therapy for UI in the 1990s was typically provided on an inpatient basis, while nonsurgical therapy was provided on an outpatient basis. Further study is needed to clarify these trends.

Veterans Health Administration (VA) data, which are based on outpatient medical records rather than population survey data, show a strong trend toward increasing prevalence of medically recognized UI with increasing age in males; the prevalence in men 85 years of age and older is approximately ten times that in men 35 to 44 years of age. Table 10 also demonstrates an increase over time in the prevalence of medically recognized UI in men, from 717 per 100,000 in 1999 to 975 per 100,000 in 2001 (all diagnoses of UI). As expected, the prevalence of medically recognized UI based on ICD-9 codes from office visits is substantially less than that found in the NHANES study, which is population-based. The increase in medically recognized UI between 1999 and 2001 likely reflects an increase in clinical ascertainment of UI, rather than an increase in underlying prevalence. Racial/ethnic differences in prevalence among men are modest compared to the differences among women, although African American men consistently have a slightly higher prevalence than do Caucasians. Racial differences in care-seeking behavior and perceptions of the health care system make these data difficult to interpret. Regional differences are slight and vary from year to year without a consistent pattern.

According to Medicare data (Table 11), the rates of physician office visits for male UI increased by 77% between 1992 and 1998, from 395 per 100,000 to 698 per 100,00, for all age groups. Visit rates for men 65 years of age and older increased from 457 per 100,000 to 818 per 100,000, and rates for those under 65 increased from 164 per 100,000 to 314 per 100,000. More detailed examination reveals that there is a trend of increasing rates of physician office visits for each age category in the 65 and older group up to and including the 85 to 94 age group, which had a rate of 1,721 per 100,000 in 1998 (Table 11 and Figure 2). Regionally, physician office visit rates varied less than hospitalization rates, which ranged widely from year to year, even within individual geographic areas. The trend to increasing physician visits was consistent across all geographic regions. In 1998, the highest rate occurred in the West, 746 per 100,000, but this was only 10% higher than the lowest rate, seen in the Midwest. In 1998, the highest utilization of physician office services was for Caucasian males, followed by Asians, Hispanics, and African Americans. According to data from NAMCS for 1992–2000, 0.1% of all office

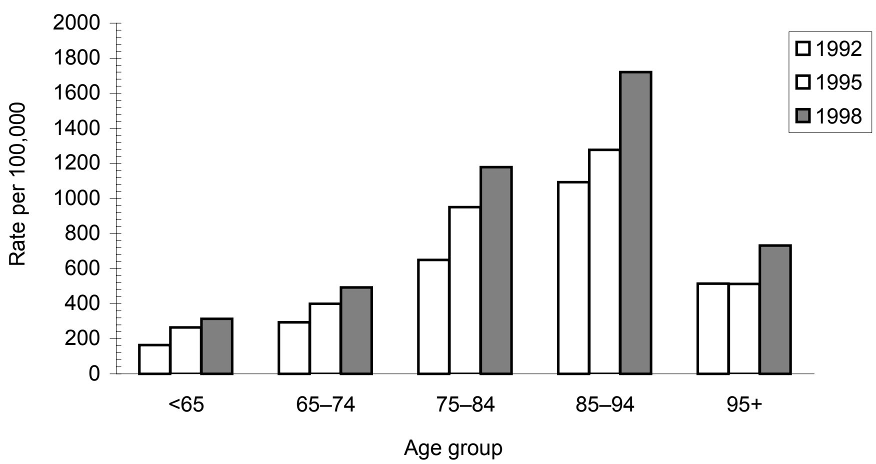

Figure 2. Physician office visits by male Medicare beneficiaries for urinary incontinence, by patient age and year.

SOURCE: Centers for Medicaid and Medicare Serivces, MedPAR, and 5% Carrier File, 1992, 1995, 1998.

Table 10. Frequency of urinary incontinence[a] in male VA patients seeking outpatient care, rate[b]

	1999		2000		2001	
	Primary Diagnosis	Any Diagnosis	Primary Diagnosis	Any Diagnosis	Primary Diagnosis	Any Diagnosis
Total	437	717	525	914	515	975
Age						
18–24	62	77	79	113	87	99
25–34	103	146	117	169	133	178
35–44	148	216	183	275	196	290
45–54	228	336	273	411	280	444
55–64	363	570	416	677	422	707
65–74	538	886	596	1,058	558	1,076
75–84	812	1,400	950	1,748	836	1,723
85+	1,227	2,243	1,489	2,792	1,365	2,908
Race/ethnicity						
White	597	963	696	1,197	688	1,264
Black	691	1,068	833	1,296	876	1,382
Hispanic	492	891	678	1,075	571	1,004
Other	549	899	634	1,129	536	894
Unknown	177	319	237	479	251	586
Region						
Midwest	398	693	484	928	459	937
Northeast	557	874	628	1,006	563	998
South	343	591	450	806	480	930
West	494	767	578	973	584	1,075
Insurance status						
No insurance/self-pay	344	541	408	660	394	690
Medicare/Medicare supplemental	679	1162	768	1,449	726	1,482
Medicaid	538	926	671	1,128	581	1,019
Private insurance/HMO/PPO	432	722	491	828	467	853
Other insurance	322	574	401	699	388	680
Unknown	1,244	2,035	1,076	1,937	416	648

HMO, health maintenance organization; PPO, preferred provider organization.

[a]Represents diagnosis codes for male urinary incontinence.

[b]Rate is defined as the number of unique patients with each condition divided by the base population in the same fiscal year x 100,000 to calculate the rate per 100,000 unique outpatients.

NOTE: Race/ethnicity data from clinical observation only, not self-report; note large number of unknown values.

SOURCE: Outpatient Clinic File (OPC), VA Austin Automation Center, FY1999–FY2001.

Table 11. Physician office visits by male Medicare beneficiaries with urinary incontinence listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	58,240	395 (392–399)	83,800	551 (547–554)	101,080	698 (694–702)
Total < 65	5,080	164 (160–169)	9,080	264 (258–269)	10,780	314 (308–320)
Total 65+	53,160	457 (453–461)	74,720	635 (630–639)	90,300	818 (812–823)
Age						
65–74	21,200	293 (289–297)	28,720	400 (395–404)	31,600	492 (486–497)
75–84	22,920	649 (641–657)	34,740	950 (940–960)	43,160	1,179 (1,168–1,190)
85–94	8,640	1,093 (1,070–1,116)	10,840	1,278 (1,254–1,302)	14,900	1,721 (1,694–1,748)
95+	400	515 (465–565)	420	512 (463–561)	640	732 (676–788)
Race/ethnicity						
White	50,280	405 (402–409)	74,320	572 (568–576)	88,900	727 (722–732)
Black	4,120	323 (313–333)	6,380	461 (449–472)	7,020	526 (514–538)
Asian	…	…	740	1,015 (943–1,088)	940	685 (642–729)
Hispanic	…	…	940	473 (443–504)	2,260	673 (646–701)
N. American Native	…	…	20	99 (55–144)	40	143 (100–186)
Region						
Midwest	15,480	417 (411–424)	20,540	533 (526–540)	23,880	646 (638–654)
Northeast	11,840	373 (367–380)	17,880	562 (554–570)	19,660	707 (698–717)
South	21,180	404 (399–410)	30,440	555 (549–561)	39,760	741 (734–748)
West	8,900	396 (388–404)	13,900	599 (589–609)	16,680	746 (735–757)

… data not available.

[a]Unweighted counts multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, MedPAR and 5% Carrier File, 1992, 1995, 1998.

Table 12. National physician office visits by adult males with urinary incontinence, count (95% CI), number of visits, percentage of visits, rate (95% CI)

	5-Year Count (95% CI)	Total No. Visits by Men 18+, 1992–2000	% of Visits	5-Year Rate (95% CI)
Primary diagnosis	989,688 (665,142–1,314,234)	1,122,162,099	0.1	1,079 (725–1,433)
Any diagnosis	1,660,627 (1,245,549–2,075,705)	1,122,162,099	0.1	1,811 (1,358–2,263)

[a]Rate per 100,000 based on the sum of weighted counts in 1992, 1994, 1996, 1998, 2000 over the mean estimated base population across those five years. Population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US male adult civilian non-institutionalized population.

SOURCE: National Ambulatory Medical Care Survey, 1992, 1994, 1996, 1998, 2000.

Table 13. Visits to ambulatory surgery centers by male Medicare beneficiaries with urinary incontinence listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	3,140	21 (21–22)	7,340	48 (47–49)	5,480	38 (37–39)
Total < 65	340	11 (9.8–12)	680	20 (18–21)	600	17 (16–19)
Total 65+	2,800	24 (23–25)	6,660	57 (55–58)	4,880	44 (43–45)
Age						
65–74	1,320	18 (17–19)	3,680	51 (50–53)	2,460	38 (37–40)
75–84	1,040	29 (28–31)	2,460	67 (65–70)	1,980	54 (52–56)
85–94	440	56 (50–61)	500	59 (54–64)	420	49 (44–53)
95+	0	0.0	20	24 (13–35)	20	23 (13–33)
Race/ethnicity						
White	2,700	22 (21–23)	6,800	52 (51–54)	4,820	39 (38–41)
Black	200	16 (13–18)	320	23 (21–26)	480	36 (33–39)
Asian	…	…	0	0.0	60	44 (33–55)
Hispanic	…	…	40	20 (14–26)	20	6.0 (3.3–8.6)
N. American Native	…	…	0	0.0	0	0.0
Region						
Midwest	1,280	35 (33–36)	2,200	57 (55–59)	1,720	47 (44–49)
Northeast	640	20 (19–22)	1,700	53 (51–56)	1,140	41 (39–43)
South	960	18 (17–19)	2,880	52 (51–54)	1,860	35 (33–36)
West	260	12 (10–13)	560	24 (22–26)	740	33 (31–35)

… data not available.
[a]Unweighted counts multiplied by 20 to arrive at values in the table.
[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.
[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.
NOTE: Counts less than 600 should be interpreted with caution.
SOURCE: Centers for Medicare and Medicaid Services, MedPAR and 5% Carrier File, 1992, 1995, 1998.

visits to physician offices by males were for UI as the primary diagnosis (Table 12). Because the counts were so low for this diagnosis, the five even years between 1992 and 2000 were collapsed to yield a physician rate of 1,079 per 100,000 for the five years combined (or 216 per 100,000 annually). When the scope of the definition was broadened to include UI as any diagnosis, the proportion remained unchanged, but the visit rate increased to 1,811 per 100,000 for the five years combined (or 362 per 100,000 annually).

Ambulatory surgery visits for men with UI (Table 13) were far less frequent than were physician office visits (Table 11). For men under 65, the rate increased between 1992 and 1995, then decreased to the 1998 level of 17 per 100,000. Likewise, the rate for men over 65 increased between 1992 and 1995, then fell slightly to the 1998 level of 44 per 100,000. This pattern of increasing rates followed by a slight decline was seen across all age groups for men 65 and over.

The pattern of change in rates of ambulatory surgery visits for regions mirrors the trend for age. That is, rates increased across all geographic regions between 1992 and 1995, then decreased for 1998, where the lowest rate, 33 per 100,00, was seen in the West.

It was not possible to calculate trends in outpatient UI surgery visit rates among ethnic groups because counts were too small to produce reliable estimates. The exception was the rate for Caucasian males, who showed an increase in outpatient surgical visits in 1995, with a subsequent reduction in 1998.

Nursing Home Care

Data from the National Nursing Home Survey (NNHS) for 1995, 1997, and 1999 are shown in Table

Table 14. Special needs of male nursing home residents regardless of continence status, count, rate[a] (95% CI)

	1995		1997		1999	
	Count	Rate	Count	Rate	Count	Rate
Has indwelling foley catheter or ostomy						
Yes	50,298	11,961 (10,569–13,352)	53,938	12,141 (10,731–13,552)	51,457	11,266 (9,941–12,591)
No	369,452	87,854 (86,453–89,254)	389,880	87,762 (86,348–89,176)	401,402	87,884 (86,497–89,271)
Question left blank	781	186 (3–368)	430	97 (0–210)	3,883	850 (385–1,315)
Requires assistance using the toilet						
Yes	207,587	49,363 (47,203–51,523)	221,599	49,882 (47,736–52,028)	241,558	52,887 (50,755–55,020)
No	141,870	33,736 (31,689–35,783)	133,378	30,023 (28,069–31,977)	128,251	28,080 (26,154–30,005)
Question skipped for allowed reason	69,267	16,471 (14,863–18,080)	86,814	19,542 (17,809–21,275)	81,977	17,948 (16,308–19,588)
Question left blank	1,807	430 (146–714)	2,459	553 (238–869)	4,956	1,085 (571–1,599)
Requires assistance from equipment when using the toilet						
Yes	57,463	13,664 (12,183–15,145)	59,329	13,355 (11,901–14,809)	67,782	14,840 (13,323–16,357)
No	143,213	34,055 (32,011–36,100)	149,218	33,589 (31,564–35,614)	162,895	35,665 (33,630–37,699)
Question skipped for allowed reason	211,137	50,207 (48,047–52,368)	220,191	49,565 (47,419–51,711)	210,228	46,028 (43,899–48,156)
Question left blank	8,719	2,073 (1,466–2,680)	15,510	3,491 (2,702–4,281)	15,837	3,467 (2,650–4,285)
Requires assistance from another person when using the toilet						
Yes	203,490	48,389 (46,230–50,548)	217,556	48,972 (46,827–51,117)	238,252	52,163 (50,029–54,297)
No	2,350	559 (237–881)	2,571	579 (234–924)	2,690	589 (237–941)
Question skipped for allowed reason	211,137	50,207 (48,047–52,368)	220,191	49,565 (47,419–51,711)	210,228	46,028 (43,899–48,156)
Question left blank	3,554	845 (451–1,239)	3,930	885 (482–1,287)	5,573	1,220 (681–1,759)
Has difficulty controlling urine						
Yes	218,491	51,956 (49,797–54,115)	232,536	52,344 (50,203–54,485)	242,189	53,025 (50,898–55,153)
No	170,988	40,660 (38,537–42,783)	175,090	39,413 (37,325–41,500)	177,128	38,781 (36,709–40,852)
Question skipped for allowed reason	29,338	6,976 (5,881–8,072)	36,416	8,197 (7,028–9,366)	34,206	7,489 (6,406–8,572)
Question left blank	1,715	408 (110–705)	207	47 (0–138)	3,220	705 (255–1,155)

[a]Rate per 100,000 adult male nursing home residents in the NNHS for that year.

SOURCE: National Nursing Home Survey, 1995, 1997, 1999.

14. The burden of UI in the nursing home setting is clear when activities of daily living are considered. In 1999, more than half of the men in nursing homes were reported to have difficulty controlling their urine and required assistance using the toilet; 14.8% required assistance from equipment and 52% required assistance from another person. Eleven percent had either an indwelling foley or an ostomy. There was little change in these parameters over the years studied. In fact, from 1997 to 1999, there was a small increase in the rate of patients requiring assistance from another person to use the toilet.

TREATMENTS

In general, treatment options for incontinence are based on the type of incontinence rather than the gender of the patient. For this reason, many studies and reviews include case mixes of men and women (20). The exceptions are in the management of issues related to the prostate gland (e.g., post-radical prostatectomy) and male neurogenic bladder, where treatment addresses the male sphincter. In these areas, where large groups of men have been studied, gender-specific treatment effects are apparent.

Nonpharmaceutical / Nonsurgical

Behavioral therapies, including pelvic floor muscle (PFM) exercises, biofeedback, and bladder training, are the least invasive options and have a low rate of side effects. They may be used both for cognitively impaired/institutionalized patients and for independently living, cognitively aware geriatric patients able to participate in learning new skills. There is a considerable body of scientific evidence supporting the effectiveness of behavioral therapy, but most subjects in those reports are women. Most of the research on conservative treatment of UI in men focuses on post-prostatectomy incontinence.

A recent review of the Cochrane database found only 6 randomized controlled trials of conservative approaches to management of post-prostatectomy incontinence. Studies were moderate in quality, and the authors concluded, "Men's symptoms tend to improve over time, irrespective of management. The value of the various approaches to conservative management of post-prostatectomy incontinence remains uncertain" (21).

PFM exercises, often attributed to Dr Kegel, refer primarily to pelvic muscle training as a means of reducing stress incontinence in women (22). In a randomized controlled trial of PFM exercises in 58 consecutive post-prostatectomy patients with a four-week follow-up, Porru et al. (23) reported more rapid resolution of UI symptoms and significantly better quality of life in the treatment group. A Cochrane review of PFM exercises reported no difference in the occurrence of post-operative UI between patients who had pre-prostate-surgery PFM training and the control group (24, 25). There are no randomized controlled trials in the literature concerning PFM exercises for non-post-operative men (26).

Biofeedback affords patients immediate observed information on performance of muscle contraction, allowing them to adjust their voiding technique accordingly to achieve maximum effect. A randomized, comparative study of biofeedback vs verbal feedback for learning PFM exercises after radical prostatectomy showed no difference in measures of UI at six-month follow-up (27).

Bladder training (a systematic approach to modifying voiding patterns) and prompted voiding (timely reminders to void for people with or without dementia) have also been the subject of Cochrane reviews. Most studies that met review criteria were in women, and no conclusions have been drawn about the benefit of these approaches for men (28, 29).

Results of combinations of strategies in men following prostatectomy are contradictory. Moore et al. (30) studied PFM exercises alone and in combination with electrical stimulation vs no treatment following prostatectomy and found no difference in UI among groups. Van Kampen et al. (31) compared combinations of PFM exercises with initial electrical stimulation and biofeedback vs sham electrical stimulation post-prostatectomy. Patients with urge incontinence also received bladder training. The active treatment group fared better in terms of duration and degree of continence and quality of life. Data for urge incontinence patients were not analyzed separately. In a randomized controlled trial by Vahtera et al. (32) of electrical stimulation followed by biofeedback and PFM exercises vs no treatment in 30 men and 50 women with detrusor hyperreflexia associated with multiple sclerosis, there was a significant improvement in subjective symptoms in the male group only.

Pharmacological

The use of medications for the treatment of stress incontinence in males is anecdotal. Anticholinergic drugs (e.g., oxybutynin and tolterodine) are more effective than placebo in treating overactive bladder syndrome, which may include urgency incontinence. Systematic literature reviews concerning pharmacological treatment of urge incontinence (20) and overactive bladder syndrome with anticholinergic drugs (33, 34) reveal significant symptom improvement. Although these studies involved male subjects, the men were not analyzed separately.

Surgical

Inpatient surgical procedures for male Medicare patients diagnosed with UI decreased from 1,804 per 100,000 men with UI in 1992 to 1,751 per 100,000 in 1995 and then to 1,337 per 100,000 men with UI in 1998. The counts of procedures performed in ambulatory surgical centers more than quadrupled during this same period (Table 15); however, this trend should be interpreted with caution, given the small numbers.

According to data from the Center for Health Care Policy and Evaluation, the rate of surgical correction of UI (including revision or repair of an artificial sphincter) was 4.8 per 100,000 males having commercial health insurance in 2000 (Table 16). Rates for prior years did not reveal counts high enough to make reliable estimates about trends in this population, nor do the data reveal the specific types of surgery done.

Urgency Incontinence/Neurogenic Bladder

Augmentation cystoplasty is performed primarily for neurogenic bladder. Although many subjects in studies of this treatment are male, results are rarely reported by gender (35). There are no randomized controlled trials of augmentation cystoplasty in the literature. Electrostimulation (sacral nerve stimulation, neuromodulation) in men sends sensory input through the pudendal nerve to inhibit detrusor activity (36). Electrodes can be placed externally (in the rectum) or can be internally implanted. A review of the literature (5) reported improvement in urge incontinence in as many as 82.5% of subjects, but men and women were not reported separately.

Prevention

Prevention is typically divided into three types of measures: primary (those that prevent onset of a

Table 15. Urinary incontinence procedures for male Medicare beneficiaries, count[a], rate[b]

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total	1,100	2,363	1,640	2,563	1,700	2,274
Operation for correction of incontinence	980	2,105	1,420	2,219	1,440	1,926
Ambulatory surgery center	140	301	280	438	420	562
Inpatient	840	1,804	1,120	1,751	1,000	1,337
Hospital outpatient	0	0.0	20	31	20	27
Physician office	0	0.0	0	0.0	0	0.0
Revision or repair of prosthetic	120	258	220	344	260	348
Ambulatory surgery center	0	0.0	40	63	40	53
Inpatient	100	215	160	250	220	294
Hospital outpatient	0	0.0	20	31	0	0.0
Physician office	20	43	0	0.0	0	0.0

[a]Unweighted counts multiplied by 20 to arrive at values in the table.
[b]Rate per 100,000 Medicare beneficiaries diagnosed with urinary incontinence in the same demographic stratum.
NOTE: Counts less than 600 should be interpreted with caution.
SOURCE: Centers for Medicare and Medicaid Services, MedPAR and 5% Carrier File, 1992, 1995, 1998.

Table 16. Urinary incontinence procedures for males having commercial health insurance in 2000, count[a], rate[b]

	Count	Rate
Total		
Operation for correction of incontinence	48	4.8
Ambulatory surgery	12	*
Inpatient	12	*
Revision/repair of prosthetic		
Ambulatory surgery	21	*
Inpatient	3	*

*Figure does not meet standard for reliability or precision.
[a]Counts less than 30 should be interpreted with caution.
[b]Rate per 100,000 based on member months of enrollment in calendar year.
SOURCE: Center for Health Care Policy and Evaluation, 2000.

condition), secondary (those that prevent progression of the condition from its preclinical or asymptomatic state to its clinical or symptomatic state), and tertiary (those that impede the progression of a condition or its complications once it is clinically manifest). Primary prevention is most germane to UI. The principal potentially modifiable risk factors for UI in men are prostatectomy (transurethral or radical) and other medical conditions, including stroke, dementia, recurrent cystitis, bladder cancer, stool impaction, reduced mobility, diabetes, chronic cough, and medications (e.g., diuretics and hypnotics) (37).

Because as many as 30% of patients experience some degree of incontinence following radical prostatectomy (18), techniques to minimize the risk of postoperative incontinence are relevant to prevention of the disorder. Physical therapy to strengthen the pelvic floor musculature has been evaluated as primary prevention for patients undergoing prostate cancer in at least two randomized controlled trials, neither of which found a benefit (23, 24). Various surgical and perioperative techniques have also been suggested to reduce the risk of post-prostatectomy UI, including modified apical dissection and construction of a tubularized neourethra (18). Using the SEER-Medicare linked database, Begg et al. (38) described significantly lower rates of UI among men undergoing radical prostatectomy when the procedures were done in high-volume hospitals by high-volume surgeons. Of course, effective efforts to prevent prostate cancer would also decrease the incidence of male incontinence.

The goal of primary prevention for incontinence not associated with prostatectomy is to prevent the conditions believed to increase the risk of UI, including stroke, dementia, diabetes, and chronic lung disease. Modification of additional risk factors may in turn reduce the incidence of UI. Such preventive measures include controlling diabetes, preventing or treating constipation, maximizing mobility, treating symptomatic urinary tract infections, and avoiding medications that contribute to incontinence. There are apparently no studies evaluating such measures; nonetheless, it is logical to recommend them, as they are consistent with good clinical care.

ECONOMIC IMPACT

As baby boomers age, the number of individuals with incontinence rises and the heavy economic burden of UI on society grows. Governments and health care institutions are increasingly concerned about the burden of this disease, particularly since UI is one of the leading causes of individuals losing the ability to live independently and having to enter a care facility.

Direct costs of UI are borne by both the health sector and individual patients and their families. Direct costs related to operating costs for the health sector include those of both inpatient and outpatient services, particularly in the areas of supplies, equipment, and health professionals. Some direct health sector costs, such as the cost of supplies and health professionals' time, are *variable*, while others, such as the overhead incurred in running a hospital or clinic, are *fixed*. The vast majority of patients do not seek medical care; it has been estimated that only 2% of individuals living in the community and 5% of those living in institutions sought treatment for UI each year (2). Direct costs borne by the patient include the costs of medication and supplies to protect against incontinence. Padding and incontinence protection devices for men are somewhat different from those for women. Some men use gender-specific protective undergarments, which are often more costly than female garments, and some choose to use condom drainage or an external device such as a penile clamp.

Indirect costs include lost earnings for both the patient and family or friends who provide care. Since the prevalence of UI increases dramatically with age, the working status of the 60+ age group is of particular importance.

Estimating the economic burden of UI is complicated by two factors. First, UI is often not coded as the primary diagnosis, making it difficult to quantify the incremental costs of a hospitalization or ambulatory visit attributable to UI. For example, complications of UI such as skin irritation, urinary tract infections, nursing home placements, and fractures incurred when rushing to the toilet may easily be overlooked in claims-based analyses. Second, relatively few individuals with incontinence receive medical treatment for the condition. As a result, even the most rigorous attempts to quantify the economic costs of UI underestimate the true burden. In this section, we estimate the costs of UI, using claims-based data, supplemented by findings from published studies, recent national surveys, and employer data. Because UI is uncommon in men, costs will be proportionately low compared to UI in women.

Published estimates of national annual expenditures for UI vary widely. One study found that the costs of UI-related conditions for persons age 15 and older exceeded $16.3 billion in 1995 dollars (39). Another study considered only adults 65 and over and reported that UI treatment cost $26.3 billion (2). Both studies included estimates of costs for UI-related medical complications, nursing home stays, and supplies such as pads and laundry, as well as the indirect costs of UI. Although the reasons for this wide discrepancy are not entirely clear, both estimates indicate a substantial economic burden on the American public. The data presented in this chapter address individual components of UI-related costs; hence, they may not be directly comparable to aggregate estimates drawn from the literature.

Direct Costs

A small, but notable, proportion of Medicare expenditures for male UI is accounted for by males under age 65, that is, disabled individuals (Table 17). This is consistent with clinical experience among younger men with spinal cord injury and other neurological disorders that can affect the urinary tract. Among male Medicare beneficiaries age 65 and over, total costs doubled between 1992 and 1995, from $19.1 million to $38.1 million, then remained stable in 1998 (Table 18). Most of the increase occurred in the ambulatory surgery setting, although expenditures for physician office visits also rose substantially. While the amount spent in the inpatient setting rose in absolute terms, it declined from 44% to 29%, consistent with secular trends toward outpatient care in the 1990s (Figure 3).

Table 17. Expenditures for male Medicare beneficiaries for the treatment of urinary incontinence (in millions of $), by site of service, 1998

	Total Annual Expenditures	
Site of Service	Age < 65	Age 65+
Inpatient	*	11.3
Outpatient		
Physician office	1.7	15.2
Hospital outpatient	0.3	1.3
Ambulatory surgery	1.3	10.6
Emergency room	0.1	0.6
Total	3.4	39.0

*Figure does not meet standard for reliability or precision.
SOURCE: Centers for Medicare and Medicaid Services, 1998.

Given the inherent limitations in deriving treatment costs from claims data, the Urologic Diseases in America analyses used multivariate regression models to estimate the incremental costs associated with a primary diagnosis of UI (Table 19). The study sample consisted of nearly 280,000 primary beneficiaries age 18 to 64 who had employer-provided coverage throughout 1999. Regression models were estimated for annual medical and pharmacy costs per person. The main independent variables included a set of measures to describe medical and drug benefits (such as deductibles, co-insurance, and co-payments), patient demographics (age, gender, work status), area characteristics (urban residence, median household income in zip code), and a set of comorbidities derived from the medical claims (binary indicators of 26 disease conditions such as diabetes, asthma, and hypertension). The regression results were used to predict average medical and pharmacy costs for persons with and without a primary diagnosis of

Table 18. Expenditures for male Medicare beneficiaries age 65 and over for treatment of urinary incontinence (in millions of $), (% of total)

	Year		
	1992	1995	1998
Total	19.1	38.1	39.0
Inpatient	8.4 (43.9%)	10.3 (27.0%)	11.3 (29.0%)
Outpatient			
Physician office	6.2 (32.5%)	11.0 (28.9%)	15.2 (39.0%)
Hospital outpatient	0.6 (3.1%)	2.0 (5.2%)	1.3 (3.3%)
Ambulatory surgery	3.3 (17.3%)	13.9 (36.5%)	10.6 (27.2%)
Emergency room	0.6 (3.1%)	0.9 (2.4%)	0.6 (1.5%)

NOTE: Percentages may not add to 100% because of rounding.
SOURCE: Centers for Medicaid and Medicare Services, 1992, 1995, 1998.

UI. Total annual expenditures in 1999 for privately insured adults age 18 to 64 with a primary diagnosis of UI were $7,702, nearly $4,500 more than those for similar individuals without a diagnosis of UI. Nonetheless, the aggregate cost is low, given the relative infrequency of urinary incontinence claims in men.

Although data on pharmaceutical costs are not available by gender, Table 20 presents the relative expenditures for the medications most often used to treat patients with UI. Almost half of the expenditures in 1996–1998 were for alpha-blockers, generally prescribed to older men with bladder outlet obstruction; this suggests that prostate enlargement contributes to both the human and the financial cost of UI. Not surprisingly, most of the actual prescriptions for UI were written for anticholinergic agents. Because these were predominantly generics, they

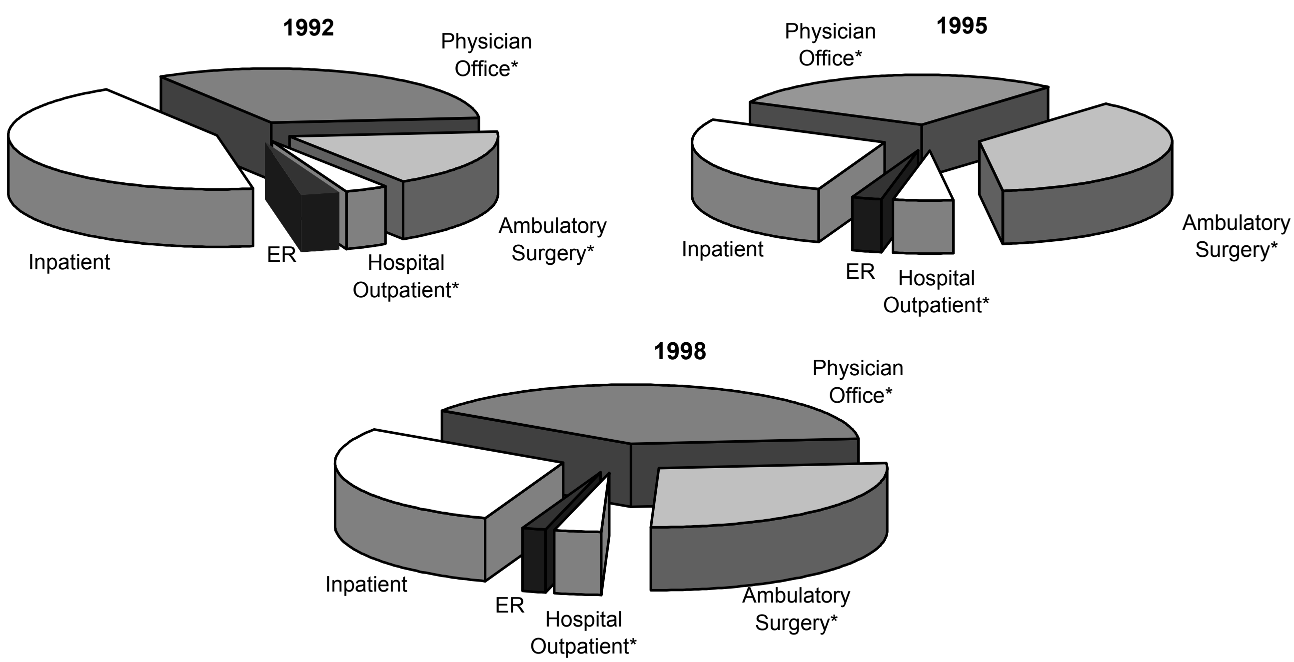

Figure 3. Expenditures of male Medicare beneficiaries age 65 and over for treatment of urinary incontinence (in millions of $).

SOURCE: Centers for Medicaid and Medicare Serivces, 1992, 1995, 1998.

Table 19. Estimated annual expenditures of privately insured workers with and without a medical claim for urinary incontinence (UI) in 1999[a] (in $)

	Annual Expenditures (per person)			
	Persons without UI (N=277,803)	Persons with UI (N=1,147)		
	Total	Total	Medical	Rx Drugs
All	3,204	7,702	6,099	1,604
Age				
18–44	2,836	7,361	5,993	1,369
45–54	3,305	8,442	6,695	1,747
55–64	3,288	7,247	5,623	1,623
Gender				
Male	2,813	*	*	*
Female	3,933	*	*	*
Region				
Midwest	3,086	8,500	6,861	1,639
Northeast	3,085	7,236	5,502	1,734
South	3,416	8,329	6,851	1,477
West	3,237	8,082	7,118	964

Rx, prescription.

*Figure does not meet standard for reliability or precision.

[a]The sample consists of primary beneficiaries ages 18 to 64 having employer-provided insurance who were continuously enrolled in 1999. Estimated annual expenditures were derived from multivariate models that control for age, gender, work status (active/retired), median household income (based on zip code), urban/rural residence, medical and drug plan characteristics (managed care, deductible, co-insurance/co-payments), and 26 disease conditions.

SOURCE: Ingenix, 1999.

Table 20. Average annual spending and use of outpatient prescription drugs for treatment of urinary incontinence (both male and female), 1996–1998[a]

Drug Name	Number of Rx Claims	Mean Price ($)	Total Expenditures ($)
Alpha-blocker			
Cardura®	378,895	43.71	16,561,486
Anticholinergics			
Oxybutynin	485,044	19.79	9,599,027
Imipramine (brand)	247,249	13.13	3,246,379
Imipramine (generic)	162,184	6.59	1,068,790
Ditropan®	130,390	32.91	4,291,146
TOTAL	1,403,762		34,766,829

Rx, prescription.

[a]Estimates include prescription drug claims with a corresponding diagnosis of urinary incontinence and exclude drugs with fewer than 30 claims. Including expenditures on prescription drugs with fewer than 30 claims (unweighted) would increase total drug spending by approximately 83%, to $63.7 million.

SOURCE: Medical Expenditure Panel Survey, 1996–1998.

represent a disproportionately small fraction of total drug expenditures in this period. Since 1998, new long-acting agents in this class have been developed and marketed, altering the economic landscape for the pharmaceutical management of individuals with UI.

Additional direct patient costs include those of pads, diapers, condom catheters, indwelling catheters, and penile clamps. Little detailed information on these costs is available; however, they are thought to be substantial, owing in large part to out-of-pocket outlays that aggregate over many years. Wagner and Hu estimated the annual cost of UI-related supplies to be $7.1 billion for individuals in the home setting and $4.3 billion for those in the institutional setting; supplies related to catheterization accounted for $224 million of the total expenditures (2).

Indirect Costs

The indirect financial burden of incontinence also falls on "informal caregivers," i.e., family and friends. Data from the 1993 Asset and Health Dynamics Study of persons over the age of 70 indicate that continent men received 7.4 hours of care per week, increasing to 11.3 hours and 16.6 hours for men with incontinence who did not and did use pads for protection, respectively. The cost of this care was an additional $1,700 per man without pads and $4,000 per man with pads (40)

Relatively little work loss is associated with UI among men, as indicated in 1999 data from Marketscan (Table 21). In fact, of the 51 men in this dataset with claims for UI, only 8% missed work because of it, about three times lower than the rate for women. Because these 51 men represent only 0.4% of the men in the sample, the proportion of men missing work for claims related to UI is only 0.03%. Among those men who missed work, the average annual work absence was only 2.3 hours, all for outpatient services, less than one-tenth the number for women. Men had much less time away from work for each outpatient visit than did women (Table 22).

RECOMMENDATIONS

The newly recommended changes in the definition of UI and its subtypes will conform better to the new ICD-10 classification, which should improve the accuracy of coding for UI. Studies are needed

Table 21. Average annual work loss of persons treated for urinary incontinence (95% CI)

			Average Work Absence (hrs)		
Gender	Number of Workers[a]	% Missing Work	Inpatient	Outpatient	Total
Male	51	8%	0.0	2.3 (0.0–5.0)	2.3 (0.0–5.0)
Female	319	23%	7.1 (1.7–12.6)	21.6 (11.3–31.9)	28.7 (14.9–42.5)

[a]Individuals with an inpatient or outpatient claim for urinary incontinence and for whom absence data were collected. Work loss is based on reported absences contiguous to the admission and discharge dates of each hospitalization or the date of the outpatient visit.

SOURCE: MarketScan, 1999.

Table 22. Average work loss associated with a hospitalization or an ambulatory care visit for treatment of urinary incontinence (95% CI)

	Inpatient Care		Outpatient Care	
Gender	Number of Hospitalizations[a]	Average Work Absence (hrs)	Number of Outpatient Visits	Average Work Absence (hrs)
Male	*	*	82	1.4 (0.1–2.7)
Female	*	*	625	11.0 (7.5–14.6)

*Figure does not meet standard for reliability or precision.

[a]Unit of observation is an episode of treatment. Work loss is based on reported absences contiguous to the admission and discharge dates of each hospitalization or the date of the outpatient visit.

SOURCE: MarketScan, 1999.

on the outcome of UI treatment specifically for men and on the role of ethnicity in both prevalence and the likelihood of seeking treatment. Given the aging population, the impact of UI within nursing home settings calls for further research into prevention, treatment, and management practices that could lessen the impact of UI on both the patients and the health care system.

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CHAPTER 5

Urinary Incontinence in Children

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Contents

Urinary Incontinence in Children

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SUMMARY

Most of the health care for pediatric urinary incontinence is delivered in the outpatient setting. During the 1990s, approximately 417,000 visits were made per year to physicians' offices and hospital outpatient departments by children with urinary incontinence listed as any diagnosis. Although the majority of these outpatient visits cannot be classified by underlying disease process, nocturnal enuresis is a listed diagnosis in up to 38% of them.

Of the commercially insured children seen for incontinence in the outpatient setting, 75% were 3- to 10-year-olds, and 15% to 20% were 11- to 17-year-olds. Only 2% to 3% of the outpatient visits were made by children under the age of 3, in whom urinary incontinence seldom has a pathologic basis.

Urinary incontinence is a relatively common reason for children to seek medical care, but it rarely requires hospitalization. When it does require inpatient care, the average length of stay is between 5 and 7 days, and the length of stay appears to be even greater in facilities providing tertiary care. Fewer than 10 of every 100,000 visits for incontinence in children are ambulatory surgical visits.

The economic burden of pediatric urinary incontinence is difficult to quantify. Data are not currently available on aggregate direct costs for inpatient, outpatient, or surgical venues. Costs for inpatient care for pediatric urinary incontinence, like those for other conditions, reflect hospital length of stay. The cost per visit for outpatient surgical procedures has increased steadily during the past decade.

DEFINITION

In contrast to the adult population, in which the inability to maintain voiding control is virtually always considered pathological, a child with urinary incontinence must be evaluated within the context of his or her developmental age. The impact on social functioning evolves as the child progresses through the first several years of life and is heavily influenced by social, cultural, and environmental factors.

Development of Voiding Control

In the infant, normal micturition occurs via a spinal-cord-mediated reflex. As the bladder fills, it surpasses an intrinsic volume threshold, which results in a spontaneous bladder contraction. This vesico-vesical reflex coordinates relaxation of the bladder neck and external urethral sphincter. Voiding is complete, occurs at low pressure, and is autonomous. In the infant, the volume threshold for urination is low; the infant voids approximately 20 times per day (1).

As the infant develops and neural pathways in the spinal cord mature, the vesico-vesical reflex is suppressed. A more complex voiding reflex, mediated at the level of the pons and midbrain, assumes coordination of voiding control. During this transitional period, functional bladder capacity increases, and the frequency of urination decreases. By 2 years of age, most children void 10 to 12 times per day, are aware of bladder fullness, and can announce their need to urinate (1). Between 2 and 3 years of age, children attain the ability to volitionally postpone voiding and to initiate voiding at bladder volumes less than capacity. During this period, an adult pattern of daytime urinary control emerges, characterized by a stable, quiescent bladder.

As with other developmental milestones, the time course for attaining urinary continence demonstrates individual variability. The majority of children master toileting prior to entrance into school, (i.e., by around 5 years of age). Beyond this age, incontinence becomes an increasing social concern. Brazelton and colleagues studied the development of voiding control and found that 26% of children had attained daytime continence by the age of 24 months, 52.5% by 27 months, 85% by 30 months, and 98% by 3 years of age (2). Bloom and colleagues studied 1,186 normal children and found that the age at which toilet training was achieved ranged from 9 months to 5.25 years, with a mean of 2.4 years. Toilet training occurred slightly earlier in females (3).

Defining pediatric urinary incontinence has historically been complicated by the lack of standardized definitions for pediatric voiding disorders. In 1997, the International Children's Continence Society attempted to ameliorate this problem by generating a report on standardization and definitions for lower urinary tract dysfunction in children (4). In the consensus report, urinary incontinence is defined as *the involuntary loss of urine, objectively demonstrable, and constituting a social or hygienic problem.*

Urethral incontinence occurs via a native or reconstructed urethra and is stratified as follows:

- stress incontinence, the involuntary loss of urine occurring in absence of detrusor contraction, when intravesical pressure exceeds urethral pressure;
- reflex incontinence, the loss of urine due to detrusor hyperreflexia and/or involuntary urethral relaxation in the absence of the sensation to void;
- overflow incontinence, any involuntary loss of urine associated with overdistension of the bladder;
- urge incontinence, involuntary loss of urine associated with a strong desire to void.

Extraurethral incontinence is defined as urine loss via a conduit other than the urethra, such as ectopic ureters (in girls) and vesicostomies.

Enuresis denotes a physiologically coordinated void occurring at an inappropriate or socially unacceptable time or place. The most recent version of the Diagnostic and Statistical Manual (DSM IV-TR) defines the essential features as repeated voiding of urine into bed or clothes and two occurrences per week for at least three months, causing clinically significant distress or impairment in social, academic (occupational), or other important areas of functioning. The child must have reached an age at which continence is expected (a chronological age of 5 years, or a mental age of 5 years for a developmentally delayed child), and the condition must not be due exclusively to the direct physiological effects of a substance or general medical condition (5).

Etiologic Classification of Pediatric Urinary Incontinence

Childhood urinary incontinence can be classified as organic or functional. Organic incontinence refers to an underlying disease process, which can be either neurogenic or structural in nature. Neurogenic forms of incontinence can be congenital or acquired; they include etiologies such as neurospinal dysraphism, sacral agenesis, cerebral palsy, spinal cord injury, and tethered spinal cord. Structural incontinence refers to developmental, iatrogenic, or traumatic anatomic abnormalities of the lower urinary tract that interfere with the urinary system's ability to hold, store, or evacuate urine. Structural incontinence includes diseases such as exstrophy-epispadias complex, ectopic ureter, and posterior urethral valves.

Functional incontinence is that in which no anatomic or neurologic abnormality can be found. It comprises a heterogeneous group of disorders, including the urge syndrome, dysfunctional voiding, lazy bladder, and enuresis. The prevalence of functional incontinence in the pediatric population merits special focus.

Urge incontinence occurs predominantly in girls and is commonly associated with other medical complaints, such as constipation, recurrent urinary tract infections, and vesicoureteral reflux. It is manifested clinically by urinary frequency, the sudden imperative to void, and holding maneuvers such as squatting on the heel (the so-called Vincent's Curtsy), crossing the legs, and flexing the pelvic floor muscles. This symptom complex is the result of overactivity of the detrusor muscle, which results in sudden bladder contractions at volumes below age-expected capacity. Incontinence occurs in those children who are unable to suppress bladder contraction volitionally.

The inability to maintain detrusor quiescence is common during the transitional phase between infantile and adult patterns of urinary control. Urge incontinence represents recurrence or persistence of this transitional phase.

Dysfunctional voiding includes several patterns of voiding with a single underlying feature: overactivity of the pelvic floor muscles during micturition. It is likely that urge incontinence and dysfunctional voiding represent different time points along the natural history of a single disease process. Children with urgency symptoms learn to abort detrusor contractions by volitional contraction of the external urethral sphincter and pelvic floor muscles. The long-term consequences of pelvic floor overactivity include high-pressure voiding, urinary infections, ureteral reflux, and, ultimately, decompensation of the detrusor muscle. Urinary incontinence can occur at any point along the continuum and results from infection, inefficient holding response, or overflow incontinence.

Enuresis is characterized by synergistic bladder-urethral function and typically occurs while the child is asleep (enuresis nocturna). This disorder is extraordinarily common in young children, with a reported incidence of 15% to 20% in 5-year-olds. It is characterized by spontaneous resolution, with 15% resolving each year after the age of 5. At age 7, the prevalence is approximately 8%. Approximately 2% of 15-year-olds continue to have wet nights (6).

A rare type of enuresis, giggle incontinence (enuresis risoria), occurs only during intense laughter. It is characterized by an abrupt, uncontrollable bladder contraction. Bladder emptying is generally complete. Affected individuals often modify their social interactions to avoid situations that are likely to induce laughter. The term diurnal enuresis (enuresis diurna) is commonly used to describe daytime wetting. A better term for this disorder is diurnal incontinence.

Vaginal voiding refers to a specific form of wetting that is characterized by post-void dribbling. It is seen predominantly in slender females who are unable to adopt an appropriate posture while voiding. This leads to trapping of urine in the vagina. It can also be seen in overweight females who are unable to adequately separate their labia during urination. The treatment of vaginal voiding involves modification of voiding posture to prevent pooling of urine in the vagina.

DIAGNOSIS

Evaluation of a child with incontinence typically begins in an office-based setting. A thorough medical history will delineate the pattern of incontinence and may identify underlying neurologic or structural anomalies. Parents are carefully questioned about the child's voiding habits, including straining, urinary frequency, posturing, pain with urination, and infection. A meticulous obstetrical history will reveal evidence of fetal distress, anoxia, birth trauma, hydronephrosis, or oligohydramnios. Developmental delays or impaired upper- or lower-extremity motor skills warrant careful attention. The association of encopresis and wetting in the older child raises the suspicion of occult neuropathy.

The physical examination should include inspection of the abdomen, genitalia, and back, as well as a directed neurologic examination. The lower back is inspected for scoliosis and stigmata of occult spinal dysraphism, such as a sacral dimple, hair patch, hemangioma, or lipoma. The coccyx is examined for evidence of sacral agenesis. The genital exam may disclose labial adhesions or an abnormal urethral position in females, or urethral abnormalities in males.

Most patients brought for evaluation before the age of 5 require no more than a history and physical examination. Additional diagnostic studies in patients younger than 5 are generally reserved for those who have evidence of a structural or neurologic abnormality or associated urinary tract symptoms such as infection or hematuria.

Noninvasive diagnostic studies used to evaluate incontinence include urinalysis, spinal tomography, urine-flow measurement, electromyography, and renal/bladder ultrasonography. Invasive studies, such as voiding cystography, and multichannel urodynamic evaluation are reserved for selected clinical situations. These procedures are generally performed in an outpatient setting.

Patients with functional incontinence are treated on an ambulatory basis with observational, medical, or behavioral therapy. Only rarely does a patient with functional incontinence require surgical intervention, and then only after all nonsurgical interventions have been exhausted. Inpatient treatment is largely reserved for those with neurologic or structural abnormalities who require surgical therapy.

ANALYTIC PERSPECTIVE

Pediatric urinary incontinence is commonly seen in both urologic and general pediatric practice. The contemporary literature is replete with patient-based and specialty department-based investigations of voiding disorders in children. Unfortunately, there is a paucity of population-based investigations of these conditions. Data collected from existing health care utilization databases do, however, provide insight into the trends in utilization of services for pediatric incontinence. An important caveat is that undercoding or miscoding may lead to undercounting of many conditions which fall under the umbrella of pediatric incontinence.

Most of the data in this chapter come from five databases. The data include observations derived from both public and proprietary sources and represent patient encounters in many health care settings. Both commercially insured and government-insured pediatric populations are included. In all cases, pediatric incontinence has been identified for analysis using the relevant 5-digit ICD-9 codes. Patients meeting criteria for inclusion are stratified where possible by age, gender, geographic region, and race/ethnicity. The disease codes used to define urinary incontinence in each of these databases are listed in Table 1.

The pediatric group is defined as patients 0 to 17 years of age. The youngest age group consists of patients less than 3 years of age and represents a cohort in which the majority are physiologically and developmentally incapable of voiding control. Children between the ages of 3 and 11 constitute the cohort in which incontinence encounters are most common. Adolescents and young adults aged 11 to

Table 1. Codes used in the diagnosis and management of pediatric urinary incontinence

Individuals under 18 with one of the following ICD-9 diagnosis codes, but not a coexisting 952.xx or 953.xx code:

307.6	Enuresis
596.59	Other functional disorder of bladder
596.52	Low bladder compliance
596.51	Hypertonicity of bladder (overactive bladder specified in 2001)
596.8	Other specified disorders of bladder
596.9	Unspecified disorder of bladder
599.8	Other specified disorders of urethra and urinary tract
599.81	Urethral hypermobility
599.82	Intrinsic urethral sphincter deficiency (ISD)
599.83	Urethral instability
599.84	Other specified disorders of urethra
625.6	Stress incontinence, female
788.3	Urinary incontinence
788.31	Urge incontinence
788.3	Urinary incontinence, unspecified
788.32	Stress incontinence, male
788.33	Mixed incontinence, male, female
788.34	Incontinence without sensory awareness
788.36	Nocturnal enuresis
788.37	Continuous leakage
788.39	Other urinary incontinence

17 are included in a separate cohort. More detailed age stratification is impossible because of limited sample sizes in the datasets. These age strata present methodological limitations in analyzing nocturnal enuresis, about which awareness increases at about age 7 when children start school and are exposed to a broader social environment. Eighteen-year-olds are included in the adult analyses.

Results are reported within three venues of health care delivery—inpatient, outpatient, and ambulatory surgery—followed by an economic perspective. In general, datasets are analyzed by both primary and any listed diagnoses of incontinence. Trend analyses are available for databases with serial years of data.

Given the heterogeneity of the incontinence population and the limitations of ICD-9 coding, it is impossible to stratify subjects etiologically. Samples in which raw counts are less than 30 have been suppressed and are not presented in this chapter. The analyses reported here are limited by the absence of national data on the use of prescription medications for children with incontinence.

TRENDS IN HEALTH CARE RESOURCE UTILIZATION

Inpatient Care

Urinary incontinence is a common reason for care-seeking by the pediatric population, but it requires hospitalization far less frequently than is the case for adults. The rate of annual admissions nationwide for a primary diagnosis of incontinence is less than 1 per 100,000 children (Table 2). There is no indication that these numbers changed substantially between 1994 and 2000. However, over the same time period, the average length of hospital stay increased from 4.7 to 5.6 days. Hospital stays were slightly longer, on average, for patients admitted to urban hospitals than for the total group studied (Table 3).

Table 2. National inpatient hospital stays by children with urinary incontinence listed as primary diagnosis, count, rate[a] (95% CI)

	Count	Rate
1994	283	0.4 (0.2–0.6)
1996	208	0.3 (0.1–0.4)
1998	195	0.3 (0.1–0.4)
2000	201	0.3 (0.1–0.4)

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US civilian non-institutionalized population under 18 years of age.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 3. Trends in mean inpatient length of stay (days) for children hospitalized with urinary incontinence listed as primary diagnosis

	Length of Stay
1994	4.7
1996	5.1
1998	5.3
2000	5.6

MSA, metropolitan statistical area.

*Figure does not meet standard for reliability or precision.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

The National Association of Children's Hospitals and Related Institutions (NACHRI) database provides information on several aspects of inpatient care in the nation's pediatric hospitals, including data on length of hospital stay for calendar years 1999 to 2001 (Table 4). A cohort of 1,251 patients with urinary incontinence listed as the principal diagnosis was identified. The average length of hospitalization for these patients was 6.9 days. The duration was greater for older children, averaging 7.8 days in the 11- to 17-year-old cohort, compared with 4.5 days for patients under 3 years of age. Duration of hospitalization did not vary by gender, race/ethnicity, or geographic region. Unlike the length of stay reported in the Health Cost and Utilization Project (HCUP) data, length of stay in the NACHRI data was stable over the time frame studied (Tables 3 and 5). Because NACHRI collects data primarily from tertiary-care pediatric specialty hospitals, its findings are likely weighted toward patients receiving higher intensity care than is represented in the population-based HCUP.

Outpatient Care

Most of the evaluation and management of incontinence in children is performed in physicians' offices. The National Hospital Ambulatory Medical Care Survey (NHAMCS) provides data on a

Table 4. Mean inpatient length of stay (days) for children hospitalized with urinary incontinence listed as primary diagnosis, 1999–2001 (95% CI)

	Count	Length of Stay	
All	1,251	6.9	(6.5–7.3)
Age			
0–2	83	4.5	(3.1–5.9)
3–10	672	6.5	(6.1–7.0)
11– 17	496	7.8	(7.0–8.5)
Race/ethnicity			
White	873	6.7	(6.3–7.2)
Black	116	7.2	(6.1–8.3)
Asian	11	7.1	(4.7–9.5)
Hispanic	150	6.7	(5.8–7.7)
American Indian	2	5.0	(0–18)
Other	42	9.4	(5.8–13)
Missing	57	7.4	(5.5–9.4)
Gender			
Male	593	6.7	(6.3–7.2)
Female	658	7.0	(6.4–7.6)
Region			
Midwest	451	7.4	(6.8–8.0)
Northeast	79	6.5	(2.7–10)
South	512	6.8	(6.4–7.2)
West	197	6.3	(5.5–7.2)
Missing	12	5.2	(2.8–7.7)

SOURCE: National Association of Children's Hospitals and Related Institutions, 1999–2001.

nationally representative sample of visits to hospital outpatient departments. NHAMCS data for patients with urinary incontinence are shown in Table 6. During four years of data collection (1994, 1996, 1998, and 2000), 243,210 hospital outpatient visits were made by children with urinary incontinence listed as any diagnosis. This represents a rate of 343 visits per 100,000 children. There were 127,586 visits for a primary diagnosis of urinary incontinence, a rate of 180 visits per 100,000 children. According to data from Schmitt (7), about 10% of children 6 years of age wet the bed. Taken together, these data suggest that urinary incontinence is a relatively common diagnosis in the pediatric population.

Analogous data from the National Ambulatory Medical Care Survey (NAMCS) are detailed in Table 7. In contrast to NHAMCS, these data are collected by physicians in office-based settings. During 1992, 1994, 1996, 1998, and 2000, there were 1,781,506 visits for which urinary incontinence was coded as any diagnosis, a rate of 2,548 per 100,000 children. A total of 1,126,911 office visits were made by children with a primary diagnosis of incontinence, a rate of 1,612 per 100,000 children.

Trends in health care utilization for urinary incontinence are available from the Center for Health Care Policy and Evaluation (CHCPE). This dataset contains national data from both traditional, commercially managed health plans and managed Medicaid programs. Data were evaluated for even years between 1994 and 2000. Base populations for the rates presented are children with the same demographic characteristics. Among members of commercial health plans, physician outpatient visits for a primary diagnosis of urinary incontinence ranged from 495 per 100,000 to 533 per 100,000; there was no trend toward an increasing rate over time (Table 8). Rates for visits in which incontinence was listed as any diagnosis ranged from 658 per 100,000 in 1994 to 782 per 100,000 in 2000, with an increasing trend over the years studied (Table 8). In each year studied, visits by boys were more common than visits by girls, the ratio being approximately 1.3:1. More than 75% of the visits were made by 3- to 10-year-olds. Interestingly, more than 2% of physician encounters occurred with patients under the age of 3 (Figure 1).

The findings were similar among enrollees in managed Medicaid plans. During the same time frame, 1994 to 2000, outpatient visits for a primary diagnosis of incontinence ranged from 497 per 100,000 to 682 per 100,000 (Table 9). Visit rates for which incontinence was listed as any diagnosis ranged from 739 per 100,000 to 1,083 per 100,000 (Table 9). Boys and girls were seen in similar proportions.

A detailed assessment of disease states contributing to incontinence is beyond the scope of the databases analyzed, in terms of both sample size constraints and the inherent lack of precision in ICD-9 coding. Nevertheless, the CHCPE data allowed us to parse the relative proportion of visits for selected diagnoses of incontinence (Table 10). The most common single condition in outpatients with a diagnosis of incontinence was nocturnal enuresis. The rate of physician outpatient visits for this condition

Table 5. Trends in mean inpatient length of stay (days) for children hospitalized with urinary incontinence listed as primary diagnosis (95% CI)

	1999			2000			2001		
	Count	Length of Stay		Count	Length of Stay		Count	Length of Stay	
All[a]	371	6.8	(6.2–7.3)	413	7.3	(6.4–8.1)	467	6.6	(6.1–7.2)
Age									
0–2	30	5.2	(2.0–8.3)	26	3.0	(1.6–4.4)	27	5.3	(2.8–7.7)
3–10	198	6.6	(5.9–7.4)	218	6.7	(6.1–7.2)	256	6.4	(5.6–7.2)
11–17	143	7.3	(6.5–8.1)	169	8.7	(6.7–11)	184	7.3	(6.5–8.0)
Race/ethnicity									
White	265	6.6	(6.0–7.2)	291	7.3	(6.1–8.4)	317	6.4	(5.8–6.9)
Black	33	6.8	(5.3–8.2)	37	7.9	(4.9–11)	46	7.0	(5.8–8.1)
Asian	4	5.5	(2.7–8.3)	2	6.5	(0–51)	5	8.6	(3.4–14)
Hispanic	42	6.5	(4.6–8.4)	41	7.0	(5.1–8.9)	67	6.7	(5.4–8.1)
American Indian	1	4.0		0			1	6.0	
Other	9	7.2	(3.9–10)	17	8.2	(5.5–11)	16	11.8	(2.5–21)
Missing	17	10.4	(4.2–16)	25	6.4	(4.7–8.1)	15	5.9	(3.9–7.8)
Gender									
Male	204	6.8	(6.0–7.6)	188	7.1	(6.3–7.9)	201	6.3	(5.7–6.9)
Female	167	6.7	(5.9–7.5)	225	7.4	(6.0–8.8)	266	6.9	(6.0–7.7)
Region									
Midwest	138	8.0	(6.9–9.0)	147	7.2	(6.4–8.1)	166	7.0	(5.8–8.1)
Northeast	23	4.4	(2.1–6.7)	28	9.8	(0–20)	28	5.0	(3.6–6.4)
South	139	6.6	(5.9–7.4)	176	7.0	(6.2–7.8)	197	6.7	(6.1–7.4)
West	63	5.3	(4.2–6.4)	58	7.2	(5.4–9.0)	76	6.4	(5.0–7.9)
Missing	8	5.6	(1.9–9.4)	4	4.5	(0.5–8.5)	0		

SOURCE: National Association of Children's Hospitals and Related Institutions, 1999–2001.

Table 6. National hospital outpatient visits by children with urinary incontinence, count (95% CI), number of visits, percentage of visits, rate (95% CI)

Total	4-Year Count (95% CI)	Total No. Visits by Males/ Females < 18, 1994–2000	% of Visits	4-Year Rate[a] (95% CI)
Primary diagnosis	127,586 (77,011–178,161)	72,578,652	0.2	180 (109–252)
Any diagnosis	243,210 (173,678–312,742)	72,578,652	0.3	343 (245–442)

[a]Rate per 100,00 based on the sum of weighted counts in 1994, 1996, 1998, and 2000 over the mean estimated base population across those four years. Population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US civilian non-institutionalized population under age 18.

SOURCE: National Hospital Ambulatory Medical Care Survey, 1994, 1996, 1998, 2000.

Table 7. National physician office visits by children with urinary incontinence, count (95% CI), number of visits, percentage of visits (%), rate[a] (95% CI)

Total	5-Year Count (95% CI)	Total No. Visits by Males/ Females <18, 1992–2000	% of Visits	5-Year Rate (95% CI)
Primary diagnosis	1,126,911 (683,252–1,570,570)	809,286,031	0.1	1,612 (977–2,247)
Any diagnosis	1,781,506 (1,247,877–2,315,135)	809,286,031	0.2	2,548 (1,785–3,312)

[a]Rate per 100,00 based on the sum of weighted counts in 1992, 1994, 1996, 1998, and 2000 over the mean estimated base population across those five years. Population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation for relevant demographic categories of US civilian non-institutionalized population under age 18.

SOURCE: National Ambulatory Medical Care Survey, 1992, 1994, 1996, 1998, 2000.

was similar between commercially insured and managed Medicaid populations, ranging from 102 per 100,000 in 1994 to 283 per 100,000 in 2000. A trend toward increased utilization was seen in both groups between 1994 and 2000. The increased utilization of physician outpatient services by children with nocturnal enuresis may be due in part to increased public awareness of the disorder.

Ambulatory Surgery

Because most children with urinary incontinence receive medical or behavioral treatment, their utilization of ambulatory surgical services should be low. In general, those who undergo surgical therapy require inpatient care. CHCPE data support this generalization. Fewer than 9 per 100,000 commercially insured children presenting for ambulatory surgical treatment in 1998 and 2000 had incontinence listed as any diagnosis. As expected, rates were highest among 3- to 10-year-olds (Table 11). Small counts in this dataset preclude reliable estimation of these rates for 1994 and 1996. Stratification by race/ethnicity, gender, and geographic region is also impossible with this dataset.

ECONOMIC IMPACT

Little information is available about the economic burden of pediatric urinary incontinence in the United States. Urinary incontinence encompasses a heterogeneous family of disorders with clinical strategies dictated by the underlying condition. Costs should primarily reflect the nature of that condition. Unfortunately, available data do not allow this type of analysis.

Hospital admissions represent a small fraction of the children seeking care for urinary incontinence. This implies that care delivered in the hospital setting should represent a small proportion of overall costs. NACHRI cost data from its participating children's hospitals indicate that between calendar years 1999 and 2001, the average cost of hospitalization for urinary incontinence was $15,219; it increased from $8,366 in those under age 3 to $14,223 in 3- to 10-year-olds, and to $17,715 in 11- to 17-year-olds (Table 12). This trend appears to reflect a longer average length of hospital stay for the older two groups (Table 4). However, the data are not risk-adjusted and therefore must be interpreted with caution. No variability by

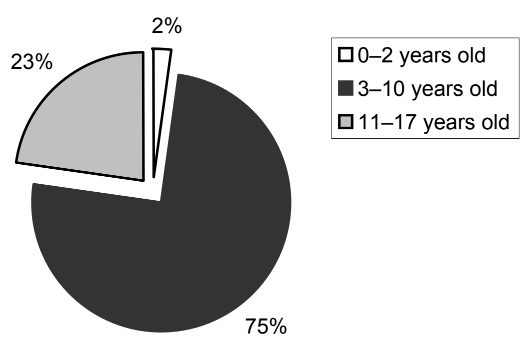

Figure 1. Age distribution of physician outpatient visits for children having commerical health insurance with urinary incontinence listed as primary diagnosis.

SOURCE: Center for Health Care Policy and Evaluation, 1994, 1996, 1998, 2000.

Table 8. Physician outpatient visits for urinary incontinence by children having commercial health insurance, count[a], rate[b]

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
	As Primary Diagnosis							
Total	1,589	501	2,287	504	3,308	495	3,841	533
Age								
< 3	28	*	65	111	81	91	80	84
3–10	1,166	800	1,714	822	2,501	814	2,882	884
11–17	395	302	508	273	726	266	879	294
Gender								
Male	975	599	1,331	574	1,853	541	2,094	566
Female	614	397	956	432	1,455	447	1,747	498
	As Any Diagnosis							
Total	2,089	658	3,104	685	4,655	697	5,636	782
Age								
< 3	48	118	96	164	123	139	137	144
3–10	1,549	1,063	2,371	1,137	3,565	1,161	4,271	1,310
11–17	492	376	637	342	967	355	1,228	411
Gender								
Male	1,294	795	1,784	769	2,628	767	3,114	842
Female	795	514	1,320	596	2,027	623	2,522	719

*Figure does not meet standard for reliability or precision.

[a]Counts less than 30 should be interpreted with caution.

[b]Rate per 100,000 based on member months of enrollment in calendar year for children in the same demographic stratum.

SOURCE: Center for Health Care Policy and Evaluation, 1994, 1996, 1998, 2000.

gender or race/ethnicity was noted in the costs of hospitalization.

The aggregate costs of delivering outpatient care for incontinence are not available, but CHCPE data provide trends in physician payment over the years from 1994 to 2000. During this period, the total mean payment for physician office visits by commercially insured children with a primary diagnosis of incontinence rose from $45 in 1994 to $60 in 2000, of which $10 to $13 was patient co-payments. Payments did not differ by age group (Table 13). Outpatient physician payments were much lower for children covered by managed Medicaid plans, ranging from $24 in 1994 to $38 in 2000 (Table 14). The differences in payments between commercially insured children and those in managed Medicaid plans were due only in part to the absence of patient co-payments in the latter group.

Although there are no direct measures of the medical coasts associated with pediatric UI, the total probably does not exceed $15 to $20 million. Table 7 shows that there are roughly 225,000 physician visits for pediatric UI per year. At $50 per visit, this would total $11 million. Similarly, the 200 annual hospitalizations shown in Table 2, at $15,000 per hospitalization would add only another $3 million.

RECOMMENDATIONS

Pediatric urinary incontinence encompasses a vast array of disease states—acute, chronic, congenital, and acquired. As in other patient groups, incontinence in children implies either a symptom or a sign, rather than a specific disease entity. While patterns of care-seeking behavior are often driven by symptoms, resource utilization, management strategies, and costs are generally dictated by the underlying condition. ICD-9 coding currently relegates urinary incontinence to a 4-digit code. Most of the 5-digit ICD-9 codes for incontinence are symptom-based, and while they are illustrative, they do not provide an etiologic context. Future population-based studies should attempt to characterize care-seeking for incontinence by underlying diagnosis.

Table 9. Physician outpatient visits for urinary incontinence by children having Medicaid, count[a], rate[b]

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
	As Primary Diagnosis							
Total	210	656	293	497	246	649	318	682
Age								
< 3	9	*	14	*	3	*	9	*
3–10	178	975	239	735	203	1,049	242	1,039
11–17	23	*	40	311	40	411	67	516
Gender								
Male	96	599	138	467	127	667	160	684
Female	114	713	155	526	119	631	158	680
	As Any Diagnosis							
Total	298	931	436	739	330	871	505	1,083
Age								
< 3	13	*	19	*	5	*	16	*
3–10	252	1,380	348	1,070	277	1,431	392	1,683
11–17	33	568	69	537	48	493	97	747
Gender								
Male	145	904	228	772	181	951	267	1,141
Female	153	957	208	706	149	791	238	1,024

*Figure does not meet standard for reliability or precision.

[a]Counts less than 30 should be interpreted with caution.

[b]Rate per 100,000 based on member months of enrollment in calendar year for children in the same demographic stratum.

SOURCE: Center for Health Care Policy and Evaluation, 1994, 1996, 1998, 2000.

Table 10. Number of plan members per year with a physician outpatient visit for pediatric urinary incontinence, by underlying condition, count[a], rate[b]

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
	Commercially Insured Population							
Spina bifida-associated	2	0.6	7	1.5	11	1.6	14	1.9
Spinal cord injury-associated	1	0.3	0	0	4	0.6	5	0.7
Neurogenic incontinence NOS	10	3.2	32	7.1	66	9.9	91	13
Nocturnal enuresis	322	102	642	142	1,249	187	1,660	231
Other incontinence	1,224	386	1,687	372	2,380	356	2,642	367
	Medicaid Population							
Spina bifida-associated	0	0	1	1.7	1	2.6	0	0
Spinal cord injury-associated	0	0	0	0	0	0	0	0
Neurogenic incontinence NOS	2	1.1	3	5.1	1	2.6	3	6.4
Nocturnal enuresis	38	119	59	100	61	161	132	283
Other incontinence	182	568	276	468	191	504	233	500

[a]Counts less than 30 should be interpreted with caution.

[b]Rate per 100,000 children in the same demographic stratum.

NOTE: Categories are not mutually exclusive. Underlying condition was assigned to the incontinence visit if a diagnosis code for that condition occurred on a claim for that patient that year.

SOURCE: Center for Health Care Policy and Evaluation, 1994, 1996, 1998, 200.

Table 11. Visits to ambulatory surgery centers for urinary incontinence listed as any diagnosis by children having commercial health insurance, count[a], rate[b]

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total	20	*	23	*	57	8.5	63	8.8
Age								
< 3	0	0.0	3	*	3	*	1	*
3–10	15	*	13	*	38	12	44	14
11–17	5	*	7	*	16	*	18	*
Gender								
Male	12	*	9	*	24	*	33	8.9
Female	8	*	14	*	33	10	30	8.6

*Figure does not meet standard for reliability or precision.
[a]Counts less than 30 should be interpreted with caution.
[b]Rate per 100,000 based on member months of enrollment in calendar year for children in the same demographic stratum.
SOURCE: Center for Health Care Policy and Evaluation, 1994, 1996, 1998, 2000.

Table 12. Mean inpatient cost per child[a] (in $) admitted with urinary incontinence listed as primary diagnosis, 1999–2001 (95% CI)

	Count	Mean Cost	
Total	1,251	15,219	(14,158–16,279)
Age			
0–2	83	8,366	(6,342–10,390)
3–10	672	14,223	(13,071–15,376)
11–17	496	17,715	(15,591–19,838)
Race/ethnicity[b]			
White	873	15,190	(13,911–16,469)
Black	116	14,157	(11,095–17,220)
Asian	11	14,291	(9,243–19,340)
Hispanic	150	14,838	(12,879–16,797)
American Indian	2	106,191	(0–107,008)
Gender			
Male	593	14,788	(13,811–15,766)
Female	658	15,607	(13,791–17,422)
Region[b]			
Midwest	451	15,472	(13,797–17,147)
Northeast	79	17,285	(6,081–28,489)
South	512	15,594	(14,548–16,640)
West	197	13,763	(11,850–15,675)

[a]Calculated using adjusted ratio of costs to charges, including variable and fixed cost among participating children's hospitals.
[b]Values do not sum to total due to inclusion of children whose region or race/ethnicity is listed as other or missing.
SOURCE: National Association of Children's Hospitals and Related Institutions, 1999–2001.

Unfortunately, it is difficult to obtain reliable epidemiologic data for urinary incontinence in children. Stratification by smaller age cohorts might provide more insight into care-seeking patterns and the natural history of incontinence complaints. A specific finding that warrants further investigation is the demonstrated health care utilization by patients under age 3. In most clinical contexts, wetting in this age cohort does not require investigation. It is unclear whether this finding is spurious, reflects the imprecision of ICD-9 coding, or represents changing attitudes toward toilet training in young children. Future analyses could characterize incontinence admissions by specific underlying diagnosis, associated diagnoses, nature of procedures, or distribution of charges. It is likely that patients requiring hospitalization represent a distinct subset of the incontinence population.

Although the majority of pediatric urinary incontinence care is provided in the outpatient setting, several features of such treatment warrant further investigation. The data sources analyzed for this chapter do not allow characterization of pediatric incontinence care by the subspecialty of the treating physician. Likewise, the proportion of costs associated with pharmaceutical usage, behavioral therapy, and diagnostic studies remains obscure. In addition, the available datasets do not allow for meaningful evaluation of long-term trends or regional variation.

The economic burden of urinary incontinence invites further investigation. Direct costs of

Table 13. Payments (in $) by children having commercial health insurance for physician outpatient visits with urinary incontinence listed as primary diagnosis

	Count[a]	Mean Total Payments	Total Amount Paid by Plan	Total Amount Paid by Patient	Count[a]	Mean Total Payments	Total Amount Paid by Plan	Total Amount Paid by Patient
	1994				1996			
Total	1,547	45	35	10	2,245	50	40	10
Age								
<3	27	38	28	9.7	61	47	36	11
3–10	1,137	46	36	10	1,684	51	40	10
11–17	383	44	34	9.5	500	47	37	10.0
Gender								
Male	953	43	34	9.2	1,313	49	38	10
Female	594	49	37	12	932	52	41	10
	1998				2000			
Total	3,263	57	45	12	3,794	60	47	13
Age								
<3	79	55	42	13	78	54	42	12
3–10	2,466	57	45	12	2,851	60	47	13
11–17	718	56	45	11	865	57	45	12
Gender								
Male	1,835	54	43	11	2,070	56	44	12
Female	1,428	60	47	13	1,724	63	50	13

[a]Counts less than 30 should be interpreted with caution.

SOURCE: Center for Health Care Policy and Evaluation, 1994, 1996, 1998, 2000.

Table 14. Payments (in $) by children having Medicaid for physician outpatient visits with urinary incontinence listed as primary diagnosis

	Count[a]	Mean Total Payments	Total Amount Paid by Plan	Total Amount Paid by Patient	Count[a]	Mean Total Payments	Total Amount Paid by Plan	Total Amount Paid by Patient
	1994				1996			
Total	207	24	24	0	290	36	36	0
Age								
<3	9	28	28	0	13	30	30	0
3–10	175	24	24	0	238	37	37	0
11–17	23	28	28	0	39	31	31	0
Gender								
Male	96	24	24	0	136	33	33	0
Female	111	25	25	0	154	38	38	0
	1998				2000			
Total	238	40	40	0	271	38	38	0
Age								
<3	3	45	45	0	6	34	34	0
3–10	197	40	40	0	209	37	37	0
11–17	38	41	41	0	56	39	39	0
Gender								
Male	124	39	39	0	140	36	36	0
Female	114	41	41	0	131	39	39	0

[a]Counts less than 30 should be interpreted with caution.

SOURCE: Center for Health Care Policy and Evalutaion, 1994, 1996, 1998, 2000.

incontinence could be characterized and stratified in greater detail. The available datasets do not allow evaluation of aggregate costs by treatment venue. An evaluation of indirect costs, including work absenteeism among caretakers and school absences among those treated, is also not available.

Urinary incontinence is a common reason for health care visits by children. Despite the prevalence of these complaints in the pediatric age group, relatively little epidemiologic and health services research has been directed at the large information gaps. To estimate the burden of pediatric incontinence care with an accurate picture of contemporary care patterns, this chapter has synthesized data from a broad array of sources, but the sparsity of the data has made the task difficult.

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CHAPTER 6

Urinary Tract Infection in Women

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Contents

Urinary Tract Infection in Women

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INTRODUCTION

Urinary tract infection is an extremely common condition that occurs in both males and females of all ages. The prevalence and incidence of urinary tract infection is higher in women than in men, which is likely the result of several clinical factors including anatomic differences, hormonal effects, and behavior patterns.

DEFINITION

Urinary tract infection (UTI) is caused by pathogenic invasion of the urinary tract, which leads to an inflammatory response of the urothelium. Infections may be acute or chronic. The clinical manifestations of UTI depend on the portion of the urinary tract involved, the etiologic organism(s), the severity of the infection, and the patient's ability to mount an immune response to it. Signs and symptoms may include fever, chills, dysuria, urinary urgency, frequency, and cloudy or malodorous urine.

Bacteriuria refers to the presence of bacteria in the urine, but this is not equivalent to UTI. A UTI includes the inflammatory response and the associated signs and symptoms that result from the presence of the bacteria. Bacteriuria may be asymptomatic, particularly in elderly adults. *Pyuria* refers to the presence of white blood cells in the urine. It is a marker of inflammation in response to bacterial infection.

Infections in the urinary system are often classified by the anatomic site or organ involved, although the entire urinary tract may be affected. *Pyelonephritis* refers to a urinary tract infection involving the kidney. This may be an acute or chronic process. Acute pyelonephritis is characterized by fever, chills, and flank pain. Patients may also experience nausea and vomiting, depending on the severity of the infection and whether there is any obstruction to the flow of urine out of the renal collecting system. The risk of renal damage in most patients with uncomplicated UTI is low, even in those with uncomplicated acute pyelonephritis. Chronic pyelonephritis implies recurrent renal infections and may be associated with the development of renal scarring and impaired function if obstruction is present. A perinephric abscess may develop in severe cases of pyelonephritis. The clinical distinction between upper and lower UTI may be difficult, particularly in women.

Cystitis is an inflammatory process of the urinary bladder, typically caused by bacterial infection. It may be acute or chronic in nature. *Urethritis* refers to an inflammation or infection of the urethra. This often occurs in combination with cystitis and may be difficult to differentiate. Isolated bacterial urethritis is rare in women. Vaginitis and cervicitis, often related to sexually transmitted organisms, may also cause symptoms attributed to cystitis or urethritis.

Recurrent UTIs involve reinfection from a source outside the urinary tract or from bacterial persistence within it. In each case, the infections may be caused by the same or different organisms. The vast majority of recurrent UTIs in women are due to reinfection.

RISK FACTORS

Research has identified a number of risk factors for UTI in women. Women are at greater risk for UTI than men, partly because of the relatively short, straight anatomy of the urethra. Retrograde ascent of bacteria from the perineum is the most common cause of acute cystitis in women. Host factors such as changes in normal vaginal flora may also affect the risk of UTI. Genetic factors, including expression of HLA-A3 and Lewis blood group Le(a-b-) or Le(a+b-), may also put women at higher risk for recurrent UTI. Sexually active women are at greater risk for UTI than women who do not engage in sexual intercourse. Simple hygiene habits, including voiding before and after sexual intercourse and wiping from anterior to posterior, are often advocated to decrease the risk of UTI; however, a recent review found no advantage to these behavioral techniques (1). Contraceptive use may affect the rate of UTI, which appears to be greater in women who use certain types of spermicides. Hematogenous and lymphatic spread of bacteria to the urinary tract is uncommon in healthy patients.

Vesicoureteral reflux has been identified as a risk factor for the development of pyelonephritis. This is most commonly diagnosed in children, but it may also be identified in adults. Patients with recurrent pyelonephritis warrant anatomic evaluation, usually with a voiding cystourethrogram to identify evidence of reflux.

A foreign body in the urinary system may act as a nidus for infection and may be associated with recurrent infections. Common examples include urinary calculi and indwelling catheters. Indwelling urinary catheters are associated with chronic bacterial colonization, which occurs in almost all patients after five to seven days. This colonization significantly increases the risk for symptomatic UTI. Catheter modifications with antibiotic and silver impregnation have been developed in an effort to decrease the rate of infection in patients with indwelling catheters (2). Urea-splitting organisms are often associated with UTI in the presence of stones.

Post-menopausal women are at higher risk for UTI than younger women are, because they lack estrogen, which is essential to maintain the normal acidity of vaginal fluid. This acidity is critical to permit the growth of *Lactobacillus* in the normal vaginal flora, which acts as a natural host defense mechanism against symptomatic UTI. Restoration of the normal hormonal milieu in the vagina is not effective treatment for active urinary tract infections, but it may be useful for prevention. Other urologic factors potentially associated with an increased risk of UTI in post-menopausal women include urinary incontinence, cystocele, and elevated volumes of post-void residual urine.

Urinary tract infections are often characterized as *uncomplicated* if they involve only the bladder and are not associated with the presence of foreign bodies or anatomic abnormalities. *Complicated* UTIs may include pyelonephritis, urosepsis and the presence of foreign bodies or anatomic disorders. Significant UTIs in elderly patients are often classified as *complicated* due to the increased risk of associated morbidity and mortality in this population.

Urinary tract infections may be caused by a variety of different organisms, most commonly bacteria. The most frequent bacterial cause of UTI in adult women is *Escherichia coli*, which is part of the normal gut flora. This organism accounts for approximately 85% of community-acquired UTIs and 50% of hospital-acquired UTIs. Other common organisms include *Enterococcus faecalis, Klebsiella pneumoniae*, and *Staphylococcus saprophyticus*. Nosocomial infections and those associated with foreign bodies may involve more aggressive organisms such as *Pseudomonas aeruginosa, Serratia, Enterobacter, and Citrobacter species*.

Nonbacterial infections are less common and tend to occur more often in immunosuppressed individuals or those with diabetes mellitus. Fungal infections with *Candida spp* are the most common nonbacterial infections. Other less common urinary tract pathogens include *Mycobacterium tuberculosis* and a variety of anaerobic organisms. The overall role of anaerobic urinary infections is controversial; however, anaerobes may be especially dangerous in immunocompromised patients due to an increased risk of severe infections such as emphysematous pyelonephritis or cystitis. Bilharzial cystitis is uncommon in the United States but may be seen in patients who have recently immigrated or traveled to areas of the world where schistosomes are endemic.

Research on the physiology and microbiology of urinary tract infections has identified a number

Table 1. Codes used in the diagnosis and management of female urinary tract infection

Females 18 years or older with one of the following ICD-9 diagnosis codes:	
Cystitis	
112.2	Candidiasis of other urogenital sites
120.9	Schistosomiasis, unspecified
595.0	Acute cystitis
595.1	Chronic interstitial cystitis
595.2	Other chronic cystitis
595.3	Trigonitis
595.89	Other specified types of cystitis
595.9	Cystitis, unspecified
646.6	Infections of genitourinary tract in pregnancy
760.1	Maternal renal and urinary tract diseases affecting fetus or newborn
Pyelonephritis	
590.0	Chronic pyelonephritis
590.00	Chronic pyelonephritis without lesion of renal medullary necrosis
590.01	Chronic pyelonephritis with lesion of renal medullary necrosis
590.1	Acute pyelonephritis
590.10	Acute pyelonephritis without lesion of medullary necrosis
590.11	Acute pyelonephritis with lesion of renal medullary necrosis
590.2	Renal and perinephric abscess
590.3	Pyeloureteritis cystica
590.8	Other pyelonephritis or pyonephrosis, not specified as acute or chronic
590.9	Infection of kidney, unspecified
593.89	Other specified disorders of kidney and ureter
Other	
597.89	Other urethritis
599.0	Urinary tract infection site not specified
646.5	Asymptomatic bacteriuria in pregnancy

of organism and host factors that may increase the risk for UTI. Disruption of the urothelium due to trauma or other irritation may increase the ability of organisms to adhere to tissue and cause infection. Bacteria may develop a number of mechanisms such as pili, fimbriae, and chemical adhesins that increase their ability to adhere to host tissues.

DIAGNOSIS

The standard ICD-9 diagnostic codes for UTI (Table 1) were used for the analyses presented in this chapter. These codes are categorized primarily on the basis of the site and type of infection involved. The primary categories include cystitis, pyelonephritis, and other infections. Common definitions are used here to permit comparisons among datasets.

The diagnosis of UTI may be made presumptively on the basis of clinical signs and symptoms in combination with urinalysis results. A urinalysis that reveals both bacteriuria and pyuria is considered clinically diagnostic of UTI. Traditionally, confirmatory cultures have been obtained to verify the infection and identify the specific organism(s) involved; however, this standard is evolving. If a culture is obtained, the presence of at least 10^5 colony-forming units (CFU) of bacteria on a voided specimen has classically been used as the culture-based definition of UTI. Lower colony counts (100 CFU) may be used to establish a clinical diagnosis in catheterized or aspirated specimens from symptomatic patients. Bacterial colonization of indwelling catheters is common, and it may be difficult to distinguish between this phenomenon and symptomatic UTI requiring therapy. Drug susceptibility data are typically obtained to verify that appropriate therapy has been selected. The increased prevalence of drug-resistant bacteria has made susceptibility testing particularly important.

PREVALENCE AND INCIDENCE

Urinary tract infection is an extremely common diagnosis in women, and treatment incurs substantial costs. It is estimated that at least one-third of all women in the United States are diagnosed with a UTI by the time they reach 24 years of age (3). In a random-digit-dialing telephone survey of 2,000 women, Foxman and colleagues found that 10.8% of women 18 years of age or older self-reported at least one UTI in the previous 12 months (95% CI, 9.4–12.1) (Figure 1). Using this information, the authors calculated the lifetime risk for UTI in their sample to be 60.4% (95% CI, 55.1–65.8). Using these data, the authors estimated that at least 11.3 million women in the United States had at least one UTI in 1995, and the overall cost of prescriptions to treat UTIs that year was more than $218 million.

Similarly, between 1988 and 1994, the overall lifetime prevalence of UTI was estimated to be 53,067 cases per 100,000 adult women, based on the National Health and Nutrition Examination Survey (NHANES-III) (Table 2). The prevalence in women was significantly higher than that estimated in men (13,689 cases per 100,000) in this study (Chapter 7, Table 2). Data from NHANES-III also shows the incidence of UTI in the past 12 months to be 13,320 per 100,000 adult women (Table 3).

Data from US Veterans Health Administration (VA) facilities revealed a similar disparity in the numbers of women and men seeking care for UTIs (Table 4). In 2001, the rate of women seeking outpatient care for cystitis was 626 cases per 100,000 (with 469 as the primary diagnosis), compared with 161 cases per 100,000 (111 as the primary diagnosis) in men. In contrast to cystitis, the overall prevalence of women seeking outpatient care for pyelonephritis was only slightly higher in women than in men: 78

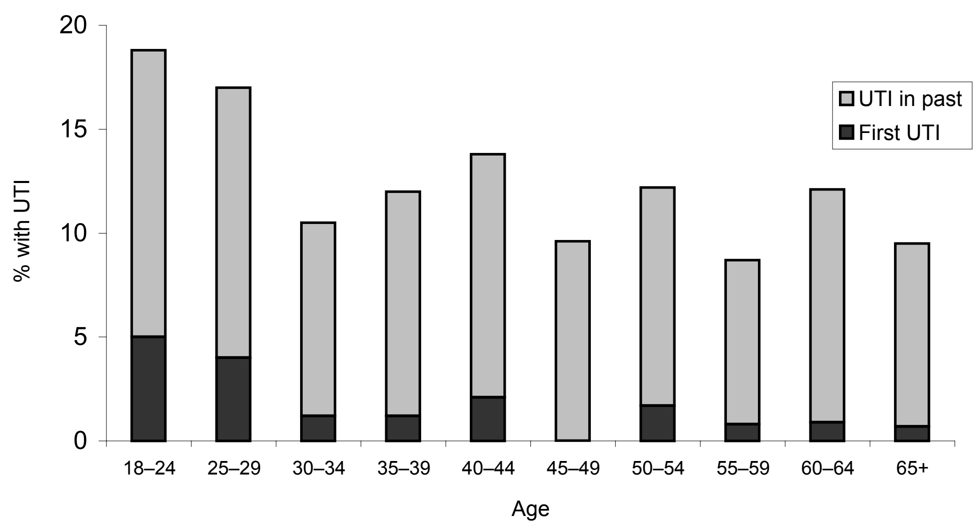

Figure 1. Self-reported incidence of physician-diagnosed urinary tract infection during the previous 12 months by age and history of urinary tract infection among 2000 United States women participating in a random digit dialing survey. The average standard error for the total incidences in each of the age groups is 2.3%.

SOURCE: Adapted from Annals of Epidemiology, 10, Foxman B, Barlow R, D'Arcy H, Gillespie B, and Sobel JD, Urinary tract infection: self-reported incidence and associated costs, 509–515, Copyright 2000, with permission from Elsevier Science.

Table 2. Female lifetime prevalence of urinary tract infections, by sociodemographic group, count, rate[a]

	Incidence	
	Count	Rate
Total count[b]	50,810,018	53,067
1–2 bladder infections ever	26,871,194	28,065
3+ bladder infections ever	23,938,824	25,002
Mean number of infections in the last 12 months of those ever having UTI	0.40	
Race/ethnicity		
White non-Hispanic	41,641,569	55,937
Black non-Hispanic	5,129,383	45,976
Hispanic	3,195,829	45,550
Other	843,238	26,937
Region		
Midwest	12,081,920	52,335
Northeast	9,508,670	47,039
South	18,116,413	54,924
West	11,103,015	57,048
Urban/rural		
MSA	24,236,785	34,135
Non-MSA	26,573,233	107,393

MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1991 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US female adult civilian non-institutionalized population.

[b]The data in this table are based on the weighted number of persons who responded "1 or more" to question HAK4: "How many times have you had a bladder infection, also called urinary tract infection, UTI or cystitis?"

NOTE: Counts may not sum to total due to rounding.

SOURCE: National Health and Nutrition Examination Survey III, 1988–1994.

Table 3. Female incidence of UTIs in past 12 months, by sociodemographic group, count, rate[a]

	Incidence	
	Count	Rate
Total count[b]	12,753,035	13,320
1 or more bladder infections in the last 12 months	12,753,035	13,320
Mean number of infections in the last 12 months	1.7	
Age		
18–24	2,741,548	21,732
25–34	3,274,713	15,196
35–44	2,338,316	11,925
45–54	1,531,348	11,550
55–64	1,129,215	10,105
65–74	930,627	9,225
75–84	619,903	10,577
85+	187,365	11,770
Race/ethnicity		
White non-Hispanic	9,949,997	13,366
Black non-Hispanic	1,572,606	14,096
Hispanic	1,017,401	14,501
Other	213,032	6,805
Region		
Midwest	2,518,030	10,907
Northeast	2,346,347	11,607
South	5,037,597	15,273
West	2,851,061	14,649
Urban/rural		
MSA	6,425,838	9,050
Non-MSA	6,327,198	25,571

MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1991 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US female adult civilian non-institutionalized population.

[b]The data in this table are based on the weighted number of persons who responded "1 or more" to question HAK5: "How many of these infections did you have during the past 12 months?"

NOTE: Counts may not sum to total due to rounding.

SOURCE: National Health and Nutrition Examination Survey III, 1988–1994.

Table 4. Frequency of urinary tract infection (including cystitis, pyelonephritis, orchitis, and other) as a diagnosis in VA patients seeking outpatient care, rate[a]

	1999		2000		2001	
Sub-Conditions	Primary Diagnosis	Any Diagnosis	Primary Diagnosis	Any Diagnosis	Primary Diagnosis	Any Diagnosis
Male UTI[b]	2,082	2,705	1,963	2,591	1,719	2,334
Cystitis	136	177	131	175	111	161
Pyelonephritis	48	65	41	57	40	60
Orchitis	314	378	297	360	99	334
Other	1,649	2,187	1,555	2,097	1,351	1,868
Female UTI[b]	4,793	6,015	4,589	5,904	4,265	5,552
Cystitis	512	670	517	684	469	626
Pyelonephritis	72	81	55	71	64	78
Other	4,378	5,521	4,187	5,409	3,883	5,075

[a]Rate is defined as the number of unique patients with each condition (unweighted frequency or # of cases) divided by the base population in the same fiscal year (# unique SSNs per strata) x 100,000 to calculate the rate per 100,000 (# cases per 100,000 unique outpatients).

[b]Represents unique cases of UTI (i.e., patients with more than one UTI subtype are counted only once).

SOURCE: Outpatient Clinic File (OPC), VA Austin Automation Center, FY1999–FY2001.

cases per 100,000 (64 as the primary diagnosis) vs 60 cases per 100,000 (40 as the primary diagnosis). In the three years for which data are available (1999 to 2001), the overall frequency of an outpatient primary diagnosis of UTI in US female VA outpatient clinic patients gradually declined, from 4,793 per 100,000 to 4,265 per 100,000 (Table 5). Also, note that the prevalence rates in the VA data are much lower than those in NHANES because the VA identifies only UTIs for which patients sought medical attention in one year, whereas NHANES relies on self-reported UTI over a lifetime and hence presents a true population prevalence.

MORBIDITY AND MORTALITY

Urinary tract infections may be associated with significant morbidity and even mortality. This is particularly true in the frail elderly and in those with associated urinary incontinence, where UTI may be related to skin breakdown and ulceration. Complicated UTIs may lead to urosepsis and death; however, the risk of UTI-related mortality in the elderly and comorbid population is unknown. It is generally believed that asymptomatic bacteriuria in elderly patients does not need to be treated, although this issue is controversial (4). More commonly, UTI is associated with bothersome urinary symptoms that can lead to work absence and decreased ability to engage in activities of daily living.

TRENDS IN HEALTH CARE RESOURCE UTILIZATION

Medications

Antimicrobial therapy remains the mainstay of treatment for patients with UTIs. Bacterial urine cultures with appropriate drug susceptibility data should guide the selection of antimicrobials. However, most symptomatic patients require selection of therapy prior to the identification of the etiologic organism. Initial therapy is usually empiric, with subsequent modifications made on the basis of urine culture and susceptibility results as necessary. The need for urine culture is also an area of debate. Many experts advocate empiric therapy for most patients, with urine cultures reserved for those who fail to respond to treatment or have recurrent infections. The Infectious Disease Society of America published guidelines in 1999 that recommended the use of trimethoprim-sulfamethoxazole (TMP-SMX) as first-line therapy for patients without an allergy to this compound (5). Specific fluoroquinolones were recommended as second-line agents. In geographic areas where resistance to TMP-SMX is high (>20%), fluoroquinolones are recommended as first-line

Table 5. Frequency of urinary tract infection[a] as a diagnosis in female VA patients seeking outpatient care, rate[b]

	1999		2000		2001	
	Primary Diagnosis	Any Diagnosis	Primary Diagnosis	Any Diagnosis	Primary Diagnosis	Any Diagnosis
Total	4,793	6,015	4,589	5,904	4,265	5,552
Age						
18–25	4,396	5,154	4,852	5,878	4,431	5,325
25–34	4,969	5,840	4,726	5,705	5,051	6,063
35–44	4,547	5,634	4,370	5,525	3,909	5,087
45–54	4,624	5,841	4,451	5,717	4,127	5,366
55–64	4,543	6,081	4,645	6,320	4,273	5,729
65–74	5,097	6,843	4,887	6,677	4,040	5,681
75–84	5,546	7,395	4,818	6,598	4,229	5,979
85+	5,484	6,567	5,269	7,446	5,088	6,416
Race/ethnicity						
White	6,094	7,697	5,764	7,484	5,322	6,937
Black	5,735	7,182	5,280	6,664	4,942	6,403
Hispanic	6,672	8,556	5,801	7,605	5,666	6,922
Other	4,787	6,080	6,722	7,665	3,630	13,299
Unknown	3,255	4,038	3,209	4,111	3,048	3,976
Region						
Eastern	4,008	4,965	3,781	4,823	3,623	4,591
Central	4,640	5,871	4,696	5,939	4,195	5,456
Southern	5,313	6,747	4,888	6,489	4,482	6,002
Western	4,778	5,887	4,720	5,865	4,512	5,707
Insurance status						
No insurance/self-pay	4,792	5,957	4,658	5,928	4,375	5,576
Medicare/Medicare supplemental	6,064	7,828	5,308	7,192	4,791	6,692
Medicaid	5,229	6,536	5,482	6,360	5,915	6,839
Private insurance/HMO/PPO	4,001	5,146	3,829	4,914	3,428	4,559
Other insurance	4,174	4,973	3,697	4,736	3,512	4,484
Unknown	5,594	6,993	1,493	1,493	1,914	1,914

HMO, health maintenance organization; PPO, preferred provider organization.

[a]Represents diagnosis codes for female urinary tract infections (including cystitis, pyelonephritis, and other UTIs).

[b]Rate is defined as the number of unique patients with each condition (unweighted frequency or # of cases) divided by the base population in the same fiscal year (# unique SSNs per strata) x 100,000 to calculate the rate per 100,000 (# cases per 100,000 unique outpatients).

NOTE: Race/ethnicity data from clinical observation only, not self-report; note large number of unknown values.

SOURCE: Outpatient Clinic File (OPC), VA Austin Automation Center, FY1999–FY2001.

Table 6. Prescribing trends from 1989 through 1998[a]

Antibiotic Prescribed	1989–1990	1991–1992	1993–1994	1995–1996	1997–1998	Adjusted Odds Ratio (95% Confidence Interval) for Predictor, Year (per decade)[b]
Trimethoprim-sulfamethoxazole	48	35	30	45	24	0.32 (0.20–0.51)
Recommended uoroquinolones[c]	19	16	33	24	29	2.12 (1.26–3.56)
Nitrofurantoin	14	25	24	20	30	2.55 (1.50–4.31)
Overall non-recommended antibiotics[d]	33	49	36	32	46	1.57 (1.00–2.44)
No. of visits per 2-year period	208	178	181	192	227	n/a

[a]Unless otherwise indicated, data are percentages of patients.

[b]In all models, antibiotic prescribing was the dependent variable. All trends adjusted for age younger than 45 years and history of urinary tract infection.

[c]Recommended uoroquinolones were defined as cipro oxacin, o oxacin, lome oxacin, enoxacin, and eroxacin.

[d]Non-recommended antibiotics were defined as all antibiotics other than trimethoprim or trimethoprim-sulfamethoxazole or recommended uoroquinolones.

SOURCE: Reprinted from Huang ES, Stafford RS, National patterns in the treatment of urinary tract infections in women by ambulatory care physicians, Archives Internal Medicine, 162, 41–47, *Copyright © 2002, with permission from the American Medical Association*. All rights reserved.

therapy.

The recommendation to use older agents such as TMP-SMX as initial therapy has strong merit. These medications cost less than newer antimicrobials such as fluoroquinolones. In addition, reserving fluoroquinolones and broad-spectrum antimicrobials for complicated infections or cases with documented resistance to first-line therapy may help reduce the incidence of bacterial resistance. However, a recent study on the national trends in prescribing patterns for UTI in women among ambulatory care physicians revealed that the use of TMP-SMX is decreasing and the use of fluoroquinolones is increasing (6). The proportion of TMP-SMX use dropped from 48% in 1989–1990 to 24% in 1997–1998 (adjusted OR, 0.33; 95% CI, 0.21–0.52 per decade). At the same time, fluoroquinolone use increased from 19% to 29% (adjusted OR, 2.28; 95% CI, 1.35–3.83 per decade) (Table 6). This indicates that there is a trend toward using more-expensive antimicrobials such as fluoroquinolones as initial therapy. This trend may be due in part to increased rates of outpatient care and increased availability and marketing of these products. However, it has the potential to increase both overall costs and antimicrobial resistance.

Inpatient Care

Severe UTIs, particularly those associated with acute pyelonephritis, may require inpatient hospitalization for treatment with intravenous antimicrobials. In 2000, inpatient services constituted 55% of all expenditures for the treatment of UTI (Table 7). According to data from the Centers for Medicare and Medicaid Services (CMS), there was a

Table 7. Expenditures for female urinary tract infection (in millions of $) and share of costs, by site of service

	1994	1996	1998	2000
Total[a]	1,885.0	1,944.3	2,211.9	2,474.0
Share of total				
Inpatient	1,168.7 (62.0%)	1,254.1 (64.5%)	1,322.7 (59.8%)	1,360.7 (55.0%)
Physician office	309.1 (16.4%)	295.5 (15.2%)	404.8 (18.3%)	536.8 (21.7%)
Hospital outpatient	126.3 (6.7%)	105.0 (5.4%)	165.9 (7.5%)	163.3 (6.6%)
Emergency room	280.9 (14.9%)	289.7 (14.9%)	318.5 (14.4%)	413.2 (16.7%)

[a]Total unadjusted expenditures exclude spending on outpatient prescription drugs for the treatment of urinary tract infection. Average drug spending for UTI-related conditions (both male and female) is estimated at $96 million to $146 million annually for the period 1996 to 1998.

SOURCES: National Ambulatory Medical Care Survey, National Hospital Ambulatory Medical Care Survey, Healthcare Cost and Utilization Project, and Medical Expenditure Panel Survey, 1994, 1996, 1998, 2000.

Table 8. Inpatient stays by female Medicare beneficiaries with urinary tract infection listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	114,640	579 (575–582)	127,460	632 (628–635)	128,380	674 (670–677)
Total < 65	8,480	355 (347–363)	9,400	350 (343–357)	11,200	403 (396–411)
Total 65+	106,160	609 (606–613)	118,060	675 (671–679)	117,180	720 (716–724)
Age						
65–74	27,880	303 (300–307)	27,300	303 (300–307)	24,760	313 (309–317)
75–84	42,180	715 (708–722)	46,980	785 (778–792)	46,480	796 (788–803)
85–94	31,700	1,527 (1,510–1,544)	37,660	1,694 (1,677–1,711)	39,460	1,774 (1,756–1,791)
95+	4,400	1,706 (1,656–1,757)	6,120	2,161 (2,108–2,215)	6,480	2,088 (2,038–2,139)
Race/ethnicity						
White	94,780	565 (561–568)	105,120	606 (602–609)	104,420	645 (642–649)
Black	13,540	803 (790–816)	17,280	939 (925–953)	17,180	974 (959–988)
Asian	…	…	300	318 (282–354)	740	418 (388–448)
Hispanic	…	…	1,660	826 (786–866)	3,040	827 (798–857)
N. American Native	…	…	200	1,238 (1,064–1,411)	380	1,457 (1,311–1,603)
Region						
Midwest	28,800	574 (567–580)	31,040	602 (595–609)	31,040	629 (622–636)
Northeast	21,000	463 (457–470)	23,980	534 (527–540)	23,660	604 (596–612)
South	50,760	726 (720–733)	56,420	781 (774–787)	57,940	826 (819–832)
West	12,780	448 (440–456)	14,420	504 (495–512)	14,040	517 (508–525)

… data not available.
[a]Unweighted counts multiplied by 20 to arrive at values in the table.
[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.
[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.
NOTE: Counts less than 600 should be interpreted with caution.
SOURCE: Centers for Medicare and Medicaid Services, MedPAR and 5% Carrier File, 1992, 1995, 1998.

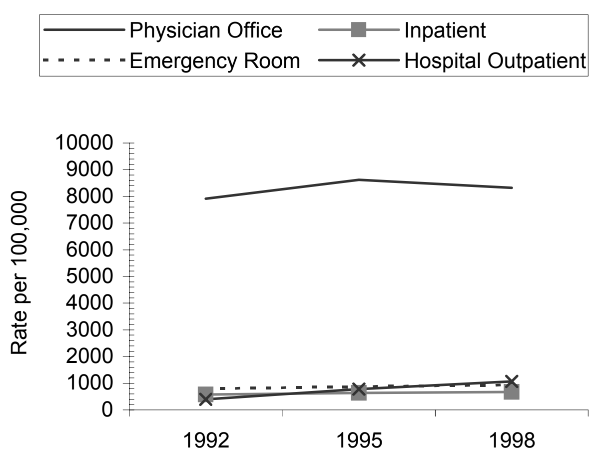

Figure 2. Trends in visits by females with urinary tract infection listed as primary diagnosis, by site of service and year.

SOURCE: Centers for Medicare and Medicaid Services, 1992, 1995, 1998.

gradual overall increase in the age-unadjusted rate of inpatient hospitalization for treatment of UTI in adult women between 1992 (579 per 100,000) and 1998 (674 per 100,000) (Table 8 and Figure 2). While the overall rate of inpatient stays for women 84 years of age and younger has remained relatively constant, there has been a dramatic increase in the rate of inpatient hospital stays for very elderly women. The rate for women 85 to 94 years of age increased from 1,527 per 100,000 in 1992 (95% CI, 1,510–1,544) to 1,774 per 100,000 in 1998 (95% CI, 1,756–1,791). The rate was even higher for women over 95, increasing from 1,706 per 100,000 in 1992 to 2,088 in 1998. Urinary tract infections may be more severe in frail elderly women due to additional comorbidity, and this may necessitate more aggressive treatment with inpatient hospitalization and intravenous antimicrobial therapy. African American women had higher rates of inpatient treatment than did other ethnic groups (1.1 to 2.95 times higher). Patients living in the South had higher rates of inpatient care than did women living in other regions.

Data from the Healthcare Cost and Utilization Project (HCUP) for the years from 1994 to 2000 indicate that the rate of inpatient hospitalization for a primary diagnosis of UTI has been generally decreasing for young and middle-aged women (18 to 54 years of age) and has been relatively stable overall for those aged 55 to 74 (Table 9). In addition, the overall rate of inpatient hospitalization is relatively low for young women, increasing approximately twofold when women reach the 65 to 74 age group. However, these data also demonstrate that there has been a gradual increase in the rate of inpatient hospitalizations for women 75 to 84 years of age when UTI is the primary admitting diagnosis. The most striking finding in the data is that women 85 and older had inpatient hospitalization rates 2.82 to 3.27 times higher than those of women in the 75 to 84 age range. This may be a reflection of the degree of associated morbidity and potential health impairment caused by UTI in elderly women. Nosocomial infections may also influence the rates of hospitalization in this patient group. It is unclear why estimated inpatient utilization rates are lower in HCUP data than in CMS data.

Acute pyelonephritis is a serious UTI often treated with intravenous antimicrobials, historically requiring inpatient care, although newer approaches include primary management with oral antimicrobials. Analysis of HCUP data for women admitted to the hospital for a primary diagnosis of pyelonephritis indicates that there was a gradual decline in the rate of admissions between 1994 and 2000 (Table 10). Pyelonephritis accounted for 28% of the female UTI hospitalizations in 1994 and 21% in 2000. The overall rate of admissions for pyelonephritis among women gradually declined from 65 per 100,000 (95% CI, 62–68) in 1994 to 49 per 100,000 (95% CI, 46–51) in 2000. This trend is reflected across essentially all age strata analyzed. It likely reflects increased use of oral antimicrobials and home-based intravenous therapy in the treatment of women with pyelonephritis. The decline in age-unadjusted rates of hospitalization for women with pyelonephritis was most noticeable in African American and Caucasian women. Rates were relatively stable in Hispanic and Asian women. Rates of hospitalization declined in all geographic areas, and no distinct regional differences were noted.

The overall length of hospital stay of women who require inpatient hospitalization for the management of UTI has decreased, consistent with the general trend toward decreased length of stay (LOS) for all conditions (Table 11). Nationwide HCUP data reveal that the mean LOS for women with UTI decreased from 6.2 days in 1994 to 4.9 days in 2000. This trend was seen across all age groups, although elderly women continued to have a somewhat greater LOS than younger women, probably due to the more-severe infections or associated comorbidity in older adults. The decrease in LOS was more pronounced for women who have Medicare or Medicaid as their primary insurer than it was for women with either private insurance or HMO coverage.

Outpatient Care

Outpatient care for UTI is provided in a variety of settings, which are analyzed separately below.

Hospital Outpatient Care

The overall rate of hospital outpatient visits for women with UTI generally increased from 1994 to 2000, according to data from the National Hospital Ambulatory Medical Care Survey (NHAMCS), both when UTI was listed as the primary diagnosis (Table 12) and when UTI was listed as one of any diagnoses at the time of visit (Table 13). The most

Table 9. Inpatient hospital stays by adult females with urinary tract infection (any anatomic location) listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	223,256	232 (223–240)	235,055	234 (226–243)	243,584	238 (230–246)	245,879	235 (227–242)
Age								
18–24	16,748	135 (126–144)	15,205	122 (114–130)	13,496	108 (101–115)	12,300	93 (87–99)
25–34	21,873	106 (99–113)	20,183	98 (92–105)	17,495	88 (83–94)	15,629	82 (76–87)
35–44	17,367	85 (80–90)	18,445	85 (80–89)	17,842	80 (75–84)	17,009	75 (71–79)
45–54	14,592	99 (93–105)	15,324	94 (88–100)	15,630	90 (85–94)	16,633	89 (85–93)
55–64	16,336	154 (145–163)	17,036	155 (146–164)	17,263	149 (142–156)	18,375	150 (144–157)
65–74	33,529	339 (324–355)	34,216	340 (324–356)	36,552	370 (353–387)	34,686	356 (342–370)
75–84	53,966	920 (881–960)	59,660	931 (892–970)	64,687	957 (922–992)	66,664	968 (935–1001)
85+	48,844	2,593 (2,477–2,709)	54,984	2,844 (2,725–2,962)	60,618	3,162 (3,038–3,286)	64,584	3,078 (2,975–3,182)
Race/ethnicity								
White	131,419	180 (172–187)	139,026	185 (177–193)	136,003	180 (173–187)	137,718	180 (174–187)
Black	26,970	234 (214–253)	28,841	239 (221–258)	24,887	200 (187–213)	23,177	180 (169–191)
Asian/Pacific Islander	1,856	68 (55–80)	1,914	56 (48–64)	2,423	64 (48–80)	3,351	83 (73–92)
Hispanic	12,829	156 (140–172)	14,359	159 (135–183)	15,865	162 (142–183)	16,430	154 (138–170)
Region								
Midwest	48,859	213 (197–228)	51,308	218 (204–233)	54,813	231 (215–247)	52,991	222 (209–236)
Northeast	47,668	235 (217–253)	44,923	223 (205–242)	47,095	232 (216–249)	47,204	229 (213–244)
South	92,109	281 (263–299)	98,838	277 (260–294)	101,638	280 (265–295)	103,304	278 (263–294)
West	34,620	170 (155–186)	39,986	189 (173–206)	40,038	182 (168–196)	42,380	183 (170–195)
MSA								
Rural	52,366	216 (200–232)	55,871	248 (230–265)	55,038	240 (225–255)	57,804	251 (236–265)
Urban	170,356	236 (226–246)	178,730	230 (220–239)	187,699	237 (227–246)	187,848	230 (221–238)

MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US female adult civilian non-institutionalized population.

[b]Persons of other races, missing or unavailable race and ethnicity, and missing MSA are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 10. Inpatient hospital stays by adult females with pyelonephritis listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	62,223	65 (62–68)	61,949	62 (59–65)	54,933	54 (51–56)	50,881	49 (46–51)
Age								
18–24	12,008	97 (90–104)	11,075	89 (83–95)	9,607	77 (71–82)	8,645	65 (60–70)
25–34	14,709	72 (67–76)	13,483	66 (61–70)	11,131	56 (52–60)	9,613	50 (46–54)
35–44	9,765	48 (45–51)	10,267	47 (44–50)	9,364	42 (39–45)	8,664	38 (36–41)
45–54	6,656	45 (41–49)	7,075	44 (40–47)	6,339	36 (34–39)	6,380	34 (32–36)
55–64	5,045	48 (44–52)	5,328	48 (44–53)	4,686	40 (38–43)	4,870	40 (37–43)
65–74	6,420	65 (59–71)	6,348	63 (58–69)	5,694	58 (53–62)	5,220	54 (49–58)
75–84	5,078	87 (79–94)	5,661	88 (80–96)	5,433	80 (74–87)	4,999	73 (66–79)
85+	2,541	135 (118–151)	2,712	140 (124–157)	2,679	140 (123–156)	2,490	119 (106–132)
Race/ethnicity								
White	34,772	48 (45–51)	33,882	45 (43–47)	28,732	38 (36–40)	25,448	33 (32–35)
Black	7,718	67 (60–74)	7,792	65 (59–70)	5,493	44 (40–48)	4,712	37 (33–40)
Asian/Pacific Islander	754	28 (22–33)	636	19 (15–22)	824	22 (15–29)	918	23 (18–28)
Hispanic	4,711	57 (50–64)	5,374	60 (47–72)	5,151	53 (44–61)	5,206	49 (42–55)
Region								
Midwest	14,047	61 (56–66)	13,962	59 (54–65)	11,931	50 (46–55)	11,378	48 (44–52)
Northeast	11,335	56 (51–61)	10,185	51 (46–56)	9,490	47 (41–53)	8,246	40 (36–43)
South	24,287	74 (67–81)	24,009	67 (62–73)	21,362	59 (55–63)	19,969	54 (50–58)
West	12,554	62 (55–68)	13,793	65 (57–74)	12,150	55 (50–60)	11,288	49 (44–54)
MSA								
Rural	15,155	63 (56–70)	14,555	64 (58–71)	13,410	58 (54–63)	12,252	53 (49–57)
Urban	46,844	65 (62–68)	47,282	61 (57–64)	41,186	52 (49–55)	38,552	47 (45–50)

MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US female adult civilian non-institutionalized population.

[b]Persons of other races, missing or unavailable race and ethnicity, and missing MSA are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 11. Trends in mean inpatient length of stay (days) for adult females hospitalized with urinary tract infection listed as primary diagnosis

	Length of Stay			
	1994	1996	1998	2000
All	6.2	5.3	4.9	4.9
Age				
18–24	3.4	3.0	3.0	2.8
25–34	3.9	3.3	3.2	3.2
35–44	4.4	3.9	3.7	3.5
45–54	5.0	4.4	4.4	4.1
55–64	6.1	5.0	4.8	4.8
65–74	6.5	5.6	5.2	5.1
75–84	7.3	6.0	5.6	5.4
85+	7.7	6.3	5.7	5.5
Race/ethnicity				
White	6.2	5.3	5.0	4.9
Black	6.9	5.9	5.6	5.7
Asian/Pacific Islander	5.1	4.9	4.6	5.3
Hispanic	5.9	4.7	4.9	4.4
Other	6.6	5.7	4.4	5.2
Region				
Midwest	5.5	4.8	4.8	4.4
Northeast	8.4	6.9	6.0	5.6
South	5.8	5.0	4.8	4.9
West	5.2	4.7	4.4	4.4
MSA				
Rural	5.5	4.8	4.3	4.4
Urban	6.4	5.4	5.1	5.0
Primary payor				
Medicare	7.1	6.0	5.5	5.4
Medicaid	5.7	4.8	4.6	4.4
Private insurance/HMO	4.2	3.8	3.7	3.6
Self-pay	4.6	3.8	3.5	3.3
No charge	*	3.7	3.7	4.5
Other	5.2	3.8	4.1	3.6

*Figure does not meet standard for reliability or precision.
MSA, metropolitan statistical area; HMO, health maintenance organization.
SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

striking increases were observed in young women 18 to 34 years of age. Overall rates of hospital outpatient visits by young women for any reason were 1.64 times greater in 2000 than they were in 1994. Race/ethnicity appears to play some role in the rate of outpatient visits for UTI: Hispanic and African American women had higher age-unadjusted visit rates where reliable estimates are available. Some regional fluctuations were noted, but no consistent trends were observed. Rates of outpatient hospital visits for female UTI have been generally stable in metropolitan statistical areas (MSAs), that is, urban settings, but have been increasing acutely in non-MSA, or rural, settings. This may reflect increased availability of hospital-based outpatient services in nonmetropolitan areas.

An analysis of Medicare data for the years 1992, 1995, and 1998 also reflects the trend toward increased hospital outpatient utilization for the management of female UTIs (Table 14). The overall utilization rate across all ages was 395 per 100,000 (95% CI, 392–397) in 1992. It rose to 780 per 100,000 (95% CI, 776–784) in 1995, and to 1,072 per 100,000 (95% CI, 1,068–1,077) in 1998. These trends were similar when stratified by age (< 65 or ≥ 65 years). Very elderly women (≥ 95 years) had the smallest overall increase in hospital outpatient utilization, which corresponds to the larger increase in inpatient hospitalization previously described for this age group.

Physician Office Care

The outpatient physician office is the most widely utilized site of service for the treatment of female UTIs (Figure 3). According to data from the National Ambulatory Medical Care Survey (NAMCS), there were more than 6,300,000 physician office visits for a primary diagnosis of female UTI in the United States in 2000 (Table 15). The rates of utilization have remained relatively stable for all patients when UTI is among any of the reasons listed for the visit (Table 16), but they increased between 1996 and 2000 when UTI was the primary diagnosis (Table 15). These increases in physician outpatient services occurred in the 35 to 64 and ≥ 65 year old age groups, but not in 18- to 34-year-old groups. Regional variations were observed during the years analyzed, with a generally higher rate of physician office visits for UTI in the South and the West.

Table 12. Hospital outpatient visits by adult females with urinary tract infection listed as primary reason for visit, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	432,626	449 (339–559)	358,850	357 (247–468)	563,504	551 (440–661)	559,406	534 (414–653)
Age								
18–34	178,349	542 (327–757)	135,538	411 (233–590)	181,772	562 (384–741)	233,033	719 (485–952)
35–64	167,763	366 (236–497)	128,161	261 (168–355)	228,773	445 (297–593)	212,682	397 (243–550)
65+	*	*	*	517 (73–961)	152,959	824 (497–1,152)	113,691	607 (305–909)
Race/ethnicity								
White	279,795	382 (282–482)	250,135	333 (199–466)	420,367	556 (427–685)	445,892	584 (434–734)
Black	*	*	*	386 (123–649)	*	*	*	*
Hispanic	*	*	60,153	667 (294–1,041)	62,288	638 (269–1,006)	*	*
Region								
Midwest	181,728	791 (403–1,180)	*	*	*	*	194,503	816 (494–1,139)
Northeast	52,869	261 (153–369)	69,047	343 (192–495)	160,350	791 (488–1,094)	102,854	498 (244–752)
South	147,905	451 (310–592)	69,346	194 (122–267)	252,082	695 (484–906)	181,573	489 (309–669)
West	50,124	247 (120–373)	64,839	307 (135–479)	*	*	*	*
MSA								
MSA	318,193	441 (329–553)	293,441	377 (246–508)	372,958	470 (349–591)	309,400	379 (274–483)
Non-MSA	*	*	*	*	190,546	830 (568–1,092)	250,006	1,084 (690–1,479)

*Figure does not meet standard for reliability or precision.

MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US female adult civilian non-institutionalized population.

[b]Persons of other races are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: National Hospital Ambulatory Medical Care Survey — Outpatient, 1994, 1996, 1998, 2000.

Table 13. Hospital outpatient visits by adult females with urinary tract infection listed as any reason for visit, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	568,202	590 (469–711)	566,676	565 (436–693)	784,752	767 (634–900)	816,459	779 (627–932)
Age								
18–34	216,162	656 (428–885)	215,041	653 (445–861)	296,592	917 (673–1,161)	349,866	1,079 (776–1,382)
35–64	233,678	510 (357–664)	213,031	434 (302–567)	281,648	548 (388–708)	282,465	527 (351–703)
65+	118,362	671 (359–984)	*	*	206,512	1,113 (714–1,512)	184,128	983 (537–1,428)
Race/ethnicity								
White	375,156	513 (396–629)	361,243	481 (332–629)	564,054	746 (591–901)	613,429	804 (622–985)
Black	75,811	658 (322–994)	92,769	769 (425–1,114)	92,170	740 (371–1,108)	110,994	861 (377–1,345)
Hispanic	*	*	103,775	1,151 (614–1,687)	115,176	1,179 (664–1,694)	85,076	797 (330–1,264)
Region								
Midwest	236,759	1,031 (610–1,452)	245,751	1,045 (571–1,520)	128,220	540 (301–778)	281,994	1,183 (787–1,580)
Northeast	80,917	399 (269–529)	133,440	664 (464–864)	233,853	1,154 (787–1,521)	177,027	858 (467–1,248)
South	195,507	596 (434–759)	104,439	293 (202–384)	313,752	864 (623–1,106)	238,542	643 (432–854)
West	55,019	271 (142–400)	83,046	393 (209–578)	108,927	495 (287–704)	118,896	513 (240–786)
MSA								
MSA	432,852	600 (471–728)	470,464	605 (454–756)	566,770	714 (563–865)	496,653	608 (456–759)
Non-MSA	135,350	560 (267–852)	*	*	217,982	950 (669–1,230)	319,806	1,387 (950–1,824)

*Figure does not meet standard for reliability or precision.

MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US female adult civilian non-institutionalized population.

[b]Persons of other races are included in the totals.

NOTE: Counts may not sum to total due to rounding.

SOURCE: National Hospital Ambulatory Medical Care Survey — Outpatient, 1994, 1996, 1998, 2000.

Table 14. Outpatient hospital visits by female Medicare beneficiaries with urinary tract infection listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages	78,180	395 (392–397)	157,420	780 (776–784)	204,360	1,072 (1,068–1,077)
Total < 65	8,960	375 (367–383)	21,980	818 (807–829)	28,620	1,030 (1,019–1,042)
Total 65+	69,220	397 (394–400)	135,440	774 (770–778)	175,740	1,080 (1075–1,085)
Age						
65–74	31,200	339 (336–343)	64,600	718 (712–723)	74,920	948 (941–955)
75–84	28,360	481 (475–486)	50,480	843 (836–851)	70,680	1,210 (1,201–1,219)
85–94	8,740	421 (412–430)	18,940	852 (840–864)	28,000	1,259 (1,244–1,273)
95+	920	357 (334–380)	1,420	501 (475–528)	2,140	690 (661–719)
Race/ethnicity						
White	60,120	358 (355–361)	126,480	729 (725–733)	169,320	1,047 (1,042–1,052)
Black	11,000	652 (640–665)	20,240	1,100 (1,085–1,115)	20,080	1,138 (1,123–1,154)
Asian	…	…	240	254 (222–286)	860	486 (454–518)
Hispanic	…	…	2,760	1,374 (1,323–1,424)	6,240	1,698 (1,656–1,740)
N. American Native	…	…	1,360	8,416 (7,989–8,843)	2,320	8,896 (8,551–9,241)
Region						
Midwest	23,000	458 (452–464)	42,500	824 (816–832)	59,980	1,216 (1,206–1,226)
Northeast	15,080	333 (327–338)	20,280	451 (445–457)	25,660	655 (647–663)
South	27,440	393 (388–397)	72,820	1,008 (1,001–1,015)	90,520	1,290 (1,282–1,298)
West	11,960	419 (412–427)	21,020	734 (724–744)	27,640	1,017 (1,005–1,029)

… data not available.

[a]Unweighted counts multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

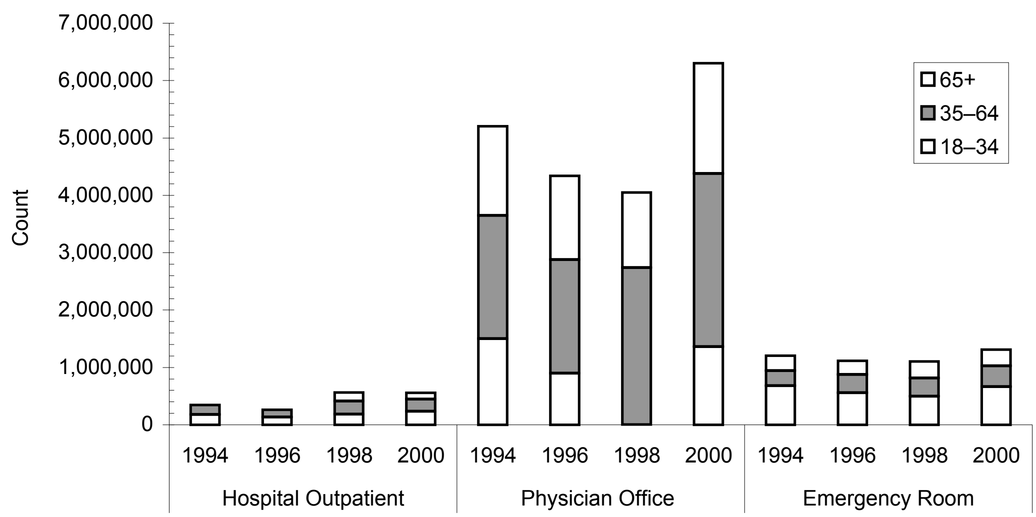

Figure 3. National trends in visits by females for urinary tract infection by patient age and site of service.

SOURCE: National Hospital Ambulatory Medical Care Survey (hospital outpatient and emergency room); National Ambulatory Medical Care Survey (physician office).

Table 15. Physician office visits by adult females with urinary tract infection listed as primary reason for visit, count, rate[a] (95% CI)

	Count	Rate	Count	Rate	Count	Rate
	1992		1994		1996	
Total	5,665,211	5,867 (4,766–6,968)	5,205,024	5,403 (4,513–6,292)	4,340,795	4,324 (3,493–5,156)
Age						
18–34	2,167,103	6,431 (4,314–8,549)	1,502,309	4,562 (3,255–5,869)	895,243	2,718 (1,749–3,687)
35–64	2,171,942	4,819 (3,391–6,248)	2,147,659	4,691 (3,413–5,969)	1,983,960	4,045 (2,874–5,217)
65+	1,326,166	7,454 (4,906–10,001)	1,555,056	8,819 (6,236–11,403)	1,461,592	7,943 (5,146–10,741)
Region						
Midwest	1,200,957	5,206 (3,157–7,255)	841,952	3,667 (2,385–4,948)	1,013,390	4,310 (2,460–6,159)
Northeast	864,968	4,280 (2,362–6,199)	981,042	4,838 (2,927–6,750)	769,391	3,827 (2,271–5,383)
South	2,437,343	7,295 (5,264–9,326)	2,042,634	6,231 (4,656–7,806)	1,386,711	3,889 (2,626–5,152)
West	1,161,943	5,848 (3,112–8,584)	1,339,396	6,590 (4,227–8,953)	1,171,303	5,550 (3,392–7,707)
MSA						
MSA	3,985,675	5,535 (4,377–6,694)	4,447,400	6,164 (5,074–7,253)	3,340,574	4,293 (3,351–5,235)
Non-MSA	1,679,536	6,841 (4,157–9,525)	*	*	1,000,221	4,432 (2,662–6,202)
Specialty						
Urology	1,103,291	1,143 (929–1,356)	731,871	760 (617–902)	780,023	777 (588–966)
GFP	2,357,447	2,441 (1,599–3,284)	2,277,566	2,364 (1,702–3,026)	1,861,398	1,854 (1,261–2,447)
All others	2,204,473	2,283 (1,623–2,943)	2,195,587	2,279 (1,711–2,847)	1,699,374	1,693 (1,151–2,234)
	1998		2000			
Total	5,288,958	5,169 (4,050–6,288)	6,300,754	6,013 (4,840–7,186)		
Age						
18–34	*	*	1,361,644	4,200 (2,479–5,921)		
35–64	2,738,069	5,325 (3,672–6,978)	3,015,698	5,624 (4,046–7,201)		
65+	1,313,974	7,081 (4,056–10,105)	1,923,412	10,265 (6,551–13,979)		
Region						
Midwest	*	*	1,377,591	5,781 (3,377–8,186)		
Northeast	*	*	1,344,803	6,514 (3,837–9,192)		
South	2,158,702	5,948 (4,030–7,865)	1,963,660	5,290 (3,449–7,131)		
West	*	*	1,614,700	6,963 (4,202–9,724)		
MSA						
MSA	3,879,002	4,888 (3,640–6,136)	4,630,497	5,666 (4,388–6,944)		
Non-MSA	1,409,956	6,143 (3,642–8,645)	1,670,257	7,245 (4,437–10,053)		
Specialty						
Urology	547,954	536 (363–708)	783,389	748 (553–942)		
GFP	2,388,058	2,334 (1,569–3,099)	2,821,067	2,692 (1,815–3,569)		
All others	2,352,946	2,300 (1,505–3,094)	2,696,298	2,573 (1,826–3,320)		

GFP, general and family practice; MSA, metropolitan statistical area.

*Figure does not meet standard for reliability or precision.

[a]Rate per 100,000 based on 1992, 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US female adult civilian non-institutionalized population.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: National Ambulatory Medical Care Survey, 1992, 1994, 1996, 1998, 2000.

Table 16. Physician office visits by adult females with urinary tract infection listed as any reason for visit, count, rate[a] (95% CI)

	Count	Rate	Count	Rate	Count	Rate
	1992		1994		1996	
Total	7,302,802	7,563 (6,307–8,819)	6,505,167	6,752 (5,757–7,747)	6,295,860	6,272 (5,276–7,268)
Age						
18–34	2,564,452	7,610 (5,280–9,941)	1,800,179	5,466 (3,963–6,970)	1,737,586	5,275 (3,765–6,786)
35–64	2,775,830	6,159 (4,523–7,795)	2,591,923	5,662 (4,286–7,037)	2,509,412	5,117 (3,817–6,417)
65+	1,962,520	11,030 (7,900–14,161)	2,113,065	11,984 (8,999–14,969)	2,048,862	11,135 (7,941–14,329)
Region						
Midwest	1,462,687	6,341 (4,114–8,567)	1,264,608	5,507 (3,746–7,269)	1,562,287	6,644 (4,413–8,876)
Northeast	1,232,828	6,101 (3,698–8,503)	1,247,926	6,155 (3,936–8,373)	939,584	4,673 (2,873–6,473)
South	2,909,465	8,708 (6,485–10,931)	2,357,740	7,193 (5,516–8,869)	2,301,628	6,455 (4,806–8,104)
West	1,697,822	8,545 (5,284–11,805)	1,634,893	8,044 (5,583–10,504)	1,492,361	7,071 (4,715–9,427)
MSA						
MSA	5,010,454	6,958 (5,651–8,266)	5,526,106	7,659 (6,438–8,880)	4,828,440	6,205 (5,086–7,325)
Non-MSA	2,292,348	9,337 (6,223–12,451)	979,061	4,047 (2,488–5,607)	1,467,420	6,502 (4,329–8,675)
Specialty						
Urology	1,280,128	1,326 (1,104–1,547)	849,076	881 (731–1,031)	895,705	892 (696–1,089)
GFP	3,022,128	3,130 (2,185–4,075)	2,840,667	2,948 (2,210–3,686)	2,629,808	2,620 (1,915–3,324)
Intern. Med.	1,208,039	1,251 (720–1,782)	1,442,635	1,497 (986–2,009)	1,344,616	1,340 (842–1,837)
All other	1,792,507	1,856 (1,286–2,427)	1,372,789	1,425 (1,046–1,804)	1,425,731	1,420 (981–1,859)
	1998		2000			
Total	7,645,826	7,473 (6,146–8,800)	8,150,279	7,778 (6,464–9,093)		
Age						
18–34	2,025,391	6,263 (4,184–8,342)	1,875,092	5,784 (3,776–7,792)		
35–64	3,431,071	6,673 (4,874–8,472)	3,693,141	6,887 (5,146–8,628)		
65+	2,189,364	11,798 (7,849–15,747)	2,582,046	13,780 (9,635–17,925)		
Region						
Midwest	1,689,897	7,111 (4,244–9,979)	1,572,822	6,601 (4,145–9,057)		
Northeast	*	*	1,615,468	7,826 (4,949–10,702)		
South	3,401,109	9,371 (6,980–11,762)	2,486,626	6,699 (4,670–8,728)		
West	1,812,256	8,241 (5,090–11,391)	2,475,363	10,674 (7,242–14,106)		
MSA						
MSA	6,001,991	7,563 (6,033–9,092)	6,242,476	7,638 (6,16– 9,113)		
Non-MSA	1,643,835	7,162 (4,509–9,816)	1,907,803	8,275 (5,380–11,170)		
Specialty						
Urology	704,268	688 (498–879)	1,077,581	1,028 (785–1,272)		
GFP	3,377,733	3,301 (2,396–4,207)	3,569,977	3,407 (2,437–4,377)		
Intern. Med.	2,335,343	2,283 (1,494–3,071)	1,914,448	1,827 (1,171–2,483)		
All other	*	*	1,588,273	1,516 (1,001–2,031)		

GFP, general and family practice; MSA, metropolitan statistical area.

*Figure does not meet standard for reliability or precision.

[a]Rate per 100,000 based on 1992, 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US female adult civilian non-institutionalized population.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: National Ambulatory Medical Care Survey, 1992, 1994, 1996, 1998, 2000.

Table 17. Physician office visits by female Medicare beneficiaries with urinary tract infection listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	1,568,800	7,918 (7,907–7,930)	1,740,660	8,625 (8,613–8,638)	1,585,360	8,319 (8,307–8,332)
Total < 65	102,780	4,303 (4,277–4,329)	145,780	5,425 (5,398–5,453)	144,520	5,204 (5,177–5,230)
Total 65+	1,466,020	8,414 (8,401–8,427)	1,594,880	9,117 (9,103–9,130)	1,440,840	8,851 (8,837–8,865)
Age						
65–74	720,880	7,843 (7,826–7,861)	767,800	8,530 (8,512–8,548)	641,100	8,113 (8,094–8,132)
75–84	571,020	9,681 (9,657–9,705)	619,480	10,348 (10,324–10,373)	599,440	10,261 (10,236–10,285)
85–94	165,460	7,970 (7,933–8,007)	197,260	8,871 (8,834–8,909)	189,900	8,536 (8,499–8,573)
95+	8,660	3,359 (3,289–3,428)	10,340	3,652 (3,582–3,721)	10,400	3,352 (3,288–3,415)
Race/ethnicity						
White	1,403,820	8,363 (8,350–8,377)	1,555,680	8,965 (8,952–8,979)	1,403,340	8,674 (8,660–8,688)
Black	95,360	5,655 (5,621–5,690)	102,840	5,590 (5,557–5,624)	91,440	5,183 (5,150–5,216)
Asian	…	…	8,480	8,983 (8,801–9,165)	12,740	7,200 (7,080–7,321)
Hispanic	…	…	26,300	13,090 (12,942–13,237)	42,340	11,520 (11,417–11,623)
N. American Native	…	…	1,080	6,683 (6,300–7,067)	1,400	5,368 (5,096–5,640)
Region						
Midwest	364,120	7,255 (7,232–7,278)	394,540	7,652 (7,629–7,675)	358,200	7,261 (7,238–7,284)
Northeast	250,720	5,532 (5,511–5,553)	270,300	6,015 (5,993–6,037)	244,060	6,230 (6,206–6,253)
South	710,660	10,170 (10,148–10,193)	782,420	10,829 (10,807–10,852)	717,800	10,229 (10,206–10,251)
West	218,240	7,654 (7,623–7,685)	257,100	8,979 (8,946–9,012)	228,500	8,407 (8,374–8,440)

… data not available.

[a]Unweighted counts multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

When physician outpatient services are stratified by provider specialty, some interesting trends emerge. The overall rates of visits to urologists are consistently lower than those for visits to family practitioners and general practitioners. This indicates that the majority of women with UTI are being treated by their primary care providers. The patients seen by urologists may be those with more complex or severe infections, recurrent UTI, acute pyelonephritis, or other concomitant urologic diagnoses. There was a larger growth in physician office visits for a primary diagnosis of UTI in nonmetropolitan service areas than in metropolitan areas. The significance of this is unclear, but the trend may reflect increased access to providers in less urban areas.

An analysis of CMS data for outpatient physician office visits for the treatment of UTI in women reveals a general increase in utilization between 1992 and 1995, which remained relatively stable in 1998 (Table 17). The most striking observation in this analysis is the peak in utilization among women between 75 and 84 years of age (Figure 4). Rates of utilization in this age group have been consistently higher than those in either older or younger patient populations. The reason for the spike in this age group is not immediately apparent. Most studies demonstrate a continued increase in the overall incidence and prevalence of UTI with increasing age. However, this likely represents the segment of the community-dwelling 75- to 84-year-old population who are treated as outpatients. Patients in the oldest age groups may be more likely to require inpatient treatment, but this accounts for only part of their lower rates of ambulatory care visits for which UTI is listed as the

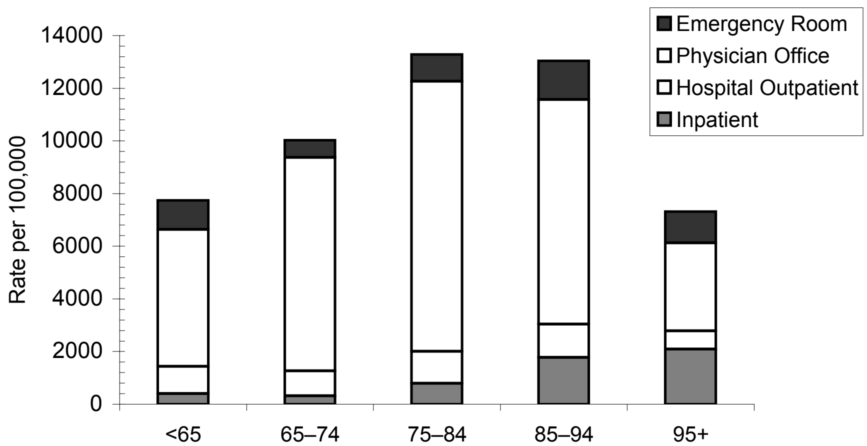

Figure 4. Distribution of urinary tract infection by site of visit, by age, 1998.

SOURCE: Centers for Medicare and Medicaid Services, 1998.

primary diagnosis (Tables 8–11). Outpatient visits by elderly women are likely to be for multiple conditions, any of which may be listed as the primary diagnosis.

An additional observation is the sizable geographic disparity between the South and other regions in the rate of physician office visits for UTI among female Medicare beneficiaries. Although this trend has been observed in some of the other analyses, it is most pronounced in this comparison. This difference appears to have been stable between 1992 and 1998. The reason for the sharply greater utilization in the South is unclear but may be associated with a higher prevalence of UTI in this region.

Ambulatory Surgery Care

Some women with UTIs may be treated in the ambulatory surgery setting. Data from Medicare beneficiaries treated for a diagnosis of UTI in ambulatory surgery centers (Table 18) revealed that the overall rate of utilization of this service site for a primary diagnosis of UTI was quite low, ranging from 108 cases per 100,000 (95% CI, 107–110) in 1992 to 96 cases per 100,000 (95% CI, 94–97) in 1998 (Figure 2). This most likely reflects the fact that UTI is not generally a primary surgical diagnosis. Many of these patients may have been scheduled for other operations and were subsequently found to have a UTI at the time of their presentation for surgery or were identified as having a UTI at the time of their pre- or post-operative visit. Utilization rates were generally low regardless of age, geographic region, or patient race/ethnicity. These data indicate that ambulatory surgery centers are not significant service sites for the treatment of UTI in women.

Emergency Room Care

The emergency room (ER) represents a significant site of care for many women with a primary diagnosis of UTI. According to NHAMCS data, approximately 1.3 million ER visits were made by women in the United States for evaluation and treatment of UTI in 2000 (Table 19). This represents a utilization rate of 1,252 visits per 100,000 adult women (95% CI, 1,077–1,426). Rates of use were highest for women 18 to 34 years of age (Figure 3). This trend was apparent in almost all the years analyzed (1994–2000). Utilization rates for young women ranged from 2.5 to 3.6 times those for 35- to 64-year-old women. Women 65 and over had higher utilization rates, but they were still lower than those of the youngest stratum. There was a slight decrease in the rate of ER utilization in all age groups between 1994 and 1998; however, the rates increased again for all patients in 2000.

Race/ethnicity appears to be an important factor in the ER utilization rates for treatment of UTI in women. The age-unadjusted rate of ER use

Table 18. Visits to ambulatory surgery centers by female Medicare beneficiaries with urinary tract infection listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	21,420	108 (107–110)	20,080	100 (98–101)	18,240	96 (94–97)
Total < 65	1,540	64 (61–68)	2,040	76 (73–79)	2,040	73 (70–77)
Total 65+	19,880	114 (113–116)	18,040	103 (102–105)	16,200	100 (98–101)
Age						
65–74	10,920	119 (117–121)	9,620	107 (105–109)	8,020	101 (99–104)
75–84	7,120	121 (118–124)	6,440	108 (105–110)	6,540	112 (109–115)
85–94	1,700	82 (78–86)	1,880	85 (81–88)	1,580	71 (68–75)
95+	140	54 (45–63)	100	35 (28–42)	60	19 (15–24)
Race/ethnicity						
White	18,860	112 (111–114)	17,820	103 (101–104)	16,080	99 (98–101)
Black	1,480	88 (83–92)	1,580	86 (82–90)	1,400	79 (75–83)
Asian	…	…	…	…	…	…
Hispanic	…	…	180	90 (77–103)	320	87 (78–97)
N. American Native	…	…	0	0.0	20	77 (42–111)
Region						
Midwest	7,300	145 (142–149)	6,260	121 (118–124)	6,140	124 (121–128)
Northeast	4,600	101 (99–104)	4,020	89 (87–92)	3,900	100 (96–103)
South	7,880	113 (110–115)	8,780	122 (119–124)	6,700	95 (93–98)
West	1,640	58 (55–60)	980	34 (32–36)	1,480	54 (52–57)

… data not available.

[a]Unweighted counts multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

by African American women was approximately twice that for Caucasians or other ethnic groups in all the years analyzed (Figure 5). This may reflect the general propensity toward increased ER utilization among African Americans for most clinical problems. Less regional variation was observed, although the overall rates of ER use among nonmetropolitan areas were higher than those in urban areas.

Analysis of Medicare data for ER use reveals similar trends (Table 20). Overall ER visits for female Medicare patients with UTI increased gradually between 1992 and 1998. When patients are stratified by age, little variation in utilization rates is seen over this time period. However, women over age 85 had a consistently higher rate of ER use than did younger women. The rate of ER use for Medicare beneficiaries was higher in the South than in other regions of the country. Caucasian women had lower rates of ER utilization than did other ethnic groups.

The notably higher overall rates of ER use by young women with UTI may reflect the relative lack of insurance in this segment of the population. These women may use the ER because they lack resources or have not identified a primary care provider. This pattern of utilization unnecessarily drives up the overall cost of health care.

Nursing Home Care

Data from the National Nursing Home Survey (NNHS) indicate that UTI as either an admitting or current diagnosis among female nursing home residents declined from 9,252 per 100,000 in 1995 to 7,111 per 100,000 in 1999 (Table 21). No clear association with age was observed over this time period. The decline in the identification of asymptomatic UTI in this population may result from the fact that screening for bacteriuria in nursing home residents is no longer widely practiced. Nursing

Table 19. Emergency room visits by adult females with urinary tract infection listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	1,205,099	1,251 (1,086–1,415)	1,114,941	1,111 (951–1,270)	1,106,420	1,081 (916–1,247)	1,311,359	1,252 (1,077–1,426)
Age								
18–34	679,567	2,064 (1,697–2,430)	557,447	1,692 (1,351–2,034)	498,278	1,541 (1,192–1,890)	665,796	2,054 (1,655–2,452)
35–64	262,839	574 (430–718)	317,112	647 (473–820)	316,118	615 (425–804)	362,324	676 (502–849)
65+	262,693	1,490 (1,049–1,931)	240,382	1,306 (893–1,719)	292,024	1,574 (1,143–2,004)	283,239	1,512 (1,038–1,985)
Race/ethnicity								
White	817,265	1,117 (932–1,301)	732,145	974 (795–1,153)	772,815	1,022 (831–1,213)	879,708	1,152 (951–1,354)
Black	244,538	2,121 (1,531–2,711)	264,662	2,195 (1,576–2,815)	239,602	1,923 (1,304–2,542)	322,515	2,501 (1,833–3,170)
Region								
Midwest	265,481	1,156 (826–1,487)	241,660	1,028 (688–1,367)	277,562	1,168 (770–1,566)	410,628	1,723 (1,284–2,162)
Northeast	309,787	1,528 (1,113–1,943)	254,887	1,268 (927–1,608)	208,294	1,028 (756–1,300)	150,389	729 (500–957)
South	451,722	1,378 (1,088–1,668)	451,731	1,267 (963–1,571)	476,927	1,314 (991–1,637)	535,863	1,444 (1,112–1,775)
West	178,109	876 (597–1,156)	166,663	790 (535–1,044)	143,637	653 (409–897)	214,479	925 (622–1,228)
MSA								
MSA	950,511	1,317 (1,127–1,507)	758,101	974 (817–1,132)	779,686	982 (809–1,156)	968,197	1,185 (1,003–1,367)
Non-MSA	254,588	1,052 (724–1,381)	356,840	1,581 (1,124–2,038)	326,734	1,424 (995–1,852)	343,162	1,488 (1,030–1,947)

MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US female adult civilian non-institutionalized population.

[b]Persons of other races are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

Source: National Hospital Ambulatory Medical Care Survey — ER, 1994, 1996, 1998, 2000.

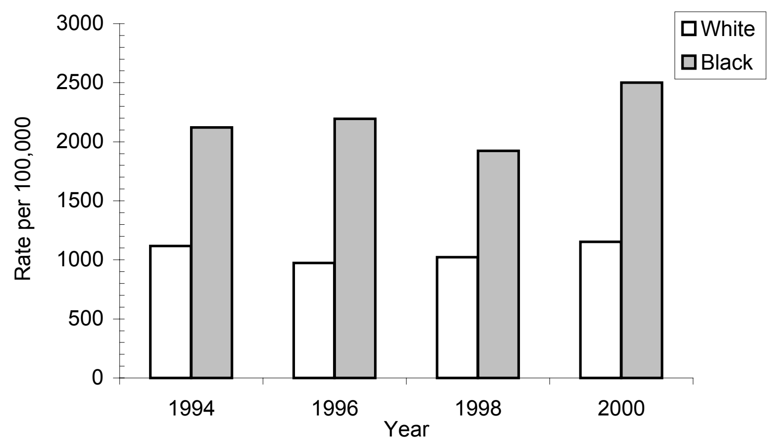

Figure 5. Rate of emergency room visits by females with urinary tract infection listed as primary diagnosis, by patient race and year.

SOURCE: Healthcare Cost and Utilization Project, 1994, 1996, 1998, 2000.

Table 20. Emergency room visits by female Medicare beneficiaries with urinary tract infection listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	157,180	793 (789–797)	177,700	881 (876–885)	177,780	933 (929–937)
Total < 65	21,620	905 (893–917)	28,180	1,049 (1,037–1,061)	30,840	1,110 (1,098–1,123)
Total 65+	135,560	778 (774–782)	149,520	855 (850–859)	146,940	903 (898–907)
Age						
65–74	53,720	584 (580–589)	56,500	628 (623–633)	51,080	646 (641–652)
75–84	53,300	904 (896–911)	56,760	948 (940–956)	59,480	1,018 (1,010–1,026)
85–94	25,640	1,235 (1,220–1,250)	32,120	1,445 (1,429–1,460)	32,680	1,469 (1,453–1,485)
95+	2,900	1,125 (1,084–1,165)	4,140	1,462 (1,418–1,506)	3,700	1,192 (1,154–1,231)
Race/ethnicity						
White	125,180	746 (742–750)	141,780	817 (813–821)	141,220	873 (868–877)
Black	22,640	1,343 (1,325–1,360)	27,380	1,488 (1,471–1,506)	26,340	1,493 (1,475–1,511)
Asian	…	…	600	636 (585–686)	740	418 (388–448)
Hispanic	…	…	2,720	1,354 (1,303–1,405)	4,880	1,328 (1,291–1,365)
N. American Native	…	…	340	2,104 (1,881–2,327)	400	1,534 (1,384–1,683)
Region						
Midwest	35,540	708 (701–715)	42,220	819 (811–827)	43,360	879 (871–887)
Northeast	27,300	602 (595–609)	29,660	660 (653–668)	26,860	686 (677–694)
South	73,280	1,049 (1,041–1,056)	83,120	1,150 (1,143–1,158)	84,300	1,201 (1,193–1,209)
West	19,380	680 (670–689)	20,780	726 (716–736)	21,000	773 (762–783)

… data not available.

[a]Unweighted counts multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

Table 21. Female nursing home residents with an admitting or current diagnosis of urinary tract infection, count, rate[a] (95% CI)

	1995		1997		1999	
	Count	Rate	Count	Rate	Count	Rate
Total[b]	104,100	9,252 (8,489–10,015)	95,302	8,243 (7,514–8,972)	83,208	7,111 (6,423–7,800)
Age						
18–74	13,280	7,800 (5,883–9,717)	17,136	9,492 (7,518–11,465)	10,454	5,529 (4,042–7,015)
75–84	35,213	9,580 (8,223–10,938)	30,158	8,109 (6,829–9,388)	24,555	6,671 (5,494–7,848)
85+	55,607	9,467 (8,415–10,520)	48,008	7,953 (6,962–8,943)	48,200	7,864 (6,857–8,872)
Race/ethnicity						
White	93,253	9,330 (8,515–10,144)	84,602	8,379 (7,591–9,166)	71,181	7,125 (6,375–7,874)
Other	10,847	8,820 (6,604–11,036)	10,700	7,752 (5,735–9,770)	11,793	7,230 (5,435–9,024)

[a]Rate per 100,000 nursing home residents in the same demographic stratum.
[b]Persons of unspecified race are included in the totals.
SOURCE: National Nursing Home Survey, 1995, 1997, 1999.

home residents with UTI had higher rates of urinary incontinence than did women in the general nursing home population (Tables 22 and 23). As expected, the proportion of women with indwelling foley catheters or ostomies nearly double in women with UTI than it was in the female nursing home population in general.

Overall trends in nursing home patients indicate that 56 to 58% of female residents have problems with urinary incontinence (Table 23). At least half of these residents also require some form of assistance to use the toilet, usually from another person. The overall rate of indwelling catheter use in nursing homes appears low (7.9% to 9.1%), according to these data. This reflects a widespread trend toward minimizing the use of indwelling catheters in nursing home residents to help minimize the risk of UTI.

ECONOMIC IMPACT

The economic burden of UTIs in adult women is significant. A substantial number of inpatient hospitalizations, outpatient hospital and clinic visits, and ER visits for the diagnosis and management of female UTI occur each year. The associated direct and indirect costs are also large and include substantial out-of-pocket expenses for the patients. Composite data suggest that the overall expenditures for treatment of UTIs among women in the United States were approximately $2.47 billion in 2000, excluding spending on outpatient prescription drugs (Table 7). Inpatient services accounted for the majority of treatment costs, although the fraction of expenditures devoted to inpatient care declined over time. Total spending on UTIs for women, after adjustment for inflation, increased about 1% per year between 1994 and 2000. The biggest percentage increases in spending were for services provided in physician offices and ERs. Most of the UTI-related expenditures in Medicare beneficiaries were for inpatient services (Table 24). The bulk of this spending was for women over 65, although UTI-related expenditures exceeded $100 million in 1998 among Medicare enrollees under 65, primarily the disabled. This does not include expenditures for complementary and alternative therapies, which may be substantial, given widespread beliefs in such remedies as cranberry juice (7).

The mean annual health care expenditures for privately insured women with a diagnosis of UTI in 1999 were approximately 1.4 times higher than those for women without UTI ($5,407 vs $3,833) (Table 25). Although similar across regions, the estimated overall costs in the South were the highest in the United States. Patient age did not appear to be a significant factor in health care expenditures in 1999.

An analysis of prescribing costs reflects a propensity to prescribe expensive medications such as the fluoroquinolones disproportionately, rather than TMP-SMX or other less expensive agents (Table 26). The average cost for a course of a fluoroquinolone is more than six times that for a course of TMP-SMX. This finding is consistent with the well-documented

Table 22. Special needs of female nursing home residents with urinary tract infection, count, rate[a] (95% CI)

	1995		1997		1999	
	Count	Rate	Count	Rate	Count	Rate
Has indwelling foley catheter or ostomy						
Yes	17,818	17,116 (13,818–20,415)	13,302	13,958 (10,735–17,180)	14,210	17,077 (13,211–20,943)
No	85,707	82,331 (78,993–85,669)	81,772	85,803 (82,556–89,050)	68,998	82,923 (79,057–86,789)
Question left blank	575	553 (0–1,183)	228	240 (0–711)	0	0
Requires assistance using the toilet						
Yes	62,124	59,677 (55,411–63,943)	57,710	60,555 (56,034–65,076)	42,226	50,748 (45,705–55,791)
No	16,430	15,783 (12,601–18,966)	13,238	13,890 (10,729–17,052)	14,070	16,909 (13,018–20,800)
Question skipped for allowed reason	25,329	24,331 (20,585–28,078)	23,883	25,060 (21,041–29,079)	26,212	31,501 (26,771–36,231)
Question left blank	217	208 (0–617)	471	495 (0–1,181)	700	842 (0–1,716)
Requires assistance from equipment when using the toilet						
Yes	17,219	16,541 (13,311–19,770)	15,682	16,456 (13,032–19,879)	15,008	18,037 (14,290–21,784)
No	43,542	41,827 (37,564–46,089)	40,082	42,058 (37,479–46,637)	25,973	31,215 (26,578–35,852)
Question skipped for allowed reason	41,759	40,114 (35,852–44,377)	37,121	38,951 (34,441–43,460)	40,281	48,410 (43,365–53,456)
Question left blank	1,580	1,518 (465–2,571)	2,417	2,536 (1,093–3,979)	1,945	2,338 (865–3,810)
Requires assistance from another person when using the toilet						
Yes	62,124	59,677 (55,411–63,943)	57,119	59,935 (55,403–64,468)	42,695	51,311 (46,267–56,356)
No	0	0	214	225 (0–667)	156	188 (0–557)
Question skipped for allowed reason	41,759	40,114 (35,852–44,377)	37,121	38,951 (34,441–43,460)	40,281	48,410 (43,365–53,456)
Question left blank	217	208 (0–617)	847	889 (12–1,767)	76	91 (0–269)
Has difficulty controlling urine						
Yes	65,954	63,356 (59,162–67,550)	62,266	65,336 (60,922–69,749)	54,497	65,495 (60,622–70,369)
No	25,656	24,645 (20,917–28,373)	24,155	25,345 (21,327–29,363)	19,204	23,079 (18,709–27,450)
Question skipped for allowed reason	11,767	11,303 (8,485–14,121)	8,484	8,903 (6,208–11,597)	9,354	11,242 (7,983–14,501)
Question left blank	724	696 (0–1,501)	397	416 (0–996)	153	184 (0–546)

[a]Rate per 100,000 adult female nursing home residents with urinary tract infection in the NNHS for that year.
SOURCE: National Nursing Home Survey, 1995, 1997, 1999.

Table 23. Special needs of female nursing home residents regardless of urinary tract infection diagnosis, count, rate[a] (95% CI)

	1995		1997		1999	
	Count	Rate	Count	Rate	Count	Rate
Has indwelling foley catheter or ostomy						
Yes	101,827	9,050 (8,281–9,819)	90,855	7,859 (7,151–8,566)	96,151	8,218 (7,484–8,951)
No	1,020,886	90,732 (89,954–91,510)	1,061,282	91,796 (91,072–92,520)	1,064,024	90,937 (90,162–91,712)
Question left blank	2,450	218 (89–347)	3,997	346 (182–510)	9,890	845 (571–1,120)
Requires assistance using the toilet						
Yes	659,035	58,572 (57,256–59,888)	652,615	56,448 (55,131–57,765)	670,006	57,262 (55,935–58,590)
No	286,946	25,503 (24,334–26,671)	280,242	24,240 (23,104–25,375)	273,104	23,341 (22,202–24,480)
Question skipped for allowed reason	173,839	15,450 (14,484–16,417)	216,408	18,718 (17,680–19,756)	218,971	18,714 (17,670–19,759)
Question left blank	5,343	475 (297–652)	6,870	594 (394–794)	7,983	682 (430–935)
Requires assistance from equipment when using the toilet						
Yes	182,812	16,248 (15,274–17,221)	180,518	15,614 (14,659–16,569)	178,305	15,239 (14,293–16,185)
No	460,230	40,903 (39,592–42,215)	433,640	37,508 (36,220–38,795)	467,351	39,942 (38,631–41,254)
Question skipped for allowed reason	460,785	40,953 (39,639–42,267)	496,649	42,958 (41,643–44,272)	492,075	42,055 (40,732–43,379)
Question left blank	21,336	1,896 (1,536–2,257)	45,327	3,921 (3,391–4,450)	32,334	2,763 (2,303–3,224)
Requires assistance from another person when using the toilet						
Yes	652,088	57,955 (56,636–59,274)	640,137	55,369 (54,048–56,689)	661,927	56,572 (55,242–57,901)
No	6,109	543 (345–741)	8,603	744 (511–977)	6,800	581 (384–779)
Question skipped for allowed reason	460,785	40,953 (39,639–42,267)	496,649	42,958 (41,643–44,272)	492,075	42,055 (40,732–43,379)
Question left blank	6,180	549 (357–741)	10,745	929 (681–1,178)	9,263	792 (527–1,056)
Has difficulty controlling urine						
Yes	633,123	56,269 (54,943–57,596)	672,699	58,185 (56,875–59,496)	685,747	58,608 (57,288–59,927)
No	424,287	37,709 (36,411–39,006)	422,839	36,574 (35,293–37,854)	422,162	36,080 (34,793–37,367)
Question skipped for allowed reason	64,822	5,761 (5,124–6,398)	57,080	4,937 (4,370–5,504)	55,713	4,761 (4,201–5,322)
Question left blank	2,931	260 (114–407)	3,517	304 (154–454)	6,444	551 (323–778)

[a]Rate per 100,000 adult female nursing home residents in the NNHS for that year.
SOURCE: National Nursing Home Survey, 1995, 1997, 1999.

Table 24. Expenditures for female Medicare beneficiaries for treatment of urinary tract infection (in millions of $), by site of service, 1998

	Total Annual Expenditures	
Site of Service	Age < 65	Age 65+
Inpatient	71.6	687.6
Outpatient		
Physician office	17.2	171.0
Hospital outpatient	2.9	15.5
Ambulatory surgery	3.4	24.0
Emergency room	9.8	58.4
Total	104.9	956.5

SOURCE: Centers for Medicare and Medicaid Services, 1998.

increases in health care costs driven by prescription drug utilization. This is also of concern because of the increased risk of drug resistance. Conversely, fluoroquinolone use may be warranted in areas where bacterial resistance to less-expensive agents already exceeds 20% of cases. These data do not reflect the success of treatment or whether prescriptions were based on culture and susceptibility results. Nor does this analysis account for any subsequent savings that may occur incident to the use of fluoroquinolones. Use of the basic therapeutic guidelines discussed earlier might alleviate some of these risks and costs. The estimated direct costs for female UTI are substantially lower in other studies (Table 27).

In addition to the direct medical costs of treatment, UTIs can affect labor market factors such as absenteeism and work limitations (Tables 28 and 29). Although cystitis is more common among women, pyelonephritis is associated with the greatest burden of work loss. Data from Medstat's 1999 Health and Productivity Management survey suggest that 24% of women with a medical claim for pyelonephritis missed some work time related to treatment of the condition, the average being 7.7 hours lost per year.

SPECIAL CONSIDERATIONS

HCUP data on women hospitalized for UTI suggest that diabetes may be a risk factor for the development of infection (Table 30). This may be due to changes in voiding physiology in diabetic patients

Table 25. Estimated annual expenditures of privately insured workers with and without a medical claim for a urinary tract infection in 1999[a] (in $)

	Annual Expenditures (per person)			
	Persons without UTI (N=267,520)	Persons with UTI (N=11,430)		
	Total	Total	Medical	Rx Drugs
All	3,099	5,470	4,414	1,056
Age				
18–34	2,685	5,067	4,333	734
35–44	2,861	5,327	4,398	929
45–54	3,173	5,752	4,565	1,187
55–64	3,279	5,515	4,342	1,173
Gender				
Male	2,715	5,544	4,528	1,016
Female	3,833	5,407	4,325	1,082
Region				
Midwest	2,988	5,423	4,367	1,057
Northeast	2,981	5,197	4,157	1,040
South	3,310	5,838	4,757	1,080
West	3,137	5,762	4,716	1,046

Rx, prescription.

[a]The sample consists of primary beneficiaries ages 18 to 64 having employer-provided insurance who were continuously enrolled in 1999. Estimated annual expenditures were derived from multivariate models that control for age, gender, work status (active/retired), median household income (based on zip code), urban/rural residence, medical and drug plan characteristics (managed care, deductible, co-insurance/co-payments), and 26 disease conditions.

SOURCE: Ingenix, 1999.

Table 26. Average annual spending and use of outpatient prescription drugs for treatment of urinary tract infection (male and female), 1996–1998[a]

Drug Name	Number of Rx Claims	Mean Price ($)	Total Expenditures ($)
Cipro®	774,067	60.27	46,652,998
Macrobid®	477,050	26.80	12,784,949
Triple antibiotic	329,253	8.44	2,778,898
Floxin®	279,564	54.10	15,124,394
Phenazopyridine	245,275	5.50	1,349,013
Amoxicillin	183,244	8.46	1,550,247
TMP/SMX	162,216	6.23	1,010,606
Bactrim	145,898	13.62	1,987,126
Nitrofurantoin	137,353	38.22	5,249,632
TMP-SMX ds	129,853	5.48	711,594
Oxybutynin	123,631	28.87	3,569,227
Cephalexin	118,985	19.06	2,267,854
Sulfacetamide	103,917	6.17	641,168
Sulfisoxazole	96,253	7.82	752,701
Total	3,306,559		96,430,407

Rx, prescription.

[a]Estimates include prescription drug claims with a corresponding diagnosis for urinary tract infection (both males and females) and exclude drug claims for which there was insufficient data to produce reliable estimates. Including expenditures on these excluded medications would increase total outpatient drug spending for urinary tract infections by approximately 52%, to $146 million.

SOURCE: Medical Expenditure Panel Survey, 1996–1998.

Table 27. Annual cost of female urinary tract infection, 1995

	Cost ($ millions)
Direct costs	
Medical expenses	
Clinic charges	385
Prescriptions	89
Nonmedical expenses	
Travel and childcare for visits	77
Output lost due to time spent for visits	108
Total direct costs	659
Indirect costs	
Output lost due to disability	
During bed days	300
During other days of restricted activity	300
During other days with symptoms	336
Total indirect costs	936
Total costs	1,594

SOURCE: Reprinted from Annals of Epidemiology, 10, Foxman B, Barlow R, D'Arcy, H, Gillespie B, Sobel JD, Urinary tract infection: self-reported incidence and associated costs, 509–515, Copyright 2000, with permission from Elsevier Science.

that lead to an increase in urinary retention, which in turn provides a nidus for infection. In addition, there may be alterations in the overall immune status of diabetic patients that predispose them to UTI. Assuming a prevalence of diabetes in the 40- to 70-year-old general population of 12.9% (8), the observed UTI rate of approximately 26% (63,662 per 245,879 in 2000) in this population suggests a relationship between the two disorders. Other data from the National Health Interview Survey also support this observation (9). However, the role of diabetes in the risk of UTI development remains controversial, and additional research is needed to clarify the associations.

SUMMARY

Urinary tract infection remains one of the most common urologic diseases of women in the United States. The overall lifetime risk of developing a UTI is high (>50% of all adult women), and appropriate diagnosis and treatment are essential to quality care. This analysis has revealed several interesting trends. There appears to have been some decrease in the use of inpatient hospitalization for the treatment of UTI in younger women, although it is still a significant source of health care expenditures for elderly women with this diagnosis. There has been an overall trend toward increased use of outpatient care in a variety of settings for acute pyelonephritis and selected cases of complicated infections. Analysis of prescribing patterns reveals great reliance on fluoroquinolones over more traditional first-line antimicrobials. This could have a variety of significant impacts in terms of both cost and biology. Efforts to slow the development of drug-resistant pathogens will depend heavily on future prescribing patterns.

RECOMMENDATIONS

This analysis raises a number of significant research questions regarding the evaluation and treatment of UTI in women. To what degree should prevention be emphasized in UTI care? What are the best recommendations for prevention? What is the role of the environment in the development of UTI in women, given the general observation that the

Table 28. Average annual work loss of persons treated for urinary tract infection (95% CI)

Condition	Number of Persons[a]	% Missing Work	Average Work Absence (hrs)		
			Inpatient	Outpatient	Total
Cystitis					
Males	116	18%	0.1 (0.0–0.4)	10.3 (0.0–24.5)	10.5 (0.0–24.7)
Females	426	16%	0.0	4.8 (3.0–6.6)	4.8 (3.0–6.6)
Pyelonephritis					
Males	71	21%	1.6 (0–4.7)	9.4 (2.6–16.2)	11.0 (3.6–18.4)
Females	79	24%	2.1 (0.0–4.2)	5.6 (2.0–9.1)	7.7 (3.7–11.7)
Other UTIs					
Males	779	15%	0.9 (0.0–2.6)	5.5 (3.7–7.3)	6.5 (4.0–8.9)
Females	1,846	17%	0.0	7.4 (5.5–9.3)	7.5 (5.6–9.3)
Orchitis	398	14%	1.5 (0.7–3.7)	6.1 (1.3–10.9)	7.6 (2.3–12.9)

[a]Individuals with an inpatient or outpatient claim for a urinary tract infection and for whom absence data were collected. Work loss is based on reported absences contiguous to the admission and discharge dates of each hospitalization or the date of the outpatient visit.
SOURCE: MarketScan, 1999.

rates of infection are higher in the South than in other regions?

Economic research related to female UTI will also be important in the future. The costs of caring for women with UTI are high, and methods to reduce costs while maintaining high-quality care are needed. The role of innovative methods for prevention and treatment will be important. For example, self-start therapy, in which a woman keeps a supply of antimicrobials for use when she develops symptoms of a UTI, has been proposed for women with recurrent UTI. Additional studies will be needed to identify the clinical efficacy and cost-utility of this approach. Additional research is also needed on the debate over definitions of UTI vs pyuria, the role of empirical therapy, and the need for routine urine culture and susceptibility testing, given the current controversies in the field. In addition, issues related to access to care will need to be explored. There has been a sharp rise in ER visits for UTI, particularly among young women. The cause of this utilization pattern needs to be identified and addressed. Answers to these research questions and others will contribute to the continued improvement of health care for women with UTI.

Table 29. Average work loss associated with a hospitalization or an ambulatory care visit for treatment of urinary tract infection (95% CI)

	Inpatient Care		Outpatient Care	
Condition	Number of Hospitalizations[a]	Average Work Absence (hrs)	Number of Outpatient Visits	Average Work Absence (hrs)
Cystitis				
Males	*	*	157	7.6 (0.0–18.1)
Females	*	*	629	3.2 (2.2–4.3)
Pyelonephritis				
Males	*	*	87	7.7 (2.1–13.2)
Females	*	*	105	4.2 (2.0–6.4)
Other UTIs				
Males	*	*	1,047	4.1 (2.8–5.4)
Females	*	*	2,669	5.1 (3.9–6.4)
Orchitis	*	*	633	3.8 (1.2–6.5)

*Figure does not meet standard for reliability or precision.

[a]Unit of observation is an episode of treatment. Work loss is based on reported absences contiguous to the admission and discharge dates of each hospitalization or the date of the outpatient visit.

SOURCE: MarketScan, 1999.

Table 30. Diabetes diagnosis as a comorbidity in adult females hospitalized for urinary tract infection, count (% of total), rate[a]

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total	223,256	232	235,055	234	243,584	238	245,879	235
Without diabetes as listed diagnosis	176,150 (79%)	183	179,391 (76%)	179	182,659 (75%)	179	182,217 (74%)	174
With diabetes as listed diagnosis	47,105 (21%)	49	55,663 (24%)	56	60,925 (25%)	60	63,662 (26%)	61

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US female adult civilian non-institutionalized population.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

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CHAPTER 7

Urinary Tract Infection in Men

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Urinary Tract Infection in Men

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INTRODUCTION

Although urinary tract infections (UTI) occur in both men and women, clinical studies suggest that the overall prevalence of UTI is higher in women. Basic concepts related to the definition and diagnosis of UTI, associated risks of morbidity and mortality, and general treatment principles are reviewed in the introduction to the chapter on UTI in Women. This chapter addresses resource utilization, epidemiology, and costs of UTI in adult men.

CLINICAL PERSPECTIVE AND RISK FACTORS

Unlike the epidemiology of UTI in females, rates are much lower in young adults and rise dramatically in older men. Indeed, several potential risk factors for the development of UTI are unique to men. Bladder outlet obstruction due to benign prostatic hyperplasia (BPH) may be associated with urinary stasis. Even though a causal relationship has been difficult to prove, chronic prostatic obstruction is thought to increase the risk of UTI in older men with BPH. Instrumentation of the urinary tract may lead to iatrogenic UTI, either from cystoscopy or catheterization, both of which are common in the evaluation of men with obstructive voiding symptoms. UTI is an uncommon complication of transrectal prostate biopsy. Complications may range from acute prostatitis and cystitis to more complex infections, including pyelonephritis, osteomyelitis, and systemic urosepsis. The most common associated organisms are gastrointestinal flora, including anaerobes. Most clinicians utilize antimicrobial prophylaxis around the time of the procedure. Fluoroquinolones are particularly effective for this condition.

Bacterial prostatitis, which may be acute or chronic, is an uncommon clinical problem. Several forms of prostatitis are recognized in the National Institutes of Health (NIH) classification system (1). Acute bacterial prostatitis (Type I) is characterized by rapid onset of symptoms, including fever and associated constitutional signs and symptoms. Urine cultures are typically positive, and intravenous antimicrobial therapy is often indicated. In contrast, chronic bacterial prostatitis (Type II) tends to be less pronounced in onset, with patients remaining asymptomatic between recurrent episodes. Recurrent cystitis is common. This is most likely due to persistence of pathogenic organisms in the prostatic secretory system. Coliform bacterial species, particularly *Enterococcus fecalis* and *Escherichia coli*, are the most common organisms in cases of chronic bacterial prostatitis. Nonbacterial prostatitis (Type III), also known as chronic pelvic pain syndrome, is a condition characterized by chronic pelvic pain that is attributed to the prostate. Patients may also complain of obstructive and irritative urinary symptoms, sexual dysfunction, and penile, testicular, or groin pain. Chronic pelvic pain syndrome may be associated with increased concentrations of inflammatory cells in prostatic secretions, despite the absence of documentable bacterial infection.

The pathogenesis of prostatitis may be multifactorial. Reflux of infected urine into the prostatic ducts in the posterior urethra occurs in some patients, while ascending urethral infection plays a role in others. Hematogenous and lymphatic spread have also been hypothesized as possible causes. Reflux of noninfected urine may be associated with cases of nonbacterial prostatitis. It is hypothesized that this intraprostatic reflux of urine may lead to histochemical inflammatory changes in the absence of bacteria.

Prostatic abscess is a localized infection in the prostate. Patients at increased risk for development of prostatic abscesses include diabetics and men who are immunocompromised. Urethral instrumentation and chronic indwelling catheters may also increase risk. Historically, prostatic abscesses were caused by *Neisseria gonorrhea*. Today, however, most cases are associated with coliform organisms, *Pseudomonas spp*., and anaerobic organisms.

Urethritis and epididymitis are generally painful conditions caused by bacterial infection of the urethra and epididymis, respectively. Both disorders may be acute or chronic. These are considered separately in the chapter on sexually transmitted diseases (STDs).

Orchitis is often associated with bacterial epididymitis. Isolated bacterial orchitis is less common. Mumps orchitis represents a specific form of the disease; it occurs in about 30% of mumps cases in postpubertal boys. The acute inflammation that occurs in these cases may lead to testicular atrophy and subsequent infertility. Other forms of orchitis include tuberculous orchitis, gangrenous orchitis, and testicular inflammation associated with infected hydroceles. In older men, most orchitis is probably related to bacterial UTI; however, in younger men, it usually represents a complication of sexually transmitted urethritis. These differences explain some of the demographic differences in hospitalization rates for orchitis noted later in this chapter. Orchitis is also addressed in the chapters on STDs and pediatric UTIs.

Scrotal infections may involve only the scrotal skin or may also include deeper structures. Fournier's gangrene is a severe form of scrotal infection associated with necrotizing fasciitis. Predisposing risk factors include diabetes, immunosuppression, poor perineal hygiene, and perirectal or perianal infections. Cultures typically yield mixed flora with both aerobic and anaerobic species. The risk of mortality with Fournier's gangrene is high because the infection can spread quickly along the layers of the abdominal wall that are contiguous with the scrotum. Aggressive surgical debridement and intravenous antimicrobial therapy are indicated.

DEFINITIONS

Clinical

The clinical definitions of general UTI, including bacteriuria, cystitis, and pyelonephritis, are reviewed in the introduction to the chapter on UTI in women. As described above, male anatomic structures that may be involved with infectious processes include the prostate, testis, scrotum, and epididymis.

Analytic

Analyses presented in this chapter used ICD-9 diagnostic codes for UTI (Table 1). These codes are based primarily on the site and type of infection involved.

PREVALENCE AND INCIDENCE

Approximately 20% of all UTIs occur in men. Between 1988 and 1994, the overall lifetime prevalence of UTI in men was estimated to be 13,689 cases per 100,000 adult men, based on the National Health and Nutrition Examination Survey (NHANES-III) (Tables 2 and 3). In comparison, the estimate for women was 53,067 cases per 100,000 adult women during the same time period (Chapter 6, Table 2).

Data from US Veterans Health Administration (VA) facilities supports the higher prevalence of UTI in women compared to men (Chapter 6, Figure 1 and Table 4). Between 1999 and 2001, the overall prevalence of UTI as a primary diagnosis in veterans seeking outpatient care was 2.3 to 2.48 times greater in women than it was in men. Rates of orchitis were generally higher than either cystitis or pyelonephritis when considered as either the primary or any diagnosis. Rates of UTI increased with age in this cohort and were higher in African American men than in other racial/ethnic groups (Table 4). The VA data show that overall rates of outpatient visits associated with a primary diagnosis of UTI among

Table 1. Codes used in the diagnosis and management of male urinary tract infection

Males 18 years or older with one of the following ICD-9 codes:

Orchitis	
016.5	Tuberculosis of other male genital organs
072.0	Mumps orchitis
603.1	Infected hydrocele
604.0	Orchitis epididymitis and epididymo-orchitis with abscess
604.9	Other orchitis, epididymitis, and epididymo-orchitis, without mention of abscess
604.90	Orchitis and epididymitis, unspecified
604.99	Other orichitis epididymitis and epididymo-orchitis without abscess
608.4	Other in ammatory disorders of male genital organs
608.0	Seminal vesiculitis
Cystitis	
112.2	Candidiasis of other urogenital sites
120.9	Schistosomiasis, unspecified
595.0	Acute cystitis
595.1	Chronic interstitial cystitis
595.2	Other chronic cystitis
595.3	Trigonitis
595.89	Other specified types of cystitis
595.9	Cystitis, unspecified
Pyelonephritis	
590.0	Chronic pyelonephritis
590.00	Chronic pyelonephritis without lesion of renal medullary necrosis
590.01	Chronic pyelonephritis with lesion of renal medullary necrosis
590.1	Acute pyelonephritis
590.10	Acute pyelonephritis without lesion of renal medullary necrosis
590.11	Acute pyelonephritis with lesion of renal medullary necrosis
590.2	Renal and perinephric abscess
590.3	Pyeloureteritis cystica
590.8	Other pyelonephritis or pyonephrosis, not specified as acute or chronic
590.9	Infection of kidney, unspecified
593.89	Other specified disorders of kidney and ureter
Other	
597.8	Other urethritis
599.0	Urinary tract infection site not specified
607.2	Other in ammatory disorders of penis
607.1	Balanoposthitis

Table 2. Male lifetime prevalence of urinary tract infections, by socio-demographic group, count, rate[a]

	Count	Rate
Total count[b]	11,892,613	13,689
1–2 Bladder infections ever	8,983,769	10,341
3+ Bladder infections ever	2,908,845	3,348
Mean number of infections in the last 12 months of those ever having UTI	0.26	
Race/ethnicity		
White non-Hispanic	9,864,439	14,458
Black non-Hispanic	932,376	10,326
Hispanic	909,324	13,229
Other	186,474	6,782
Region		
Midwest	3,327,654	15,899
Northeast	2,379,704	13,285
South	4,319,184	14,625
West	1,866,072	10,085
Urban/rural		
MSA	5,585,151	8,688
Non-MSA	6,307,463	27,919

MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1991 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US male adult civilian non-institutionalized population.

[b]The data in this table are based on the weighted number of persons who responded "1 or more" to question HAK4: "How many times have you had a bladder infection, also called urinary tract infection, UTI or cystitis?"

NOTE: Counts may not sum to total due to rounding.

SOURCE: National Health and Nutrition Examination Survey III, 1988–1994.

Table 3. Male incidence of UTI in past 12 months, by socio-demographic group, count, rate[a]

	Count	Rate
Total count[b]	2,013,448	2,318
1 or more bladder infections in the last 12 months	2,013,448	2,318
Mean number of infections in the last 12 months	1.5	0
Age		
18–24	111,205	920
25–34	374,050	1,789
35–44	251,245	1,336
45–54	302,969	2,419
55–64	239,659	2,394
65–74	432,123	5,303
75–84	242,354	6,693
85+	59,842	7,754
Race/ethnicity		
White non-Hispanic	1,505,602	2,207
Black non-Hispanic	209,061	2,315
Hispanic	180,689	2,629
Other	118,096	4,295
Region		
Midwest	495,025	2,365
Northeast	334,275	1,866
South	846,422	2,866
West	337,725	1,825
Urban/rural		
MSA	837,678	1,303
Non-MSA	1,175,769	5,204

MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1991 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US male adult civilian non-institutionalized population.

[b]The data in this table are based on the weighted number of persons who responded "1 or more" to question HAK5: "How many of these infections did you have during the past 12 months?"

NOTE: Counts may not sum to total due to rounding.

SOURCE: National Health and Nutrition Examination Survey III, 1988-1994.

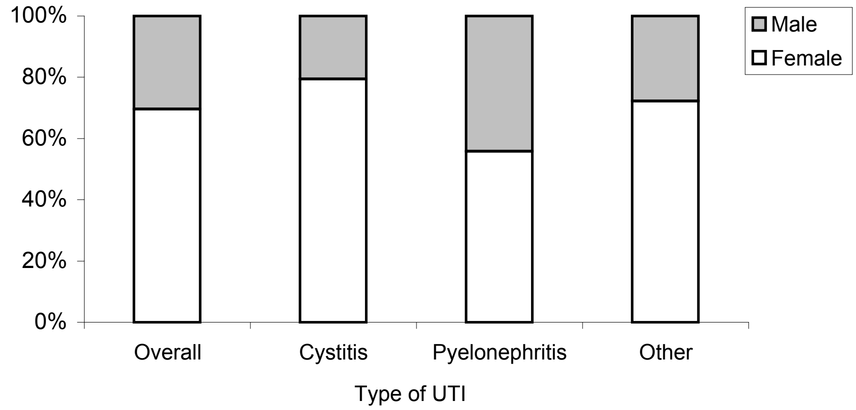

Figure 1. Percent contribution of males and females to types of urinary tract infections, 1999–2001.

SOURCE: Outpatient Clinic File (OPC), VA Austin Automation Center, FY 1999–2001.

adult male veterans dropped steadily between 1999 and 2001; this trend was most pronounced for older men and occurred across all racial/ethnic groups and geographic regions.

TRENDS IN HEALTH CARE RESOURCE UTILIZATION

Antimicrobial therapy is the primary mode of treatment for most patients with UTI. Antimicrobial selection is tailored on the basis of culture and susceptibility data following the initiation of empiric therapy. Selection of antimicrobials is guided by the severity and location of the individual infection and by consideration of regional and local epidemiological data on bacterial resistance.

Health care providers treat patients with UTI in a variety of clinical settings. This section examines trends in treatment patterns for male UTI at different sites of service.

Inpatient Care

Inpatient care with administration of intravenous antimicrobials may be required to treat men with severe UTI. Increased patient age appears to be associated with an increased rate of inpatient treatment for UTI in men. Data from the Centers for Medicare and Medicaid Services (CMS) from 1992 to 1998 reveal that across all years of study, the rates of inpatient care for men 65 years of age and older are approximately 1.7 times those of men younger than 65 (Table 5). The younger group comprises primarily those who qualified for Medicare because of disability or end-stage renal disease. The risk appears to increase significantly with age; rates more than double in men aged 85 and older. For example, the rate of inpatient care in 1992 for men 85 to 94 years of age was 1,678 per 100,000 (95% CI, 1649–1706) compared with 777 per 100,000 (95% CI, 768–786) for men aged 75 to 84, and 308 per 100,000 (95% CI, 304–312) for men 65 to 74. This trend was similar in 1995 and 1998. Increased use of inpatient care may be associated with more severe infections in older men due to increased comorbidity and changes in immune response associated with increased age. In the time period covered by the Medicare data, rates of inpatient hospitalization for male UTI care were about 1.5 times higher in African Americans than in Caucasians or Hispanics (counts in Asians and North American Natives were too low to produce reliable estimates of rates). The rate of inpatient utilization was somewhat higher in the South than in other regions.

Data for 1994 to 2000 from the Healthcare Cost and Utilization Project (HCUP) reveal that the rates of inpatient hospital care for men with a primary diagnosis of UTI at any anatomic location have been relatively stable for young and middle-aged men (18 to 64 years) and for men between ages 65 and 74 (Table 6). In contrast, the rates of hospitalization for men in the 75- to 84-year age group have slowly declined,

Table 4. Frequency of urinary tract infection[a] as a diagnosis in male VA patients seeking outpatient care, rate[b]

	1999		2000		2001	
	Primary Diagnosis	Any Diagnosis	Primary Diagnosis	Any Diagnosis	Primary Diagnosis	Any Diagnosis
Total	2,082	2,705	1,963	2,591	1,719	2,334
Age						
18–24	1,351	1,475	1,429	1,620	1,586	1,731
25–34	1,524	1,803	1,545	1,796	1,415	1,673
35–44	1,663	2,022	1,634	1,995	1,492	1,867
45–54	1,725	2,179	1,707	2,184	1,538	2,017
55–64	2,013	2,623	1,894	2,499	1,695	2,267
65–74	2,172	2,901	1,986	2,698	1,654	2,308
75–84	2,695	3,581	2,361	3,211	1,979	2,786
85+	3,983	5,317	3,540	4,733	2,975	4,321
Race/ethnicity						
White	2,553	3,311	2,411	3,167	2,139	2,881
Black	3,313	4,287	3,172	4,077	2,912	3,841
Hispanic	3,111	4,118	2,935	3,989	2,888	4,052
Other	2,088	2,642	1,763	2,351	1,764	2,338
Unknown	1,101	1,438	1,058	1,430	925	1,295
Region						
Midwest	1,989	2,606	1,892	2,503	1,578	2,132
Northeast	1,784	2,304	1,646	2,128	1,449	1,910
South	2,349	3,104	2,188	2,966	1,918	2,681
West	2,103	2,640	2,043	2,608	1,861	2,471
Insurance status						
No insurance/self-pay	1,994	2,552	1,929	2,486	1,716	2,271
Medicare/Medicare supplemental	2,560	3,412	2,254	3,087	1,928	2,702
Medicaid	2,455	2,972	2,188	2,846	2,287	2,998
Private insurance/HMO/PPO	1,700	2,234	1,534	2,036	1,280	1,760
Other insurance	1,830	2,338	1,868	2,361	1,519	2,039
Unknown	5,540	7,405	4,692	5,768	1,168	1,550

HMO, health maintenance organization; PPO, preferred provider organization.

[a]Represents diagnosis codes for male UTIs (including cystitis, pyelonephritis, orchitis, and other UTIs).

[b]Rate is defined as the number of unique patients with each condition divided by the base population in the same fiscal year x 100,000 to calculate the rate per 100,000 unique outpatients.

NOTE: Race/ethnicity data from clinical observation only, not self-report; note large number of unknown values.

SOURCE: Outpatient Clinic File (OPC), VA Austin Automation Center, FY1999–FY2001.

Table 5. Inpatient stays by male Medicare beneficiaries with urinary tract infection listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	74,320	505 (501–508)	72,820	478 (475–482)	70,480	487 (483–490)
Total < 65	9,960	322 (316–329)	10,940	318 (312–323)	10,840	315 (310–321)
Total 65+	64,360	553 (549–557)	61,880	526 (521–530)	59,640	540 (536–544)
Age						
65–74	22,300	308 (304–312)	19,980	278 (274–282)	17,320	269 (265–274)
75–84	27,440	777 (768–786)	26,180	716 (707–724)	26,180	715 (706–724)
85–94	13,260	1,678 (1,649–1,706)	14,560	1,716 (1,689–1,744)	14,760	1,705 (1,678–1,732)
95+	1,360	1,752 (1,659–1,844)	1,160	1,415 (1,334–1,495)	1,380	1,579 (1,496–1,661)
Race/ethnicity						
White	60,820	490 (486–494)	59,680	459 (455–463)	57,180	468 (464–471)
Black	9,780	768 (752–783)	10,100	729 (715–744)	9,800	734 (720–749)
Asian	…	…	180	247 (211–283)	380	277 (249–305)
Hispanic	…	…	1,000	504 (472–535)	1,560	465 (442–488)
N. American Native	…	…	140	696 (582–810)	340	1,216 (1,087–1,345)
Region						
Midwest	18,200	491 (484–498)	18,720	486 (479–493)	18,480	500 (493–507)
Northeast	15,460	488 (480–495)	13,900	437 (430–444)	13,820	497 (489–506)
South	31,620	604 (597–610)	30,720	560 (554–566)	28,500	531 (525–537)
West	8,260	368 (360–376)	8,340	360 (352–367)	8,260	369 (361–377)

… data not available.

[a]Unweighted counts multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, MedPAR and 5% Carrier File, 1992, 1995, 1998.

while the rates for men over 85 have gradually increased over time. The rates of inpatient care increase steadily with age, more than doubling with each decade beyond age 55. In this analysis, Asian men had the lowest rates of inpatient hospitalization for UTI care, followed by Hispanics and Caucasians. African American men had the highest rates of inpatient utilization. When analyzed by region, the lowest rates of inpatient care were seen in the West, while rates were similar in other geographic regions. Rates of inpatient care were similar in urban and rural settings. It is unclear why estimated inpatient utilization rates are lower in HCUP data than in CMS data.

Data from HCUP also reveal that approximately 10% of all inpatient care for UTI in men is for the treatment of orchitis (Table 7). Between 1994 and 2000, the overall rate of inpatient care for the treatment of orchitis was relatively stable, ranging from 12 to 14 per 100,000 population. Rates appear to rise gradually with age, the most significant increases occurring between 65 and 85 years of age. Inpatient utilization rates for elderly men decreased somewhat in 2000 compared to prior years. African American men had the highest rates of inpatient utilization for treatment of orchitis, and Asian men had the lowest rates. Inpatient utilization rates were slightly lower in the West than in other regions, and there was no significant difference between rates in urban and rural locations. The mean length of stay for inpatient hospitalizations in men with a primary diagnosis of UTI decreased from 6.5 days in 1994 to

Table 6. Inpatient hospital stays by adult males with urinary tract infection (any anatomic location) listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	115,258	131 (126–135)	111,680	121 (117–126)	118,193	125 (121–130)	121,367	126 (122–130)
Age								
18–24	2,475	20 (18–23)	2,129	17 (15–20)	2,139	17 (15–19)	1,983	15 (13–17)
25–34	6,670	33 (31–36)	6,124	31 (28–33)	5,344	28 (26–30)	5,045	28 (25–30)
35–44	8,525	43 (40–46)	9,114	43 (40–46)	8,956	41 (39–43)	8,764	40 (38–42)
45–54	9,830	70 (66–74)	9,748	63 (59–67)	10,324	62 (59–66)	11,165	63 (59–66)
55–64	12,394	129 (121–137)	11,840	119 (112–126)	13,327	126 (119–133)	13,360	120 (113–126)
65–74	25,188	320 (304–336)	23,215	284 (269–299)	24,256	301 (286–317)	24,374	303 (289–318)
75–84	32,866	867 (828–905)	32,246	765 (729–800)	33,885	747 (717–777)	35,667	738 (709–767)
85+	17,309	1,931 (1,830–2,031)	17,265	1,996 (1,890–2,101)	19,962	2,025 (1,932–2,119)	21,010	2,054 (1,968–2,140)
Race/ethnicity								
White	68,442	101 (97–105)	68,319	98 (94–102)	68,032	97 (93–101)	68,899	97 (93–100)
Black	13,583	147 (136–158)	13,334	138 (128–148)	12,935	130 (121–139)	12,488	122 (113–131)
Asian/Pacific Islander	813	33 (26–40)	919	29 (24–34)	1,153	34 (29–39)	1,629	46 (40–52)
Hispanic	5,699	69 (61–78)	6,067	67 (58–77)	6,947	69 (61–77)	7,982	77 (71–83)
Region								
Midwest	25,498	122 (112–132)	25,542	119 (111–126)	26,933	124 (114–133)	26,666	119 (111–127)
Northeast	24,955	138 (128–148)	23,501	130 (119–141)	23,233	128 (119–137)	24,625	136 (127–145)
South	47,476	160 (151–168)	44,858	141 (133–149)	48,656	147 (140–154)	49,021	144 (137–151)
West	17,329	88 (80–97)	17,779	87 (79–94)	19,371	91 (82–100)	21,055	98 (90–105)
MSA								
Rural	26,408	118 (109–127)	26,148	126 (117–135)	25,469	121 (113–129)	26,675	125 (117–133)
Urban	88,714	135 (129–140)	85,413	120 (115–125)	92,416	126 (121–131)	94,578	126 (122–131)

MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US male adult civilian non-institutionalized population.

[b]Persons of other races, missing or unavailable race and ethnicity, and missing MSA are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 7. Inpatient hospital stays by adult males with orchitis listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	12,322	14 (13–15)	11,363	12 (12–13)	11,941	13 (12–13)	12,174	13 (12–13)
Age								
18–24	614	5.0 (4.0–6.1)	454	3.7 (2.8–4.6)	584	4.7 (3.8–5.6)	532	4.1 (3.2–4.9)
25–34	2,058	10 (9.0–11)	1,548	7.8 (6.7–8.8)	1,428	7.4 (6.4–8.4)	1,312	7.2 (6.2–8.2)
35–44	2,207	11 (10–12)	2,390	11 (10–13)	2,481	11 (10–13)	2,469	11 (10–12)
45–54	1,848	13 (11–15)	1,928	12 (11–14)	2,100	13 (11–14)	2,446	14 (12–15)
55–64	1,610	17 (14–19)	1,431	14 (13–16)	1,710	16 (14–18)	1,786	16 (14–18)
65–74	1,964	25 (22–28)	1,896	23 (21–26)	1,674	21 (18–23)	1,865	23 (20–26)
75–84	1,570	41 (36–47)	1,305	31 (27–35)	1,509	33 (29–38)	1,384	29 (25–33)
85+	451	50 (37–64)	411	47 (36–59)	454	46 (36–57)	379	37 (28–46)
Race/ethnicity								
White	6,545	10 (8.9–10)	6,333	9.1 (8.5–9.8)	6,437	9.2 (8.5–9.8)	6,216	8.7 (8.0–9.4)
Black	1,896	21 (18–23)	1,647	17 (15–20)	1,571	16 (14–18)	1,613	16 (14–18)
Asian/Pacific Islander	*	*	*	*	*	*	*	*
Hispanic	773	9.4 (7.1–12)	788	8.7 (7.3–10)	910	9.0 (7.0–11)	1,241	12 (10–14)
Region								
Midwest	2,720	13 (12–15)	2,874	13 (12–15)	2,752	13 (11–14)	2,650	12 (10–13)
Northeast	3,297	18 (16–20)	2,714	15 (13–17)	2,536	14 (12–16)	2,543	14 (12–16)
South	4,456	15 (13–17)	4,226	13 (12–14)	4,796	14 (13–16)	4,920	14 (13–16)
West	1,850	9.4 (8.1–11)	1,549	7.6 (6.5–8.6)	1,858	8.7 (7.1–10)	2,061	10 (8.1–11)
MSA								
Rural	2,686	12 (10–14)	2,527	12 (11–14)	2,551	12 (11–14)	2,397	11 (10–13)
Urban	9,589	15 (14–16)	8,829	12 (12–13)	9,340	13 (12–14)	9,759	13 (12–14)

*Figure does not meet standard of reliability or precision.

MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US male adult civilian non-institutionalized population.

[b]Persons of other races, missing or unavailable race and ethnicity, and missing MSA are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 8. Trends in mean inpatient length of stay (days) for adult males hospitalized with urinary tract infection listed as primary diagnosis

	Length of Stay			
	1994	1996	1998	2000
All	6.5	5.4	5.1	5.1
Age				
18–24	4.4	3.9	3.6	3.4
25–34	4.9	4.2	4.0	4.2
35–44	5.2	4.6	4.1	4.4
45–54	5.4	4.8	4.5	4.8
55–64	5.9	4.9	4.8	4.8
65–74	6.3	5.3	5.0	5.1
75–84	7.2	6.0	5.5	5.4
85+	7.8	6.3	5.8	5.6
Race/ethnicity				
White	6.3	5.4	5.0	5.1
Black	7.5	6.3	5.9	5.7
Asian/Pacific Islander	7.1	5.5	5.6	5.4
Hispanic	6.1	5.3	5.2	5.0
Other	5.9	6.5	4.7	5.4
Region				
Midwest	6.0	5.1	4.9	4.8
Northeast	8.2	7.0	5.9	5.7
South	6.0	5.1	4.9	5.2
West	5.9	4.8	4.6	4.5
MSA				
Rural	5.7	5.0	4.6	4.6
Urban	6.7	5.6	5.2	5.2

MSA, metropolitan statistical area.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

5.1 days in 2000 (Table 8). Consistent with the general trend toward decreased use of inpatient care, this observation in men with UTI was noted across all age groups and geographic regions, and in both rural and urban hospitals.

Outpatient Care

Outpatient care for UTI in men is administered in a variety of clinical settings, including hospital outpatient clinics, physician offices, ambulatory surgery centers, and emergency rooms. Each of these settings was analyzed separately.

Hospital Care

Data from the National Hospital Ambulatory Medical Care Survey (NHAMCS) from 1994 to 2000 reveal that hospital outpatient visits by men with UTI listed as any of the reasons for the visit have been variable (Table 9), ranging from 91 to 175 per 100,000. When UTI was listed as the primary reason for the hospital patient visit, the rates increased from 80 per 100,000 (95% CI, 33–127) in 1996 to 136 per 100,000 (95% CI, 80–193) in 1998. The rate in 2000 dropped slightly, to 124 per 100,000 (95% CI, 62–186). These data suggest that there has been a general trend toward increased outpatient care for UTI in men. This complements the observed decreases in inpatient care noted above.

Table 9. National hospital outpatient visits by adult males with urinary tract infection, count, rate[a] (95% CI)

	Primary Reason		Any Reason	
	Count	Rate	Count	Rate
1994	73,571	83 (44–122)	154,900	175 (92–259)
1996	73,508	80 (33–127)	83,579	91 (44–138)
1998	128,629	136 (80–193)	163,573	173 (110–237)
2000	119,557	124 (62–186)	152,422	159 (91–226)

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US male adult civilian non-institutionalized population.

SOURCE: National Hospital Ambulatory Medical Care Survey — Outpatient, 1994, 1996, 1998, 2000.

Hospital outpatient visit data from CMS reveal a similar increase in utilization during the past decade (Table 10). Among Medicare beneficiaries at least 65 years old, rates of hospital outpatient visits for men with UTI rose from 191 per 100,000 (95% CI, 189–194) in 1992 to 301 per 100,000 (95% CI, 298–304) in 1995, and 362 per 100,000 (95% CI, 358–365) in 1998. The most dramatic increases were observed in the oldest elderly men. In those 95 years of age and older, the rates of hospital outpatient visits more than doubled between 1992 and 1995 and doubled again between 1995 and 1998. Rates of hospital outpatient visits for UTI care in men were highest in the Midwest and South, and the rates in both regions have increased over time. In the years for which complete data regarding racial/ethnic differences in outpatient hospital utilization were available (1995 and 1998), Hispanic men had the highest rates of utilization, followed by African American men. In 1998, the rates for Hispanic men were 1.23 and 1.80 times higher than those for African Americans and Caucasians, respectively (counts in Asians were too low to

Table 10. Outpatient hospital visits by male Medicare beneficiaries with urinary tract infection listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	28,580	194 (192–196)	46,020	302 (300–305)	51,720	357 (354–360)
Total < 65	6,300	204 (199–209)	10,560	307 (301–312)	11,760	342 (336–348)
Total 65+	22,280	191 (189–194)	35,460	301 (298–304)	39,960	362 (358–365)
Age						
65–74	10,080	139 (137–142)	14,920	208 (204–211)	16,920	263 (259–267)
75–84	9,340	264 (259–270)	14,020	383 (377–390)	15,800	432 (425–438)
85–94	2,700	342 (329–355)	6,160	726 (708–744)	6,460	746 (728–764)
95+	160	206 (174–238)	360	439 (394–484)	780	892 (830–954)
Race/ethnicity						
White	18,540	149 (147–152)	33,160	255 (252–258)	40,560	332 (328–335)
Black	6,280	493 (481–505)	9,060	654 (641–668)	6,460	484 (472–496)
Asian	…	…	160	220 (185–254)	480	350 (319–381)
Hispanic	…	…	1,520	766 (727–804)	2,000	596 (570–622)
N. American Native	…	…	580	2,883 (2,649–3,116)	700	2,504 (2,321–2,686)
Region						
Midwest	8,460	228 (223–233)	12,780	332 (326–337)	15,160	410 (403–416)
Northeast	6,860	216 (211–221)	6,780	213 (208–218)	7,680	276 (270–283)
South	8,400	160 (157–164)	19,580	357 (352–362)	21,440	399 (394–405)
West	3,960	176 (171–182)	6,240	269 (262–276)	7,240	324 (316–331)

…data not available.
[a]Unweighted counts multiplied by 20 to arrive at values in the table.
[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.
[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.
NOTE: Counts less than 600 should be interpreted with caution.
SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

produce reliable estimates of rates). The reason for this observed difference is unclear.

Physician Offices

The majority of UTIs in both men and women are treated in physicians' offices. According to data from the National Ambulatory Medical Care Survey (NAMCS), more than 1,896,000 physician office visits that included a diagnosis of UTI were made in 2000 by men in the United States (Table 11). Of these visits, more than 1,290,000 were for a primary diagnosis of UTI. Fluctuations in rates of utilization have been observed over time, with peaks occurring in 1992 and 1996. In these years, the observed rates of physician office visits for UTI in men aged 55 and older were significantly higher than those for younger men. This likely reflects the higher incidence and prevalence of UTI in older men. The reasons for the dramatic increases in 1992 and 1996 are unclear but may be related to coding anomalies.

Medicare data for outpatient physician office visits for men with UTI indicate that rates of utilization remained relatively stable throughout the 1990s (Table 12). Rates were consistently highest in men in the 85- to 94-year age group, followed by those aged 75 to 84 (Figure 2). Rates in the most elderly cohort (95 and older) were similar to the overall mean. Regional variations in Medicare physician outpatient visits for men with UTI appear to have diminished over time and were least pronounced in 1998. As in the NHAMCS data, Hispanic men had the highest rates of physician office utilization among the racial/

Table 11. National physician office visits by adult males with urinary tract infection, count, rate[a] (95% CI)

	1992		1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate	Count	Rate
	Primary Reason for Visit									
Total	1,992,546	2,268 (1,598–2,938)	1,111,037	1,259 (889–1,629)	2,163,849	2,353 (1,601–3,105)	1,664,141	1,765 (1,060–2,470)	1,290,406	1,342 (854–1,830)
Age										
18–54	1,067,943	1,642 (964–2,320)	682,612	1,033 (652–1,414)	1,147,995	1,669 (913–2,425)	845,264	1,205 (582–1,828)	819,947	1,153 (568–1,738)
55+	924,603	4,050 (2,340–5,760)	428,425	1,932 (993–2,872)	1,015,854	4,379 (2,412–6,346)	*	*	470,459	1,879 (1,013–2,745)
	Any Reason for Visit									
Total	2,372,185	2,700 (1,997–3,402)	1,594,515	1,807 (1,368–2,245)	2,652,548	2,884 (2,093–3,675)	2,105,332	2,232 (1,447–3,018)	1,896,810	1,973 (1,377–2,568)
Age										
18–54	1,203,792	1,851 (1,149–2,553)	831,728	1,258 (843–1,674)	1,243,005	1,807 (1,041–2,574)	971,180	1,384 (731–2,038)	1,153,805	1,623 (915–2,330)
55+	1,168,393	5,118 (3,297–6,939)	762,787	3,441 (2,209–4,673)	1,409,543	6,076 (3,910–8,241)	*	*	743,005	2,967 (1,876–4,058)

*Figure does not meet standard for reliability or precision.

[a]Rate per 100,000 based on 1992, 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US male adult civilian non-institutionalized population.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: National Ambulatory Medical Care Survey — Outpatient, 1992, 1994, 1996, 1998, 2000.

Table 12. Physician office visits by male Medicare beneficiaries with urinary tract infection listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	524,880	3,564 (3,555–3,574)	540,200	3,549 (3,540–3,559)	498,620	3,444 (3,435–3,453)
Total < 65	62,880	2,035 (2,019–2,051)	75,040	2,178 (2,163–2,193)	71,420	2,078 (2,063–2,093)
Total 65+	462,000	3,970 (3,959–3,981)	465,160	3,951 (3,939–3,962)	427,200	3,869 (3,858–3,880)
Age						
65–74	231,780	3,202 (3,190–3,215)	231,720	3,224 (3,211–3,237)	197,840	3,078 (3,065–3,092)
75–84	177,880	5,037 (5,014–5,060)	180,140	4,925 (4,903–4,947)	173,720	4,744 (4,723–4,766)
85–94	49,700	6,289 (6,235–6,342)	50,300	5,929 (5,879–5,980)	52,980	6,119 (6,069–6,170)
95+	2,640	3,400 (3,273–3,528)	3,000	3,659 (3,530–3,787)	2,660	3,043 (2,928–3,157)
Race/ethnicity						
White	446,400	3,599 (3,589–3,610)	464,380	3,572 (3,562–3,582)	425,500	3,480 (3,469–3,490)
Black	47,140	3,700 (3,667–3,733)	48,560	3,507 (3,476–3,538)	40,760	3,054 (3,025–3,083)
Asian	…	…	2,400	3,293 (3,164–3,422)	4,700	3,427 (3,331–3,523)
Hispanic	…	…	9,740	4,906 (4,811–5,001)	14,980	4,463 (4,393–4,533)
N. American Native	…	…	520	2,584 (2,366–2,803)	440	1,574 (1,427–1,720)
Region						
Midwest	126,780	3,418 (3,399–3,436)	125,900	3,266 (3,248–3,284)	113,680	3,074 (3,056–3,092)
Northeast	86,280	2,721 (2,703–2,739)	93,300	2,934 (2,915–2,952)	83,440	3,002 (2,982–3,022)
South	223,640	4,270 (4,252–4,287)	220,600	4,021 (4,005–4,038)	210,400	3,920 (3,904–3,937)
West	76,500	3,405 (3,381–3,429)	83,260	3,590 (3,567–3,614)	76,820	3,435 (3,411–3,459)

… data not available.

[a]Unweighted counts multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

ethnic groups analyzed.

Ambulatory Surgery

Visits to ambulatory surgery centers represent a small percentage of Medicare visits for men with UTI (Table 13). Among Medicare beneficiaries at least 65 years old, rates ranged from 83 per 100,000 in 1992 (95% CI, 82–85) to 93 per 100,000 in 1995 (95% CI, 92–95) and 95 per 100,000 in 1998 (95% CI, 93–97). Rates were lower and more stable among younger Medicare beneficiaries who qualified because of disability or end-stage renal disease. As with Medicare physician office visits, the highest rates were observed in men 75 to 94 years of age. Rates were highest in the Midwest and Northeast and lowest in the South and West. The reasons for these geographic differences are unclear. No clear racial/ethnic differences were observed in this analysis. The low rates of utilization for ambulatory surgery centers indicate that this is not a primary site of service for men with UTI. The cases identified likely represent perioperative UTI in men scheduled for outpatient surgery.

Emergency Room

Patients with UTI may present to an emergency room (ER) for initial evaluation and management. Data from NHAMCS indicate approximately 424,700 ER visits by men with a primary diagnosis of UTI in 2000 (Table 14). The overall rate of utilization in 2000 was 442 per 100,000, which is similar to the rate of 420 per 100,000 observed in 1994. Lower rates of ER utilization in this population were observed

Table 13. Visits to ambulatory surgery centers by male Medicare beneficiaries with urinary tract infection listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	11,120	76 (74–77)	12,860	84 (83–86)	12,200	84 (83–86)
Total < 65	1,420	46 (44–48)	1,860	54 (52–56)	1,720	50 (48–52)
Total 65+	9,700	83 (82–85)	11,000	93 (92–95)	10,480	95 (93–97)
Age						
65–74	5,400	75 (73–77)	5,880	82 (80–84)	4,940	77 (75–79)
75–84	3,500	99 (96–102)	4,200	115 (111–118)	4,460	122 (118–125)
85–94	780	99 (92–106)	860	101 (95–108)	1,040	120 (113–127)
95+	20	26 (14–37)	60	73 (55–91)	40	46 (32–59)
Race/ethnicity						
White	9,680	78 (76–80)	11,280	87 (85–88)	10,820	88 (87–90)
Black	780	61 (57–66)	1,100	79 (75–84)	940	70 (66–75)
Asian	…	…	100	137 (110–165)	20	15 (8.0–21)
Hispanic	…	…	100	50 (40–60)	240	72 (63–80)
N. American Native	…	…	…	…	20	72 (39–104)
Region						
Midwest	3,420	92 (89–95)	3,960	103 (100–106)	3,880	105 (102–108)
Northeast	2,940	93 (89–96)	3,000	94 (91–98)	3,000	108 (104–112)
South	3,840	73 (71–76)	4,540	83 (80–85)	3,960	74 (71–76)
West	880	39 (37–42)	1,240	53 (50–56)	1,260	56 (53–59)

… data not available.

[a]Unweighted counts multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

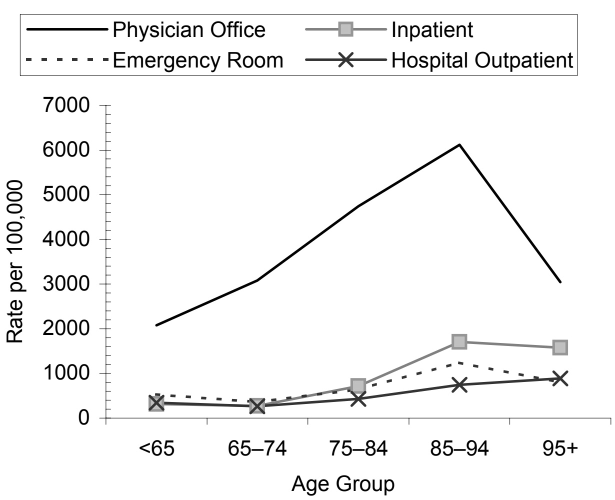

Figure 2. Trends in visits by males with urinary tract infection listed as primary diagnosis by patient age and site of service, 1998.

SOURCE: Centers for Medicare and Medicaid Services, 1998.

Table 14. National emergency room visits by adult males with urinary tract infection listed as primary diagnosis, count, rate[a] (95% CI)

	Count	Rate
1994	370,637	420 (320–520)
1996	296,377	322 (232–412)
1998	322,937	342 (245–440)
2000	424,705	442 (325–559)

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US male adult civilian non-institutionalized population.

SOURCE: National Hospital Ambulatory Medical Care Survey — ER, 1994, 1996, 1998, 2000.

Table 15. Emergency room visits by male Medicare beneficiaries with urinary tract infection listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	74,500	506 (502–510)	78,220	514 (510–518)	76,280	527 (523–531)
Total < 65	15,100	489 (481–496)	17,680	513 (506–521)	18,320	533 (525–541)
Total 65+	59,400	510 (506–515)	60,540	514 (510–518)	57,960	525 (521–529)
Age						
65–74	26,440	365 (361–370)	24,200	337 (333–341)	23,000	358 (353–362)
75–84	22,960	650 (642–659)	25,040	685 (676–693)	23,540	643 (635–651)
85–94	9,140	1,156 (1,133–1,180)	10,360	1,221 (1,198–1,245)	10,720	1,238 (1,215–1,262)
95+	860	1,108 (1,034–1,181)	940	1,146 (1,073–1,220)	700	801 (741–860)
Race/ethnicity						
White	58,080	468 (464–472)	60,220	463 (460–467)	58,820	481 (477–485)
Black	12,200	958 (941–974)	14,820	1,070 (1,053–1,087)	13,040	977 (960–994)
Asian	…	…	140	192 (161–224)	300	219 (194–244)
Hispanic	…	…	1,300	655 (620–690)	2,240	667 (640–695)
N. American Native	…	…	120	596 (492–701)	300	1,073 (951–1,195)
Region						
Midwest	17,820	480 (473–487)	18,140	471 (464–477)	19,600	530 (523–537)
Northeast	12,720	401 (394–408)	13,660	430 (422–437)	12,140	437 (429–445)
South	33,080	632 (625–638)	36,740	670 (663–677)	34,240	638 (631–645)
West	9,680	431 (422–439)	8,500	367 (359–374)	8,980	402 (393–410)

… data not available.

[a]Unweighted counts multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

in 1996 and 1998. The rates of ER utilization by male Medicare beneficiaries were somewhat higher, ranging from 506 per 100,000 (95% CI, 502–510) in 1992 to 527 per 100,000 (95% CI, 523–531) in 1998 (Table 15). In this analysis, utilization rates were consistently highest in the next-to-oldest cohort (85 to 94 years of age), followed closely by the oldest men (those 95 and older). Rates of ER utilization by older men were nearly twice those of men younger than 85 years of age. This may represent increased severity of infection in elderly men prompting evaluation in the ER. Rates of ER utilization in this cohort were consistently highest in the South. Again, the reason for the geographic variation is unclear. African American men had rates of ER utilization twice as high as those of Caucasians in this analysis (Figure 3). The lowest rates were observed in Asian men.

Nursing Homes

Information regarding UTI in men living in nursing home facilities was obtained from the National Nursing Home Survey of 1995, 1997, and 1999 (Tables 16–18). The overall rates for men with either an admitting or current diagnosis of UTI in this sample appear stable over time, ranging from 5,642 per 100,000 in 1997 (95% CI, 4,641–6,642) to 5,803 per 100,000 in 1995 (95% CI, 4,794–6,812). It is interesting to note that the rates of UTI for men living in nursing homes are closer to those for women than are the rates for the community-dwelling cohorts, as discussed in the chapter on UTI in Women (see Chapter 6 , Tables 21–23). No clear trends were observed over time with regard to age in male nursing home residents. In all years studied, about half of male nursing home residents required special assistance using the toilet,

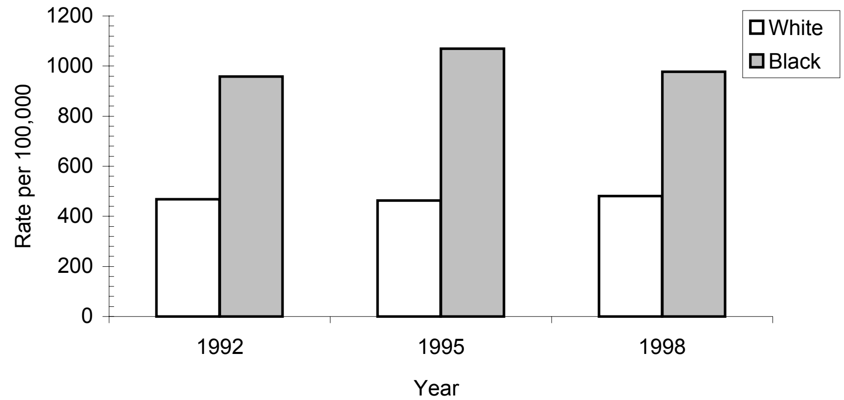

Figure 3. Rate of emergency room visits for males with urinary tract infection listed as primary diagnosis by patient race and year.

SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

regardless of whether they had a UTI (Table 18). In 1997, only 39% of men with UTI required special assistance using the toilet, but this survey item was skipped at a much higher rate that year, making its results difficult to interpret (Table 17). Men with UTI had higher rates of incontinence than did the general cohort of male nursing home residents. It is not clear whether UTI or urinary incontinence is the causal factor.

The rates of indwelling catheter and ostomy use in male nursing home residents have remained stable at 11.9% in 1995 and 11.3% in 1999 (Table 18). This is of concern because of the well-established association between indwelling catheter use and urinary tract colonization and infection. Although these rates of catheter and ostomy use are not dramatic, they are higher than the 7.9 to 9.1% range observed in female nursing home residents. (see Chapter 6, Table 23).

ECONOMIC IMPACT

Direct Costs

Urinary tract infections in men are associated with a significant economic cost. Adjusted mean

Table 16. Male nursing home residents with an admitting or current diagnosis of urinary tract infection, count, rate[a] (95% CI)

	1995		1997		1999	
	Count	Rate	Count	Rate	Count	Rate
Total[b]	24,404	5,803 (4,794–6,812)	25,063	5,642 (4,641–6,642)	26,229	5,743 (4,761–6,724)
Age						
18–74	8,223	5,746 (4,046–7,445)	9,158	6,011 (4,302–7,720)	9,552	5,860 (4,266–7,455)
75–84	8,017	5,554 (3,886–7,223)	7,082	4,408 (2,956–5,859)	9,438	6,311 (4,397–8,225)
85+	8,164	6,135 (4,244–8,026)	8,822	6,723 (4,629–8,817)	7,239	5,020 (3,440–6,600)
Race						
White	18,678	5,500 (4,403–6,597)	19,029	5,364 (4,258–6,470)	18,455	5,070 (4,052–6,087)
Other	5,508	6,973 (4,453–9,493)	5,704	6,637 (4,252–9,021)	7,558	8,349 (5,608–11,089)

[a]Rate per 100,000 male nursing home residents in the same demographic stratum.
[b]Persons of unspecified race are included in the total.
SOURCE: National Nursing Home Survey, 1995, 1997, 1999.

Table 17. Special needs of male nursing home residents with urinary tract infection, count, rate[a] (95% CI)

	1995		1997		1999	
Category	Count	Rate	Count	Rate	Count	Rate
Has indwelling foley catheter or ostomy						
Yes	6,925	28,375 (20,204–36,546)	8,960	357,50 (26,693–44,806)	6,880	26,229 (18,779–33,680)
No	17,479	71,625 (63,454–79,796)	16,103	64,250 (55,194–73,307)	19,349	73,771 (66,320–81,221)
Question left blank	0	0	0	0	0	0
Requires assistance using the toilet						
Yes	12,388	50,761 (41,692–59,830)	9,869	39,377 (30,473–48,280)	14,214	54,192 (45,293–63,092)
No	4,465	18,295 (11,292–25,297)	5,885	23,483 (15,212–31,754)	4,151	15,828 (9,343–22,312)
Question skipped for allowed reason	7,329	30,032 (21,702–38,363)	9,068	36,183 (27,302–45,064)	7,513	28,643 (20,417–36,869)
Question left blank	223	912 (0–2,715)	240	957 (0–2,850)	351	1,337 (0–3,204)
Requires assistance from equipment when using the toilet						
Yes	2,546	10,433 (4,740–16,126)	2,749	10,970 (54,89–16,452)	3,038	11,581 (5,996–17,166)
No	9,629	39,458 (30,628–48,288)	6,303	25,149 (17,344–32,954)	10,352	39,467 (30,808–48,125)
Question skipped for allowed reason	11,794	48,327 (39,262–57,392)	14,954	59,666 (50,709–68,623)	11,664	44,470 (35,581–53,360)
Question left blank	435	1,782 (0–4,262)	1,056	4,215 (504–7,925)	1,176	4,482 (911–8,053)
Requires assistance from another person when using the toilet						
Yes	12,388	50,761 (41,692–59,830)	9,637	38,450 (29,602–47,298)	14,214	54,192 (45,293–63,092)
No	0	0	0	0	0	0
Question skipped for allowed reason	11,794	48,327 (39,262–57,392)	14,954	59,666 (50,709–68,623)	11,664	44,470 (35,581–53,360)
Question left blank	223	912 (0–2,715)	472	1,884 (0–4,505)	351	1,337 (0–3,204)
Has difficulty controlling urine						
Yes	14,667	60,102 (51,208–68,997)	14,705	58,673 (49,604–67,743)	14,550	55,472 (46,703–64,240)
No	5,311	21,762 (14,269–29,256)	4,728	18,865 (11,759–25,972)	6,723	25,631 (17,996–33,265)
Question skipped for allowed reason	4,210	17,250 (10,366–24,135)	5,629	22,461 (14,800–30,122)	4,957	18,898 (12,329–25,467)
Question left blank	216	885 (0–2,635)	0	0	0	0

[a]Rate per 100,000 male nursing home residents with urinary tract infection in the NNHS for that year.
SOURCE: National Nursing Home Survey, 1995, 1997, 1999.

Table 18. Special needs of male nursing home residents regardless of urinary tract infection diagnosis, count, rate[a] (95% CI)

Category	1995 Count	1995 Rate	1997 Count	1997 Rate	1999 Count	1999 Rate
Has indwelling foley catheter or ostomy						
Yes	50,298	11,961 (10,569–13,352)	53,938	12,141 (10,731–13,552)	51,457	11,266 (9,941–12,591)
No	369,452	87,854 (86,453–89,254)	389,880	87,762 (86,348–89,176)	401,402	87,884 (86,497–89,271)
Question left blank	781	186 (3–368)	430	97 (0–210)	3,883	850 (385–1,315)
Requires assistance using the toilet						
Yes	207,587	49,363 (47,203–51,523)	221,599	49,882 (47,736–52,028)	241,558	52,887 (50,755–55,020)
No	141,870	33,736 (31,689–35,783)	133,378	30,023 (28,069–31,977)	128,251	28,080 (26,154–30,005)
Question skipped for allowed reason	69,267	16,471 (14,863–18,080)	86,814	19,542 (17,809–21,275)	81,977	17,948 (16,308–19,588)
Question left blank	1,807	430 (146–714)	2,459	553 (238–869)	4,956	1,085 (571–1,599)
Requires assistance from equipment when using the toilet						
Yes	57,463	13,664 (12,183–15,145)	59,329	13,355 (11,901–14,809)	67,782	14,840 (13,323–16,357)
No	143,213	34,055 (32,011–36,100)	149,218	33,589 (31,564–35,614)	162,895	35,665 (33,630–37,699)
Question skipped for allowed reason	211,137	50,207 (48,047–52,368)	220,191	49,565 (47,419–51,711)	210,228	46,028 (43,899–48,156)
Question left blank	8,719	2,073 (1,466–2,680)	15,510	3,491 (2,702–4,281)	15,837	3,467 (2,650–4,285)
Requires assistance from another person when using the toilet						
Yes	203,490	48,389 (46,230–50,548)	217,556	48,972 (46,827–51,117)	238,252	52,163 (50,029–54,297)
No	2,350	559 (237–881)	2,571	579 (234–924)	2,690	589 (237–941)
Question skipped for allowed reason	211,137	50,207 (48,047–52,368)	220,191	49,565 (47,419–51,711)	210,228	46,028 (43,899–48,156)
Question left blank	3,554	845 (451–1,239)	3,930	885 (482–1,287)	5,573	1,220 (681–1,759)
Has difficulty controlling urine						
Yes	218,491	51,956 (49,797–54,115)	232,536	52,344 (50,203–54,485)	242,189	53,025 (50,898–55,153)
No	170,988	40,660 (38,537–42,783)	175,090	39,413 (37,325–41,500)	177,128	38,781 (36,709–40,852)
Question skipped for allowed reason	29,338	6,976 (5,881–8,072)	36,416	8,197 (7,028–9,366)	34,206	7,489 (6,406–8,572)
Question left blank	1,715	408 (110–705)	207	47 (0–138)	3,220	705 (255–1,155)

[a]Rate per 100,000 adult male nursing home residents in the NNHS for that year.

SOURCE: National Nursing Home Survey, 1995, 1997, 1999.

Table 19. Estimated annual expenditures of privately insured workers with and without a medical claim for a UTI in 1999[a] (in $)

	Annual Expenditures (per person)			
	Persons without UTI (N=267,520)	Persons with UTI (N=11,430)		
	Total	Total	Medical	Rx Drugs
All	3,099	5,470	4,414	1,056
Age				
18–34	2,685	5,067	4,333	734
35–44	2,861	5,327	4,398	929
45–54	3,173	5,752	4,565	1,187
55–64	3,279	5,515	4,342	1,173
Gender				
Male	2,715	5,544	4,528	1,016
Female	3,833	5,407	4,325	1,082
Region				
Midwest	2,988	5,423	4,367	1,057
Northeast	2,981	5,197	4,157	1,040
South	3,310	5,838	4,757	1,080
West	3,137	5,762	4,716	1,046

Rx, prescription.

[a]The sample consists of primary beneficiaries ages 18 to 64 having employer-provided insurance who were continuously enrolled in 1999. Estimated annual expenditures were derived from multivariate models that control for age, gender, work status (active/retired), median household income (based on zip code), urban/rural residence, medical and drug plan characteristics (managed care, deductible, co-insurance/co-payments), and 26 disease conditions.

SOURCE: Ingenix, 1999.

health care expenditures for privately insured men diagnosed with a UTI was $5,544 in 1999, while the expenditure was $2,715 for men who did not experience a UTI (Table 19). In adults without a UTI, annual health care expenditures were lower for men than for women ($2,715 versus $3,833, respectively). However, there was little difference in total annual health care expenditures for men and women with UTI ($5,544 vs $5,407).

The total annual estimated expenditures for outpatient prescription medication for the treatment of UTI in both men and women between 1996 and 1998 were estimated to exceed $96.4 million (Table 20). Fluoroquinolones accounted for a large portion of these expenditures, in terms of both costs and numbers of claims. This may reflect a growing trend toward the use of fluoroquinolones rather than other types of antimicrobials for the treatment of UTI. The extent to which fluoroquinolones were prescribed as first-line therapy for prostatitis and other appropriate indications could not be determined from this dataset.

Indirect Costs

Overall time lost from work due to UTI was similar in men and women. Although men had only slightly higher rates of work loss due to cystitis (18% of men vs 16% of women), men tended to miss more than twice as much work time (10.5 hours vs 4.8 hours) (Table 21). Men with pyelonephritis also missed more total time from work than did women (11.0 hours vs 7.7 hours), although the percentage of men missing work was slightly lower than the percentage of women (21% vs 24%). Of men diagnosed with orchitis in this sample, 14% reported missing work, for a mean total of 7.6 hours (95% CI, 2.3–12.9). For each ambulatory care visit or hospitalization for orchitis, men missed an average of 3.8 hours of work (95% CI, 1.2–6.5) (Table 22).

Based on composite data, the overall medical expenditures for men with UTI in the United States were estimated to be approximately $1.028 billion in 2000 (Table 23). This is approximately 2.4 times lower than the overall amount spent to care for women with UTI during the same time period (see UTI in Women,

Table 20. Average annual spending and use of outpatient prescription drugs for treatment of urinary tract infection (male and female), 1996–1998[a]

Drug Name	Number of Rx Claims	Mean Price ($)	Total Expenditures ($)
Cipro®	774,067	60.27	46,652,998
Macrobid®	477,050	26.80	12,784,949
Triple antibiotic	329,253	8.44	2,778,898
Floxin®	279,564	54.10	15,124,394
Phenazopyridine	245,275	5.50	1,349,013
Amoxicillin	183,244	8.46	1,550,247
TMP/SMX	162,216	6.23	1,010,606
Bactrim	145,898	13.62	1,987,126
Nitrofurantoin	137,353	38.22	5,249,632
TMP-SMX ds	129,853	5.48	711,594
Oxybutynin	123,631	28.87	3,569,227
Cephalexin	118,985	19.06	2,267,854
Sulfacetamide	103,917	6.17	641,168
Sulfisoxazole	96,253	7.82	752,701
Total	3,306,559		96,430,407

Rx, prescription.

[a]Estimates include prescription drug claims with a corresponding diagnosis for urinary tract infection (both males and females) and exclude drug claims for which there was insufficient data to produce reliable estimates. Including expenditures on these excluded medications would increase total outpatient drug spending for urinary tract infections by approximately 52%, to $146 million.

SOURCE: Medical Expenditure Panel Survey, 1996–1998.

Table 7). The costs of care for UTI in men appear to be increasing, as is the case with women (Table 23 and UTI in Women, Table 7). Inpatient care accounts for the largest portion of these expenditures, followed by physician office care and ER care. The total annual expenditures for male Medicare beneficiaries with UTI were approximately $480.2 million in 1998 (Table 24). This is significantly higher than the expenditures for younger male Medicare beneficiaries (total $91.1 million) but comparable on a per-person basis. Inpatient expenditures of older Medicare beneficiaries have remained constant over time after accounting for inflation (Table 25). However, spending on ambulatory services and emergency care has increased significantly in real terms between 1992 and 1998.

SPECIAL CONSIDERATIONS

Diabetes has been identified as a comorbid condition that may increase the risk of UTI. Some patients with diabetes develop voiding dysfunction, which predisposes them to an increased risk of UTI. Diabetes may also be associated with a component of immunosuppression. HCUP data from 1994 to 2000 indicate that the rates of diabetes as a comorbid condition in men hospitalized for UTI increased through the 1990s (Table 26). It is notable that diabetes is approximately twice as common among men hospitalized for UTI as it is in the general population (2).

Table 21. Average annual work loss of persons treated for urinary tract infection (95% CI)

Condition	Number of Persons[a]	% Missing Work	Average Work Absence (hr) Inpatient	Outpatient	Total
Cystitis					
Males	116	18%	0.1 (0–0.4)	10.3 (0–24.5)	10.5 (0–24.7)
Females	426	16%	0.0	4.8 (3.0–6.6)	4.8 (3.0–6.6)
Pyelonephritis					
Males	71	21%	1.6 (0–4.7)	9.4 (2.6–16.2)	11.0 (3.6–18.4)
Females	79	24%	2.1 (0.0–4.2)	5.6 (2.0–9.1)	7.7 (3.7–11.7)
Other UTIs					
Males	779	15%	0.9 (0–2.6)	5.5 (3.7–7.3)	6.5 (4.0–8.9)
Females	1,846	17%	0.0	7.4 (5.5–9.3)	7.5 (5.6–9.3)
Orchitis	398	14%	1.5 (0.7–3.7)	6.1 (1.3–10.9)	7.6 (2.3–12.9)

[a]Individuals with an inpatient or outpatient claim for a UTI and for whom absence data were collected. Work loss is based on reported absences contiguous to the admission and discharge dates of each hospitalization or the date of the outpatient visit.

SOURCE: MarketScan, 1999.

Table 22. Average work loss associated with a hospitalization or an ambulatory care visit for treatment of urinary tract infection (95% CI)

	Inpatient Care		Outpatient Care	
Condition	Number of Hospitalizations[a]	Average Work Absence (hr)	Number of Outpatient Visits	Average Work Absence (hr)
Cystitis				
Males	*	*	157	7.6 (0.0–18)
Females	*	*	629	3.2 (2.2–4.3)
Pyelonephritis				
Males	*	*	87	7.7 (2.1–13)
Females	*	*	105	4.2 (2.0–6.4)
Other UTIs				
Males	*	*	1,047	4.1 (2.8–5.4)
Females	*	*	2,669	5.1 (3.9–6.4)
Orchitis	*	*	633	3.8 (1.2–6.5)

*Figure does not meet standard for reliability or precision.

[a]Unit of observation is an episode of treatment. Work loss is based on reported absences contiguous to the admission and discharge dates of each hospitalization or the date of the outpatient visit.

SOURCE: MarketScan, 1999.

Table 23. Expenditures for male urinary tract infection (in millions of $) and share of costs, by site of service

	Year			
	1994	1996	1998	2000
Total[a]	811.5	903.8	969.3	1,027.9
Share of total				
Inpatient	626.5 (77.2%)	629.9 (69.7%)	691.1 (71.3%)	733.9 (71.4%)
Physician office	81.2 (10.0%)	179.9 (19.9%)	157.0 (16.2%)	135.7 (13.2%)
Hospital outpatient	18.7 (2.3%)	18.1 (2.0%)	31.0 (3.2%)	28.8 (2.8%)
Emergency room	85.2 (10.5%)	75.9 (8.4%)	90.1 (9.3%)	129.5 (12.6%)

[a]Total unadjusted expenditures exclude spending on outpatient prescription drugs for the treatment of UTI. Average drug spending for UTI-related conditions (both male and female) is estimated at $96 million to $146 million annually for the period 1996 to 1998.

SOURCES: National Ambulatory Medical Care Survey, National Hospital Ambulatory Mecial Care Survey, Healthcare Cost and Utilization Project, Medical Expenditure Panel Survey, 1994, 1996, 1998, 2000.

SUMMARY

Urinary tract infections are among the most common urological disorders in both men and women. A variety of forms of UTI are recognized, and they may differ significantly, by location and severity. Overall, approximately 20% of all UTIs occur in men. These infections result in significant financial and personal costs for both individual patients and the health care system.

The data analyses presented here reveal several specific trends in men diagnosed with UTI. The overall rates of UTI in men appear to have remained stable during the 1990s. Although inpatient care still accounts for a significant portion of medical care for male UTI, there has been a general trend toward greater utilization of outpatient care in various settings for treatment of UTI-related disorders. Per capita financial expenditures for UTI in men appear similar to those for UTI in women. However, the mean time lost from work by men is somewhat greater.

Table 24. Expenditures for male Medicare beneficiaries for the treatment of urinary tract infection (in millions of $), by site of service, 1998

Site of Service	Total Annual Expenditures	
	Age < 65	Age 65+
Inpatient	70.9	376.4
Outpatient		
Physician office	9.8	59.0
Hospital outpatient	1.3	4.7
Ambulatory surgery	2.8	17.7
Emergency room	6.4	22.4
Total	91.1	480.2

SOURCE: Centers for Medicare and Medicaid Services, 1998.

Table 25. Expenditures for male Medicare beneficiaries age 65 and over for treatment of urinary tract infection (in millions of $)

	Year		
	1992	1995	1998
Total	436.9	452.8	480.2
Inpatient	363.6 (83.2%)	364.2 (80.4%)	376.4 (78.4%)
Outpatient			
Physician office	41.4 (9.5%)	46.9 (10.4%)	59 (12.3%)
Hospital outpatient	2.8 (0.6%)	3.8 (0.8%)	4.7 (1.0%)
Ambulatory surgery	12.3 (2.8%)	17.4 (3.8%)	17.7 (3.7%)
Emergency room	16.8 (3.8%)	20.6 (4.5%)	22.4 (4.7%)

NOTE: Percentages may not add to 100% because of rounding.

SOURCE: Centers for Medicare and Medicaid Services, 1992, 1995, 1998.

Table 26. Diabetes diagnosis as a comorbidity in adult males hospitalized for urinary tract infection, count (% of total), rate[a]

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total	115,258	131	111,680	121	118,193	125	121,367	126
Without diabetes as listed diagnosis	92,853 (81%)	105	87,403 (78%)	95	90,294 (76%)	96	91,046 (75%)	95
With diabetes as listed diagnosis	22,405 (19%)	25	24,277 (22%)	26	27,899 (24%)	30	30,321 (25%)	32

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US male adult civilian non-institutionalized population.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

RECOMMENDATIONS

Analysis of these data raises several important research questions related to UTI in adult men. What is the relationship between comorbid urologic conditions such as benign prostatic hyperplasia, urinary incontinence, and urinary tract infection? What is the role of preventive care in men at risk for the development of UTI? How can the diagnosis and treatment of men with UTI be improved to minimize time lost from work and decrease overall medical expenditures? What roles do demographic factors, including race/ethnicity and geography, play in the risk for developing UTI? How can health care delivery be optimized to provide high-quality care while simultaneously decreasing costs and complications?

Many of these questions apply to both men and women with UTI. Additional research on health services, outcomes, economic impacts, and epidemiological factors is needed to answer these challenging questions.

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CHAPTER 8

Urinary Tract Infection in Children

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SUMMARY

Urinary tract infection (UTI) affects 2.6% to 3.4% of children in the United States annually. Throughout childhood, the risk of UTI is 2% for boys and 8% for girls. UTIs are primarily managed in physicians' offices, where they account for more than 1 million visits (0.7% of all pediatric office visits) per year. The emergency room is also an important site of care, accounting for 5% to 14% of physician encounters for pediatric UTI. Inpatient hospitalization is required in 2% to 3% of cases, with UTI accounting for more than 36,000 admissions in 2000. More care is rendered to girls than to boys, at a ratio of 3–4 to 1. Hospitalization is more frequent for infants, but it is more expensive for adolescents. Overall costs for inpatient hospital care increased during the 1990s despite shorter lengths of stay. The cost of hospitalization for UTI amounts to more than $180 million annually. However, the true financial burden is probably much higher because it includes costs for outpatient services, imaging, other diagnostic evaluations, long-term complications, and management of associated conditions that increase the frequency and morbidity of UTI. The economic impact on the family due to parental work loss is largely unknown. Efforts to lessen the economic burden on patients, payers, and society include decreasing the length and frequency of inpatient hospitalizations, streamlining the post-UTI imaging evaluation, developing new antimicrobials to fight resistant organisms, and generating easy-to-implement nonantimicrobial strategies.

DEFINITION

Normally, the urinary tract proximal to the distal urethra is sterile, but it is constantly challenged by infectious pathogens fighting to gain access. A UTI, strictly speaking, occurs when an infectious agent is present within this sterile system; however, a more appropriate clinical definition is that UTI occurs when the infectious agent is not only present, but is also causing illness. This distinction underscores the inherent clinical difficulty of managing patients with UTI. In practice, a diagnosis of UTI is presumed when irritative urinary tract symptoms occur simultaneously with a positive test for infectious agents, such as bacteria, fungi, viruses, or parasites, in the urinary tract. Because other factors can cause similar symptoms, the presence of symptoms in the absence of a positive culture has historically been considered inadequate for diagnosis. Likewise, the presence of leukocytes in the urine is not proof of infection. Asymptomatic bacteriuria may represent colonization or contamination and should be differentiated from UTI. Thus, for clinical purposes, the definition of a UTI requires a combination of symptoms and laboratory findings.

Both the infectious agent and the anatomic location typically define the UTI. The urinary tract is commonly divided into the upper tract (kidneys and ureters) and the lower tract (bladder and urethra). In the male, infections such as prostatitis, epididymitis, and orchitis are frequently included as UTIs but are more accurately considered genital infections; they have a separate epidemiology and natural history.

In this chapter, genital infections are excluded from the definition of UTI, and non-sexually transmitted orchitis is discussed separately.

UTIs are also categorized as complicated or uncomplicated. Complicated UTIs are infections in which there is a comorbidity that predisposes a child either to infection or to greater morbidity due to the infection. Comorbidities include the presence of stones, neurological impairment affecting urinary tract functioning, and anatomic abnormalities such as obstruction, reflux, or enterovesical fistula.

UTI is a frequent complication of medical care, especially hospitalization. Unfortunately, the datasets analyzed for this chapter preclude distinguishing nosocomial from community-acquired infections.

In this compendium, children are defined as persons less than 18 years of age. Where possible, they are further subdivided into infants (under 3 years of age), older children (3 to 10), and adolescents (11 to 17). Most of the datasets analyzed for this chapter do not distinguish the site of the UTI, with the notable exception of data from the Healthcare Cost and Utilization Project (HCUP) and MarketScan, in which pyelonephritis and orchitis, respectively, are distinguished from UTIs in other sites. The method by which the site of UTI is determined in these datasets is based on diagnostic coding and likely varies across the population.

The vast majority of UTIs are caused by bacterial agents, the most important of which are the Enterobacteriaciae, a family of gram-negative bacilli. *Escherichia coli* accounts for more than 80% of acute UTIs in children. The rest of the cases are distributed primarily among *Proteus mirabilis*, *Klebsiella pneumonia*, and *Pseudomonsa aeruginosa*. Less common infectious agents include gram-positive cocci, such as *Enterococcus* and *Staphylococcus*. Fungal infections, particularly *Candida*, are usually seen in nosocomial infections, complicated UTIs, or catheter-associated UTIs. Viral infections are under-recognized because of difficulties with culture and identification, but they have clearly been associated with infectious bladder symptoms. Cytomegalovirus is frequently seen in immunocompromised patients, particularly following organ transplantation.

Analyses for this chapter are based on the ICD-9 codes defining UTI listed in Table 1.

DIAGNOSIS

The clinical diagnosis of UTI is usually based on a combination of symptoms, physical and radiographic findings, and laboratory results. Diagnostic methods vary markedly and depend on presentation, clinical suspicion, medical history, and local practice patterns. Children pose a unique challenge in the diagnosis of UTI, because they often are unable to provide an accurate history or description of symptoms. Obtaining adequate specimens may also be difficult, and clinical signs such as fever and leukocytosis may be unreliable in the very young.

A lower tract infection is typically suspected in the presence of dysuria, urgency, frequency, and, less commonly, suprapubic pain. Upper tract involvement is typically heralded by fever, flank pain, nausea, vomiting, and lethargy. In the young child, there can be significant overlap in the clinical presentations of upper and lower tract infections. Symptoms may not be verbalized, and the diaper may conceal the voiding pattern. Fever is frequently the presenting sign, although lethargy may be the sole indicator of significant infection in infants. Parents' perception of an odor is an unreliable sign of infection (1). Hence, the clinician must have a high index of suspicion to make an accurate diagnosis of UTI.

Diagnosis is further hindered by the difficulty of obtaining adequate samples for laboratory testing. Urinalysis, the standard initial screening test for UTI, ideally requires a midstream, clean catch of urine, but this may be impossible in the very young. Alternatively, urine can be obtained by sterile catheterization or suprapubic needle aspiration. However, both of these techniques are invasive and frequently met with parental disapproval. Urine may be obtained by the adherence of a sterile collection bag to the perineum, but this method has a high rate of contamination, limiting its reliability. Once obtained, urine is examined with a reagent dipstick for the presence of nitrates and leukocyte esterase. A finding that the urine is crystal clear to visual inspection has a 97% negative predictive value for UTI (2). The urine can also be microscopically examined after gram-stain, as well as cultured for the presence of bacteria or fungi. Other adjunctive laboratory tests include serum white blood cell count and C-reactive protein level (3).

Table 1. ICD-9 codes used in the diagnosis and management of pediatric urinary tract infection

Individuals under 18 with any one of the following ICD-9 codes:	
Cystitis	
112.2	Candidiasis of other urogenital sites
120.9	Schistosomiasis, unspecified
595.9	Cystitis, unspecified
595.1	Chronic interstitial cystitis
595.0	Acute cystitis
595.3	Trigonitis
595.89	Other specified types of cystitis
595.2	Other chronic cystitis
Pyelonephritis	
590.0	Chronic pyelonephritis
590.00	Chronic pyelonephritis without lesion of renal medullary necrosis
590.01	Chronic pyelonephritis with lesion of renal medullary necrosis
590.1	Acute pyelonephritis
590.10	Acute pyelonephritis without lesion of renal medullary necrosis
590.11	Acute pyelonephritis with lesion of renal medullary necrosis
590.2	Renal and perinephric abscess
590.3	Pyeloureteritis cystica
590.8	Other pyelonephritis or pyonephrosis, not specified as acute or chronic
590.9	Infection of kidney, unspecified
593.89	Other specified disorders of kidney and ureter
Orchitis	
016.5	Tuberculosis of other male genital organs
072.0	Mumps orchitis
603.1	Infected hydrocele
604.0	Orchitis epididymitis and epididymo-orchitis with abscess
604.9	Other orchitis, epididymitis, and epididymo-orchitis, without mention of abscess
604.90	Orchitis and epididymitis, unspecified
604.99	Other orchitis epididymitis and epididymo-orchitis without abscess
608.0	Seminal vesiculitis
608.4	Other in ammatory disorders of male genital organs
Other	
597.89	Other urethritis
599.0	Urinary tract infection, site not specified
607.1	Balanoposthitis
607.2	Other in ammatory disorders of penis
646.5	Asymptomatic bacteriuria in pregnancy

Imaging studies can assist in diagnosis, but they play a more prominent role in elucidating underlying comorbid conditions that may increase the risk or morbidity of infection. Ultrasound, the most common imaging study employed in cases of pediatric UTI, is used to evaluate for the presence of obstruction or stones, which can greatly increase the severity and sequelae of infection. The ultrasonographic appearance of the kidney can also be altered by the presence of acute infection. Ultrasound can assist in localizing the site of infection in the presence of renal abscess, parenchymal edema (lobar nephronia), or pyonephrosis. Despite the many advantages of ultrasound (it has no ionizing radiation and is non-invasive, well-tolerated, relatively low-cost, and readily available), its usefulness for identifying acute UTI has recently been questioned, given its relatively low yield in an era of widespread prenatal screening (4). Indeed, significant controversy has arisen over the timing of imaging studies and their implications for therapy recommendations in children with UTIs (4).

The nuclear renal scan with dimercaptosuccinic acid (DMSA) has been proposed as the most sensitive means for documenting renal involvement in UTI (5). It has been reported to be the best method for confirming acute pyelonephritis and later for assessing the presence of scarring. Many advocate basing further evaluation and follow-up care on the results of the DMSA scan (6). Computed tomography (CT) can also be useful for identifying anatomic anomalies, stones, and intrarenal abscess, as well as for documenting renal involvement in UTIs. CT is often used to exclude alternate diagnoses, such as appendicitis, in the presence of fever and abdominal pain or hematuria. Intravenous pyelography (IVP) is rarely used in the evaluation of pediatric UTI, particularly in young children, in whom renal visualization is limited by poor renal concentrating ability and increased small bowel air. Voiding cystourethrography (VCUG) has no role in the diagnosis of acute UTI, although it is nearly universally recommended for identifying vesicoureteral reflux or other anatomic abnormalities that may contribute to future infection risk.

NATURAL HISTORY

The natural history of uncomplicated acute cystitis is generally benign and free of significant long-term morbidity. The course is typically characterized by discomfort and irritative voiding symptoms with rapid resolution following the initiation of appropriate antimicrobials. The primary risk is that of recurrence or persistence. Children with constipation or voiding dysfunction are particularly prone to recurrence; 10% of these children develop a rapid recurrence following the completion of a course of antimicrobials. However, most recurrences do not progress to severe infections in the absence of anatomic abnormalities, and recurrent childhood UTIs tend to disappear in adolescence.

The natural history of pyelonephritis carries greater potential for long-term morbidity. Pyelonephritis can result in irreversible scarring of the renal parenchyma due to interstitial inflammation and virulence factors from the pathogen. Renal scarring is frequently, although not exclusively, associated with the simultaneous presence of reflux and infection. The likelihood of scarring increases with the number of infectious episodes, but significant renal damage can occur after a single infection. Renal scarring can lead to renal insufficiency and subsequent hypertension. The actual incidence of renal insufficiency due to scarring is unknown, in part because of changing definitions of reflux nephropathy and changing clinical presentations that have resulted from the widespread use of prenatal ultrasound. Historically, reflux nephropathy was considered responsible for 3% to 25% of the ESRD cases in children (7).

RISK FACTORS

The urinary tract is challenged by the ubiquitous presence of pathogens in close proximity. Any factors that enhance bacterial virulence or detract from host defense can predispose to UTI. Bacterial virulence factors include adhesins, K-antigen, hemosysins, and colicin. Bacterial colonization of the perineum typically precedes acute infection in the susceptible host. Adhesins are specialized structures that enable the bacteria to adhere to specific receptors on the uroepithelium. Such attachment leads to ascension into the urinary tract and promotes tissue invasion, inflammation, and tissue injury. Adhesins may also help promote intestinal carriage of more virulent bacteria, leading to perineal colonization. K-antigen helps prevent phagocytosis of bacteria; hemosysins damage renal tubular cells; and colocin helps kill competing bacteria near the colocin-producing cell.

Successful host defense depends on the proper functioning of the urinary system. A primary function of the urinary tract is the frequent and complete emptying of urine in a low-pressure environment. This effectively flushes out bacteria prior to their establishment of clinical infection. Any breakdown in this process can tip the balance toward the pathogen and result in UTI. Host risk factors are thought to include vesicoureteral reflux, dysfunctional voiding, constipation, obstruction, and gender-specific anatomy (the short urethra in females and the prepuce in males).

Vesicoureteral reflux is a frequent finding in children presenting with febrile infections. Present in approximately 1% of the asymptomatic population and 35% of those with UTI, reflux increases the risk of infection, in part by increasing post-void residual. Reflux also bypasses one of the host defense mechanisms against upper tract invasion by allowing less virulent strains of bacteria to reach the kidney.

Obstruction at the ureteropelvic junction, ureterovesical junction, or urethra is an infrequent but important host risk factor that can contribute to increased morbidity, persistence, and recurrence. Obstruction is present in fewer than 1% of children with UTI.

Dysfunctional voiding and dysfunctional elimination (constipation or functional fecal retention) are increasingly recognized as important host risk factors for UTI, particularly recurrent infections in anatomically normal children. Dysfunctional voiding refers to a learned pattern of behavior surrounding voiding that frequently begins with voluntary holding. It can present clinically with irritative symptoms such as urgency, frequency, urge incontinence, pelvic pain, and signs of holding such as squatting. Alternatively, it can present as an atonic bladder with infrequent voiding and high post-void residuals. In both patterns, elevated intravesical pressure, infrequent voiding, and poor emptying enhance the risk of UTI. Frequently, dysfunctional voiding can be compounded by chronic constipation. The exact mechanism by which constipation exerts its influence on voiding is unclear, but it frequently coexists in children with recurrent UTIs, and its resolution is often associated with resolution of the UTIs.

The relatively short length of the female urethra has traditionally been blamed for the increased risk of UTIs in girls. In the past, there was concern that a tight ring narrowed the urethra, often prompting urethral dilation in girls with UTI. Current evidence indicates that urethral constriction is not a reproducible finding, nor does it cause infection. Urethral dilation should play no role in the contemporary management of UTI in girls.

In boys, the most widely discussed host risk factor for UTI is the presence of the prepuce. It is clear that male infants with an intact prepuce are at a significantly higher risk of UTI during their first year of life. Colonization of bacteria on the inner preputial mucosa occurs, but it is not clear whether this is the etiology of infection (8). Circumcision is protective against UTI, but it carries its own risks. Uncircumcised boys have an overall 12-fold increased risk of urinary infection during their first 6 months compared with circumcised boys, in addition to a significantly higher probability of hospital admission for UTI (7.02 of 1,000) as compared with circumcised boys (1.88 of 1,000; $P<0.0001$) (9). A fuller discussion of this controversial subject is beyond the scope of this chapter.

INCIDENCE

It is difficult to estimate accurately the incidence of UTI in the pediatric population. Contributing questions include whether the determination of infection is based on symptoms, positive culture, or both; how accurate the method of specimen collection is; how accurate the history is, especially in young children; whether evaluation is focused on a specific age group or gender; whether the data are prospective or retrospective; whether or not the infections are associated with fever; and what the baseline rate of circumcision is in the population.

Frequently quoted estimates place the incidence of UTI in infants at approximately 1% during the first year of life (boys and girls), cumulative incidence at approximately 2% at two years of life (boys and girls), and cumulative childhood risk at 2% for boys and 8% for girls (10). Beyond the age of 2, UTIs in boys are not common enough to alter the childhood incidence through age 17.

Boys are at the greatest risk for UTI in the first months of life, but the risk decreases significantly after age 2. Boys who are uncircumcised have a ten-fold higher risk of UTI in the first year of life than do circumcised boys (11, 12).

Girls have an increased risk of febrile infection in the first year of life, then the risk steadily declines throughout childhood. Their risk of nonfebrile infections is higher during childhood than during infancy.

TRENDS IN HEALTH CARE RESOURCE UTILIZATION

Inpatient Care

Data from the Healthcare Cost and Utilization Project (HCUP) reveal that annual inpatient hospitalizations for UTI decreased slightly between 1994 and 2000, from 41,204 (60 per 100,000 children) to 36,568 (51 per 100,000 children) (Table 2). This declining trend was noted in both genders but was inconsistent across racial/ethnic groups and geographic regions. In 2000, hospitalization rates for UTI in infants (174 per 100,000) were substantially higher than those for older children (29 per 100,000) or adolescents (24 per 100,000). During the mid to late 1990s, girls were about 2.5 times more likely than boys to be hospitalized for UTI. Although not age-adjusted, the data from HCUP suggest that Hispanics were at much greater risk for UTI-related hospitalization than other racial/ethnic groups and that African Americans were at greater risk than Caucasians.

HCUP data also indicate that between 1994 and 2000, annual inpatient hospitalizations associated with pyelonephritis as a primary diagnosis remained stable at about 13,000 per year (18 to 20 per 100,000) (Table 3). Despite recent support for outpatient treatment of pediatric pyelonephritis (13), these data indicate no trend downward in hospitalization rates for this condition. From 1996 onward, the hospitalization rate was at least 2.5 times higher for infants than it was for older children or adolescents. The female-to-male ratio was at least 5:1 for each year analyzed. Racial/ethnic stratification suggested that African American children had a trend toward somewhat lower hospitalization rates for pyelonephritis, and that rates for Asian children were even lower. While the gender differences are consistent with clinical experience, the reasons for the racial/ethnic differences are not apparent. Hospitalization rates did not appear to vary by geographical region, but urban teaching hospitals had higher rates than did rural hospitals.

Age differences were most prominent among patients requiring hospitalization. The rate of inpatient hospital stays was 6.4 times higher among commercially insured infants than the rate among older children, and 11 times higher than the rate among adolescents (Table 4). This reflects the fact that UTIs in young children are more likely to involve the upper tract or to be complicated by comorbidities such as anatomic abnormalities. It also reflects more aggressive treatment patterns in the very young that tend to include parental antimicrobials.

Outpatient Care

Tables 4 and 5 present data from the Center for Health Care Policy and Evaluation (CHCPE) on visits by children insured commercially or through Medicaid for whom UTI was listed as the primary diagnosis. In both groups, the most common site of care for UTI was physicians' offices. Overall rates of visits to physicians' offices for UTI remained stable throughout the 1990s at approximately 2,400 per 100,000 (2.4%) for children with commercial insurance (Table 4) and 2,800 per 100,000 (2.8%) for children with Medicaid (Table 5). Among other settings—all much less commonly used than physicians' offices—emergency room (ER) visits were three times more common than inpatient hospitalizations. Of all encounters for which UTI was listed as the primary diagnosis, the rates of ER visits were substantially higher for those insured by Medicaid (Table 5) than the rates for those insured commercially (Table 4). Hospital outpatient clinics and ambulatory surgical centers contributed minimally, especially in the Medicaid population. Children with Medicaid visited physicians' offices, ERs, and ambulatory surgery centers more often than did children with commercial insurance.

That children with Medicaid visited emergency rooms for UTI-related care 2.8 times more frequently in 2000 than did those with commercial insurance

Table 2. Inpatient hospital stays by children with urinary tract infection listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	41,204	60 (54–67)	40,378	57 (51–63)	39,822	56 (50–61)	36,568	51 (46–55)
Age								
0–2	21,128	177 (150–203)	22,797	191 (163–219)	22,591	194 (166–222)	20,372	174 (153–195)
3–10	11,629	38 (34–41)	10,185	32 (28–35)	9,987	31 (27–34)	9,323	29 (26–31)
11–17	8,447	33 (30–36)	7,396	27 (25–30)	7,245	26 (24–28)	6,874	24 (23–26)
Gender								
Male	12,516	36 (30–42)	12,341	34 (28–40)	11,317	31 (26–36)	10,258	28 (24–31)
Female	28,678	86 (79–94)	28,037	81 (73–89)	28,501	81 (75–88)	26,306	75 (68–81)
Race/ethnicity								
White	18,579	41 (38–44)	17,276	38 (34–41)	16,339	36 (33–39)	14,504	32 (28–35)
Black	5,954	55 (48–62)	5,601	50 (43–57)	4,373	39 (33–46)	3,364	30 (25–36)
Asian/Pacific Islander	549	28 (20–37)	411	14 (8–20)	900	29 (20–39)	851	28 (19–38)
Hispanic	6,872	74 (50–97)	8,452	82 (56–107)	7,159	66 (45–86)	8,032	69 (58–80)
Region								
Midwest	8,394	51 (45–56)	7,393	44 (37–51)	7,443	44 (39–48)	7,666	44 (37–51)
Northeast	7,553	59 (49–68)	7,600	58 (48–67)	8,231	64 (51–76)	6,044	46 (39–54)
South	17,204	75 (61–90)	16,756	69 (57–80)	16,453	66 (55–77)	15,036	61 (52–71)
West	8,053	50 (38–63)	8,630	52 (34–69)	7,695	45 (35–56)	7,822	45 (37–53)
MSA								
Rural	7,946	46 (41–52)	7,738	48 (42–53)	6,780	41 (38–45)	6,938	44 (40–48)
Urban	33,114	65 (57–73)	32,595	59 (51–67)	32,794	59 (53–66)	29,594	52 (47–58)
Hospital type								
Rural	7,946	12 (10–13)	7,738	11 (10–12)	6,780	9 (9–10)	6,938	10 (9–10)
Urban non-teaching	16,230	24 (21–27)	16,764	24 (20–27)	10,929	15 (13–17)	11,435	16 (14–18)
Urban teaching	16,885	25 (20–30)	15,831	22 (17–27)	21,865	31 (26–35)	18,159	25 (21–29)

MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US civilian non-institutionalized population under age 18.

[b]Persons of missing gender, other races, missing or unavailable race and ethnicity, missing MSA, and missing hospital type are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 3. Inpatient hospital stays by children with pyelonephritis listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	13,334	20 (18–21)	13,536	19 (17–21)	13,226	18 (17–20)	12,926	18 (16–20)
Age								
0–2	3,372	28 (23–33)	4,537	38 (31–45)	4,206	36 (29–43)	4,466	38 (32–45)
3–10	5,268	17 (15–19)	4,818	15 (13–17)	4,728	15 (12–17)	4,450	14 (12–15)
11–17	4,695	18 (17–20)	4,181	15 (14–17)	4,292	16 (14–17)	4,010	14 (13–16)
Gender								
Male	2,229	6.4 (5.3–7.4)	2,200	6.0 (4.7–7.4)	2,024	5.5 (4.5–6.6)	2,206	6.0 (4.9–7.0)
Female	11,099	33 (30–36)	11,336	33 (30–36)	11,201	32 (29–35)	10,720	30 (27–33)
Race/ethnicity								
White	7,150	16 (14–17)	6,869	15 (13–16)	6,647	14 (13–16)	5,934	13 (11–15)
Black	1,398	13 (11–15)	1,297	12 (10–14)	928	8.3 (6.5–10.1)	940	8.4 (6.2–10.6)
Asian/Pacific Islander	178	9.2 (5.2–13)	*	*	185	6.0 (3.2–8.8)	171	5.7 (3.2–8.2)
Hispanic	1,390	15 (12–18)	2,170	21 (15–27)	1,443	13 (9–17)	1,942	17 (13–20)
Region								
Midwest	3,032	18 (16–21)	3,036	18 (15–21)	3,066	18 (15–21)	3,263	19 (15–22)
Northeast	2,422	19 (14–23)	2,476	19 (15–22)	2,227	17 (14–20)	1,881	14 (12–17)
South	5,019	22 (19–25)	4,630	19 (16–22)	4,860	20 (17–23)	4,701	19 (15–23)
West	2,861	18 (14–21)	3,394	20 (14–27)	3,073	18 (13–23)	3,080	18 (14–22)
MSA								
Rural	3,314	19 (16–22)	2,903	18 (16–20)	3,104	19 (17–21)	2,846	18 (16–21)
Urban	9,964	20 (17–22)	10,589	19 (17–22)	10,025	18 (16–20)	10,067	18 (16–20)
Hospital type								
Rural	3,314	4.9 (4.1–5.6)	2,903	4.1 (3.6–4.6)	3,104	4.3 (3.8–4.9)	2,846	3.9 (3.4–4.5)
Urban nonteaching	5,450	8.0 (7.1–8.8)	5,552	7.8 (6.8–8.8)	3,933	5.5 (4.8–6.2)	4,169	5.8 (5.0–6.6)
Urban teaching	4,514	6.6 (5.3–8.0)	5,037	7.1 (5.5–8.6)	6,092	8.5 (6.8–10.2)	5,898	8.2 (6.6–9.7)

*Figure does not meet standard of reliability or precision.

MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US civilian non-institutionalized population under age 18.

[b]Persons of other races, missing or unavailable race and ethnicity, missing MSA, and missing hospital type are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 4. Visits for urinary tract infections listed as primary diagnosis among children having commerical health insurance, count[a], rate[b]

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
	Physician Office Visits							
Total	7,600	2,395	10,801	2,382	16,206	2,425	17,101	2,374
Age								
<3	1,234	3,033	1,802	3,078	3,001	3,383	3,033	3,181
3–10	4,105	2,816	5,923	2,841	9,059	2,950	9,338	2,864
11–17	2,261	1,727	3,076	1,651	4,146	1,522	4,730	1,582
Gender								
Male	1,474	906	2,057	887	2,988	872	3,087	835
Female	6,126	3,961	8,744	3,950	13,218	4,059	14,014	3,997
	Emergency Room Visits							
Total	431	136	575	127	958	143	1,079	150
Age								
<3	81	199	97	166	197	222	183	192
3–10	185	127	271	130	422	137	459	141
11–17	165	126	207	111	339	124	437	146
Gender								
Male	85	52	132	57	176	51	218	59
Female	346	224	443	200	782	240	861	246
	Inpatient Visits							
Total	147	46	206	45	370	55	367	51
Age								
<3	68	167	104	178	178	201	202	212
3–10	54	37	67	32	115	37	108	33
11–17	25	*	35	19	77	28	57	19
Gender								
Male	32	20	41	18	56	16	88	24
Female	115	74	165	75	314	96	279	80
	Hospital Outpatient Visits							
Total	27	*	75	17	185	28	153	21
Age								
<3	2	*	16	*	58	65	40	42
3–10	16	*	48	23	94	31	79	24
11–17	9	*	11	*	33	12	34	11
Gender								
Male	3	*	14	*	28	*	28	*
Female	24	*	61	28	157	48	125	36
	Ambulatory Surgery Visits							
Total	49	15	63	14	211	32	139	19
Age								
<3	6	*	13	*	70	79	49	51
3–10	31	21	40	19	105	34	69	21
11–17	12	*	10	*	36	13	21	*
Gender								
Male	19	*	16	*	44	13	32	8.7
Female	30	19	47	21	167	51	107	31

*Figure does not meet standard for reliability or precision.

[a]Counts less than 30 should be interpreted with caution.

[b]Rate per 100,000 based on member months of enrollment in calendar year for children in the same demographic stratum.

SOURCE: Center for Health Care Policy and Evaluation, 1994, 1996, 1998, 2000.

Table 5. Visits for urinary tract infections listed as primary diagnosis among children having Medicaid, count[a], rate[b]

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
				Physician Office Visits				
Total	910	2,842	1,428	2,420	1,096	2,893	1,309	2,806
Age								
<3	193	2,427	350	2,569	312	3,551	335	3,232
3–10	554	3,035	838	2,576	572	2,955	733	3,147
11–17	163	2,804	240	1,868	212	2,177	241	1,855
Gender								
Male	214	1,334	337	1,140	271	1,424	305	1,304
Female	696	4,355	1,091	3,704	825	4,378	1,004	4,318
				Emergency Room Visits				
Total	193	603	303	514	155	409	197	422
Age								
<3	52	654	93	683	56	637	80	772
3–10	95	520	125	384	65	336	75	322
11–17	46	791	85	662	34	349	42	323
Gender								
Male	40	249	68	230	33	173	59	252
Female	153	957	235	798	122	647	138	594
				Inpatient Stays				
Total	36	112	59	100	43	114	44	94
Age								
<3	22	*	39	286	31	353	32	309
3–10	12	*	16	*	11	*	7	*
11–17	2	*	4	*	1	*	5	*
Gender								
Male	10	*	17	*	14	*	14	*
Female	26	*	42	143	29	*	30	129
				Hospital Outpatient Visits				
Total	7	*	23	*	13	*	7	*
Age								
<3	1	*	10	*	2	*	6	*
3–10	4	*	11	*	9	*	0	0.0
11–17	2	*	2	*	2	*	1	*
Gender								
Male	4	*	5	*	2	*	0	0.0
Female	3	*	18	*	11	*	7	*
				Ambulatory Surgery Visits				
Total	4	*	3	*	59	156	31	66
Age								
<3	0	0.0	1	*	31	353	15	*
3–10	4	*	1	*	26	*	16	*
11–17	0	0.0	1	*	2	*	0	0.0
Gender								
Male	2	*	2	*	15	*	7	*
Female	2	*	1	*	44	233	24	*

*Figure does not meet standard for reliability or precision.

[a]Counts less than 30 should be interpreted with caution.

[b]Rate per 100,000 based on member months of enrollment in calendar year for children in the same demographic stratum.

SOURCE: Center for Health Care Policy and Evaluation, 1994, 1996, 1998, 2000.

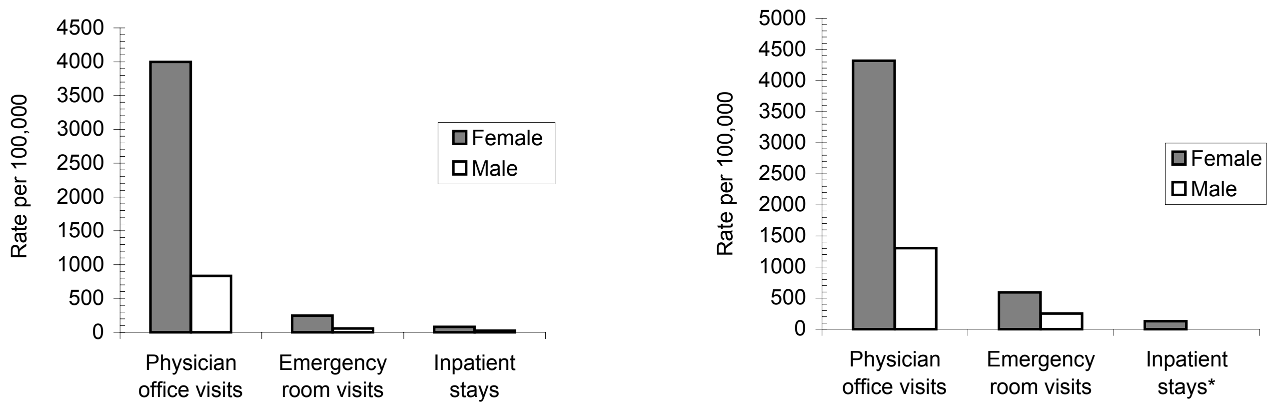

Figure 1. Urinary tract infections listed as primary diagnosis among children having commercial health insurance (left) and Medicaid (right) by visit setting and gender.
***The rate for males in this category was too low to produce a reliable national estimate.**

SOURCE: Center for Health Care Policy and Evaluation, 2000.

(422 per 100,000 vs 150 per 100,000) is consistent with well-known patterns of care in socioeconomically disadvantaged populations. The slight decrease in the use of ERs by those insured through Medicaid from 1994 to 2000 may reflect improved access to primary care physicians or increasing dissatisfaction with the availability of ER care.

As expected, girls had much higher visit rates than boys did (Tables 4 and 5, Figure 1). The female-to-male ratio for physicians' office visits by commercially insured children rose from 4.4:1 in 1994 to 4.8:1 in 2000 (Table 4), but it remained stable at about 3.3: 1 for children insured through Medicaid during the same time period (Table 5). The differences in these ratios are difficult to explain, but they may be due in part to the fact that boys covered by Medicaid are less likely to be circumcised. Caucasians are considerably more likely to be circumcised than are African Americans or Hispanics (81% vs 65% or 54%); these differences remain significant when other variables are controlled (14). Circumcision is not a covered service, and families insured through Medicaid may not be able to afford to pay for it out-of-pocket; the cost of circumcision typically ranges from $250 to $750. Families insured through Medicaid may also be more likely to have social norms that do not include routine circumcision. In the office setting, adolescents had lower visit rates than did either infants or older children, regardless of insurance status (Tables 4 and 5).

Data from the National Ambulatory Medical Care Survey showed that during 1992, 1994, 1996, 1998, and 2000, there were there were more than 1.1 million annual physician office visits (1,590 per 100,000 in each year) associated with UTI as the primary diagnosis and 1.4 million annual physician office visits (2,051 per 100,000 in each year) associated with UTI as any listed diagnosis (Table 6). Because counts were low for this diagnosis in children, these counts and rates were derived by first collapsing data from the even years in 1992–2000 and then dividing by 5. As a primary diagnosis, UTI accounted for 0.7 % of all physician office visits by children during those years. Data from the National Hospital Ambulatory Medical Care Survey showed that during 1994, 1996, 1998, and 2000, approximately 94,000 annual hospital outpatient visits (132 per 100,000 in each year) were associated with UTI as a primary diagnosis, representing 0.5% of all hospital outpatient visits by children (Table 7). Because counts were low for this diagnosis in children, these counts and rates were derived by first collapsing data from the even years in 1994–2000 and then dividing by 4.

NON-SEXUALLY TRANSMITTED ORCHITIS

Isolated orchitis is extremely rare in the prepubertal male and in most cases is due to the extension of acute epididymitis into epididymo-orchitis. Most cases occur in adolescents and present

Table 6. National physician office visits by children with urinary tract infections, count (95% CI), number of visits, percentage of visits, rate[a] (95% CI)

	5-Year Count (95% CI)	Total No. Visits by Male/Females <18, 1992–2000	% of Visits	5-Year Rate (95% CI)
Primary diagnosis	5,556,971 (4,502,468–6,611,474)	809,286,031	0.7	7,949 (6,440–9,457)
Any diagnosis	7,171,390 (5,995,021–8,347,759)	809,286,031	0.9	10,258 (8,575–11,941)

[a]Rate per 100,000 based on the sum of weighted counts in 1992, 1994, 1996, 1998, and 2000 over the mean estimated base population across those five years. Population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US civilian non-institutionalized population under age 18.

SOURCE: National Ambulatory Medical Care Survey, 1992, 1994, 1996, 1998, 2000.

Table 7. National hospital outpatient visits by children with urinary tract infections, count (95% CI), number of visits, percentage of visits, rate[a] (95% CI)

	4-Year Count (95% CI)	Total No. Visits by Males/Females <18, 1994–2000	% of Visits	4-Year Rate (95% CI)
Primary diagnosis	374,907 (298,369–451,445)	72,578,652	0.5	529 (421–637)
Any diagnosis	527,424 (430,174–624,674)	72,578,652	0.7	744 (607–882)

[a]Rate per 100,00 based on the sum of weighted counts in 1994, 1996, 1998, and 2000 over the mean estimated base population across those four years. Population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US civilian non-institutionalized population under age 18.

SOURCE: National Hospital Ambulatory Medical Care Survey, 1994, 1996, 1998, 2000.

with fever, pain, testicular swelling, and scrotal erythema. The primary differential diagnosis is torsion of the testis or appendix testis. Often, there is a simultaneous UTI. Frequently, an associated predisposing factor, such as urethral obstruction, ectopic ureter, neurogenic bladder dysfunction, or recent catheterization, is present. On rare occasions, orchitis may be caused by hematogenous spread of bacteria. Nonbacterial epididymitis can also result from vasal reflux of urine causing an inflammatory response. Rare, nonbacterial cases include viral, tuberculous, and mumps orchitis.

HCUP data indicate that inpatient hospitalization for orchitis is rare, 1.6 per 100,000 in 2000 (Table 8). MarketScan data from 1999 indicate that despite the general recommendation for antimicrobial treatment for orchitis, only 22% of children treated in physicians' offices or hospital outpatient clinics received an antimicrobial within a week of the visit, and only 43% received an antimicrobial within a year of the visit (Table 9). Of those treated in ERs, 56% received an antimicrobial. In the ER, adolescents were twice as likely to receive an antimicrobial as were boys 3 to 10 years of age. The unexpectedly low utilization of antimicrobials may be due in part to incorrect coding, as many children with torsion of the appendix testis are misclassified as having epididymitis despite the absence of infection. The higher rate of antimicrobial usage in adolescents may represent an appropriate understanding that the true infectious form of this disease is more common in this age group. Greater rigor in diagnosis and terminology is necessary to utilize antimicrobials appropriately in the treatment of patients with orchitis.

Table 8. National inpatient hospital stays for children with orchitis[a], count, rate[b]

Year	Count	Rate
1994	1,036	3.0
1996	777	2.1
1998	576	1.6
2000	612	1.6

[a]Orchitis defined as ICD-9 code 604.xx.

[b]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US male civilian non-institutionalized population under age 18.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 9. Use of antibiotics in the treatment of pediatric orchitis, 1999

	# of boys who had a physician office visit or hospital outpatient visit for orchitis	% of boys w/ office visit who received an antibiotic within a year of the visit	% of boys w/ office visit who received an antibiotic within a week of the visit	# of boys who had an ER visit for orchitis	% of boys w/ ER visit who received an antibiotic within a year of the visit	% of boys w/ ER visit who received an antibiotic within a week of the visit
Total	60	43%	22%	9	56%	56%
Age						
0–2	5	40%	0%	0		
3–10	12	58%	33%	3	33%	33%
11–17	43	40%	21%	6	67%	67%
Region						
Midwest	23	48%	26%	3	33%	33%
Northeast	13	23%	15%	3	33%	33%
South	17	47%	18%	0		
West	4	50%	25%	3	100%	100%
Unknown	3	67%	33%	0		

SOURCE: MarketScan, 1999.

ECONOMIC IMPACT

Direct Cost

Pediatric UTIs are a significant source of health care expenditures. Data analyzed for this chapter are limited to the immediate costs of treatment of the acute infection; however, UTI is frequently a manifestation of a larger underlying condition. Hence, much of the economic burden of diagnosing and treating the related conditions is not included here. Costs are not included for follow-up imaging, long-term antimicrobials, or treatment of anatomic abnormalities, dysfunctional elimination, and neurological abnormalities. Also not included in these analyses are long-term costs related to the sequelae of repeated pyelonephritis and scarring, such as hypertension or renal insufficiency.

According to data from the National Association of Children's Hospitals and Related Institutions (NACHRI), the mean cost per child admitted for a UTI from 1999 to 2001 was $4,501 (Table 10). The cost was higher among adolescents ($6,796) than among infants ($4,069) or older children ($4,554). Costs were higher for boys ($5,165) than for girls ($4,094). Costs were highest in the Northeast ($5,518) and lowest in the Midwest ($3,948). No racial/ethnic differences in costs were apparent. Inpatient costs per admission rose from $3,869 in 1999 to $4,444 in 2000 and $5,145 in 2001, although the increase was not caused by significant changes in any particular gender, geographic, or racial/ethnic group (Table 11).

Despite shorter length of stay for all groups analyzed between 1999 and 2001 (Table 12), nominal costs increased in all regions of the country (Table 11) in children hospitalized for UTI. Although hospitalized less often than girls (Tables 4 and 5), boys had higher inpatient costs (Table 10), no doubt related to their longer hospital stays, a finding noted in data from both NACHRI (Table 12) and HCUP (Table 13). Stays were longer in urban teaching hospitals, a finding likely related to differences in case mix between teaching and nonteaching facilities. The general trend toward shorter length of stay for UTI may reflect changing practice patterns in the management of uncomplicated UTI, with a greater reliance on outpatient oral antimicrobials to complete the therapeutic course initiated in the hospital. Nonetheless, the data suggest that inpatient costs have risen, despite efforts to decrease them through shorter hospital stays. Caution should be used in interpreting this trend, because these costs are not adjusted for inflation.

Given an average of 40,000 hospitalizations per year for UTIs (Table 2) and an average cost of $4,500 per inpatient episode (Table 10), a rough estimate of the annual economic burden for inpatient treatment of UTI would be $180 million. However, it is important to remember that while inpatient is by far the most expensive treatment setting, it represents a small fraction of UTI care. Hence, comprehensive estimates of the financial burden of pediatric UTI also need to incorporate the costs of outpatient and ER care, as well as those associated with evaluating and treating associated conditions.

Table 10. Inpatient cost per child admitted with urinary tract infection listed as primary diagnosis, 1999–2001, mean cost[a] (in $) (95% CI)

	Count	Mean Cost	
Total[b]	16,024	4,501	(4,324–4,678)
Age			
0–2	10,383	4,069	(3,963–4,175)
3–10	3,774	4,554	(4,177–4,930)
11–17	1,867	6,796	(5,630–7,963)
Race/ethnicity			
White	7,807	4,500	(4,263–4,737)
Black	2,862	4,730	(4,158–5,302)
Asian	300	4,569	(3,966–5,172)
Hispanic	3,050	4,778	(4,364–5,192)
American Indian	39	8,851	(475–17,227)
Gender			
Male	6,092	5,165	(4,776–5,554)
Female	9,932	4,094	(3,938–4,249)
Region			
Midwest	4,635	3,948	(3,812–4,084)
Northeast	850	5,518	(4,794–6,241)
South	7,900	4,864	(4,535–5,194)
West	2,363	4,531	(4,259–4,804)

[a]Calculated using adjusted ratio of costs to charges, including variable and fixed cost among participating children's hospitals.
[b]Children of other races and missing race/ethnicity or region are included in the total.
SOURCE: National Association of Children's Hospitals and Related Institutions, 1999–2001.

Table 11. Inpatient cost per child admitted with urinary tract infection listed as primary diagnosis, count, mean cost[a] (in $) (95% CI)

	1999		2000		2001	
	Count	Mean Cost	Count	Mean Cost	Count	Mean Cost
Total[b]	5,039	3,869 (3,706–4,033)	5,551	4,444 (4,182–4,706)	5,434	5,145 (4,726–5,564)
Age						
0–2	3,248	3,702 (3,498–3,906)	3,617	3,954 (3,827–4,081)	3,518	4,526 (4,315–4,738)
3–10	1,223	3,611 (3,417–3,805)	1,287	5,357 (4,314–6,399)	1,264	4,648 (4,331–4,964)
11–17	568	5,381 (4,630–6,132)	647	5,365 (4,867–5,863)	652	9,450 (6,216–12,684)
Race/ethnicity						
White	2,525	3,951 (3,769–4,132)	2,600	4,286 (4,058–4,513)	2,682	5,226 (4,595–5,857)
Black	867	4,227 (3,511–4,943)	1,011	4,386 (3,968–4,804)	984	5,526 (4,047–7,005)
Asian	87	4,041 (3,256–4,827)	100	4,571 (3,416–5,727)	113	4,973 (3,881–6066)
Hispanic	749	3,562 (3,376–3,748)	1,087	5,327 (4,236–6,418)	1,214	5,036 (4,704–5,369)
American Indian	5	2,737 (705–4768)	17	15,163 (0–35,084)	17	4,337 (2,879–5,795)
Gender						
Male	1,877	4,327 (3,946–4,709)	2,114	4,697 (4,427–4,966)	2,101	6,384 (5,346–7,423)
Female	3,162	3,598 (3,468–3,727)	3,437	4,288 (3,898–4,678)	3,333	4,364 (4,171–4,557)
Region						
Midwest	1,505	3,481 (3,277–3,686)	1,596	3,934 (3,762–4,106)	1,534	4,420 (4,111–4,730)
Northeast	180	4,929 (4,062–5,796)	325	5,034 (3,922–6,145)	345	6,281 (4,907–7,655)
South	2,399	4,261 (3,973–4,549)	2,744	4,799 (4,328–5,270)	2,757	5,454 (4,673–6,235)
West	800	3,937 (3,593–4,281)	765	4,684 (4,050–5,319)	798	4,981 (4,579–5,382)

[a]Calculated using adjusted ratio of costs to charges, including variable and fixed cost among participating children's hospitals.
[b]Children of other races and missing race/ethnicity or region are included in the totals.
SOURCE: National Association of Children's Hospitals and Related Institutions, 1999–2001.

Indirect Cost

Because children do not contribute direct economic support in most families, the impact of lost productivity or time off from school cannot be determined. However, an ill child usually means work loss for parents and, as such, may generate substantial indirect costs. Better tools are needed to assess the parental economic impact of pediatric UTI.

PREVENTION

Strategies to prevent UTI primarily revolve around enhancing host defenses. Such practices as proper hygiene, good voiding habits, and relief of constipation are the primary methods for preventing uncomplicated infections. In some patients, prophylactic antimicrobials may be beneficial. For those with complicated UTIs, the correction of underlying anatomic abnormalities or the institution of adaptive approaches, such as intermittent catheterization, can be important. Efforts to reduce nosocomial infections though proper catheter management and to prevent resistance through more selective use of antimicrobials are increasing.

From a public health standpoint, there is continuing debate over the roles of both routine newborn circumcision and sibling screening for reflux once an index case is identified. Prenatal ultrasound screening may decrease the burden of illness by identifying anatomic abnormalities prior to the first infection.

Table 12. Trends in mean inpatient length of stay (days) for children hospitalized with urinary tract infection listed as primary diagnosis (95% CI)

	1999		2000		2001	
	Count	Length of Stay	Count	Length of Stay	Count	Length of Stay
All	5039	3.7 (3.6–3.8)	5551	3.6 (3.5–3.8)	5434	3.6 (3.6–3.7)
Age						
0–2	3,248	3.8 (3.6–4.0)	3,617	3.5 (3.4–3.6)	3,518	3.7 (3.6–3.8)
3–10	1,223	3.4 (3.2–3.5)	1,287	3.8 (3.3–4.3)	1,264	3.3 (3.1–3.4)
11–17	568	3.9 (3.5–4.2)	647	3.8 (3.5–4.1)	652	4.3 (3.8–4.7)
Race/ethnicity						
White	2,525	3.4 (3.3–3.5)	2,600	3.3 (3.2–3.4)	2,682	3.5 (3.3–3.6)
Black	867	4.2 (3.5–5.0)	1,011	3.8 (3.3–4.4)	984	3.7 (3.5–4.0)
Asian	87	3.3 (2.8–3.8)	100	3.4 (2.8–4.1)	113	3.7 (3.1–4.4)
Hispanic	749	3.7 (3.5–3.8)	1,087	4.0 (3.8–4.3)	1,214	4.0 (3.8–4.2)
American Indian	5	2.2 (0.8–3.6)	17	6.2 (2.9–9.4)	17	3.5 (2.4–5.5)
Other	325	3.9 (3.4–4.3)	345	3.4 (3.1–3.7)	242	3.4 (3.0–3.7)
Missing	481	4.3 (4.0–4.6)	391	3.9 (3.5–4.3)	182	3.3 (3.0–3.6)
Gender						
Male	1,877	4.2 (3.8–4.5)	2,114	3.9 (3.8–4.1)	2,101	4.1 (3.9–4.3)
Female	3,162	3.4 (3.3–3.5)	3,437	3.4 (3.2–3.6)	3,333	3.3 (3.2–3.4)
Region						
Midwest	1,505	3.2 (3.1–3.4)	1,596	3.1 (3.0–3.2)	1,534	3.2 (3.1–3.4)
Northeast	180	3.8 (3.2–4.4)	325	3.4 (3.1–3.8)	345	3.4 (3.0–3.7)
South	2,399	4.1 (3.8–4.4)	2,744	3.9 (3.7–4.2)	2,757	3.9 (3.8–4.1)
West	800	3.2 (3.0–3.4)	765	3.5 (3.2–3.8)	798	3.5 (3.3–3.7)
Missing	155	4.2 (3.6–4.8)	120	5.1 (4.3–5.9)	0	

SOURCE: National Association of Children's Hospitals and Related Institutions, 1999–2001.

RECOMMENDATIONS

The management of patients with acute uncomplicated UTI is well established, but ongoing efforts are likely to streamline diagnosis and treatment. Further research is needed to optimize the evaluation phase following the diagnosis of UTI in order to improve quality of care and decrease cost. To ensure proper access to care for all children, investigation is needed into who is and who is not receiving appropriate evaluation. In addition, there is a need for greater education among parents and health care providers regarding the role of dysfunctional voiding and constipation in UTI risk.

For hospitalized patients, urethral catheterization remains the primary risk factor for nosocomial UTI. Enhanced awareness of the morbidity and cost of this complication should lead to more judicious use of catheters and improved protocols for their management.

Table 13. National trends in mean length of stay (days) for children hospitalized with urinary tract infection listed as primary diagnosis

	Length of Stay			
	1994	1996	1998	2000
All	4.2	3.6	3.4	3.1
Age				
0–2	4.7	3.9	3.6	3.4
3–10	3.7	3.2	3.1	2.8
11–17	3.5	3.0	3.1	2.7
Gender				
Male	4.9	4.2	4.0	3.7
Female	3.8	3.3	3.1	2.9
Race/ethnicity				
White	3.7	3.3	3.1	2.9
Black	5.1	4.2	4.0	3.6
Asian/Pacific Islander	4.8	4.1	3.6	4.2
Hispanic	4.4	4.2	4.2	3.6
Other	6.8	4.4	3.3	3.6
Region				
Midwest	3.5	3.2	2.9	2.8
Northeast	5.0	4.0	3.5	3.6
South	4.2	3.7	3.5	3.2
West	3.8	3.5	3.6	3.0
MSA				
Rural	3.5	3.0	2.8	2.6
Urban	4.3	3.7	3.5	3.2
Hospital Type				
Rural	3.5	3.0	2.8	2.6
Urban nonteaching	3.7	3.4	3.1	3.1
Urban teaching	4.9	4.1	3.7	3.4

MSA, metropolitan statistical area.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

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CHAPTER 9

Sexually Transmitted Diseases

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INTRODUCTION

This chapter focuses on the epidemiology and cost of sexually transmitted diseases (STDs) commonly seen in urologic practice in the United States. STDs generally comprise acute and/or chronic conditions attributed to acquisition of infectious agents during penile, anal, vaginal, and/or oral sex, but the emphasis in this chapter is on the urologic burden of these diseases.

The immediate and long-term disease burden and costs of STDs in the United States are immense, with severe and costly consequences for adolescents, adults, and their offspring. Infection with a bacterial STD may cause painful acute symptoms of urethritis, vaginitis, cervicitis, dysuria, or skin manifestations that require health care. If undetected and untreated, some bacterial STD infections may lead to serious and costly long-term consequences. For example, untreated bacterial STD in men may ascend to the upper genital tract, causing epididymitis, orchitis, or prostatitis. In women, untreated lower genital tract infection may lead to salpingitis or pelvic inflammatory disease (PID) that may result in infertility, life-threatening ectopic pregnancy, or chronic pelvic pain. Infection with a viral STD may become chronic, with single or relapsing episodes of painful or problematic symptoms and signs, as seen with genital herpes caused by herpes simplex virus (HSV) and genital warts and anogenital neoplasia caused by human papillomavirus (HPV). HSV infection also complicates the course and management of human immunodeficiency virus (HIV) infection. Infection by STDs during gestation or birth can result in eye infections (due to *Chlamydia trachomatis* or *Neisseriae gonorrhoeae*); pneumonia (from *C. trachomatis*); recurrent respiratory papillomatosis (from HPV); lifelong disability, including blindness, bone deformities, mental retardation (due to syphilis); or death (from syphilis or HSV).

The burden of disease and the trends for specific STDs vary considerably, but together these infections constitute a significant public health problem. The number of cases in the United States has been estimated to be in the tens of millions (Table 2), and as many as 15 million new (incident) STDs occur each year, of which 3 million are among teenagers (1).

GENERAL NOTES ON ANALYTIC APPROACH

In keeping with the goals and scope of this compendium, this assessment focused on the acute and chronic STD infections and clinical manifestations that are encountered commonly by urologists. Unlike patients with many other conditions associated with urinary tract pathology or dysfunction, those with STDs are not primarily referred to urologists for diagnosis and treatment. Accordingly, we quantified the burden of selected STDs that most commonly present with symptoms of the penis, urethra, bladder, and external genitalia. We focused on the numbers of cases of medical visits of inpatient and outpatient services for four pathogen-specific STDs (herpes, chlamydia, gonorrhea, and syphilis), genital warts (a presentation in which HPV is always implicated), and two syndromic presentations commonly due to

Table 1. ICD-9 codes used in the diagnosis of sexually transmitted diseases[a]

Genital Herpes	
054.1	Genital herpes
054.10	Genital herpes unspecified
054.13	Herpetic infection of penis
054.19	Other genital herpes
Genital Warts	
078.11	Condyloma acuminatum
Chlamydia	
078.88	Other specified diseases due to Chlamydiae
079.88	Other specified chlamydial infection
079.98	Unspecified chlamydial infection
099.41	Other nongonococcal urethritis *Chlamydia trachomatis*
099.53	Other venereal diseases due to *Chlamydia trachomatis* lower genitourinary sites
099.54	Other venereal diseases due to *Chlamydia trachomatis* other genitourinary sites
099.55	Other venereal diseases due to *Chlamydia trachomatis* unspecified genitourinary site
Gonorrhea	
098.0	Gonococcal infection (acute) of lower genitourinary tract
098.1	Gonococcal infection (acute) of upper genitourinary tract
098.10	Gonococcal infection (acute) of upper genitourinary tract site unspecified
098.11	Gonococcal cystitis (acute)
098.12	Gonococcal prostatitis (acute)
098.13	Gonococcal epididymo-orchitis (acute)
098.14	Gonococcal seminal vesiculitis (acute)
098.15	Gonococcal cervicitis (acute)
098.16	Gonococcal endometritis (acute)
098.17	Gonococcal salpingitis specified as acute
098.19	Other gonococcal infection (acute) of upper genitourinary tract
098.2	Gonococcal infection (chronic) of lower genitourinary tract
098.30	Chronic gonococcal infection of upper genitourinary tract site unspecified
098.31	Gonococcal cystitis chronic
098.32	Gonococcal prostatitis chronic
098.33	Gonococcal epididymo-orchitis chronic
098.34	Gonococcal seminal vesiculitis chronic
Syphilis	
091.0	Genital syphilis (primary)
095.4	Syphilis of kidney
095.8	Other specified forms of late symptomatic syphilis
Epididymitis/orchitis not designated as due to Chlamydia or Gonococcus	
604	Orchitis and epididymitis
604.0	Orchitis, epididymitis, and epididymo-orchitis, with abscess
604.9	Other orchitis, epididymitis, and epididymo-orchitis, without mention of abscess [excludes gonococcal (098.13 and 098.33), mumps (072.0), tuberculous (016.4 and 016.50)]

Continued on next page.

Table 1 (continued). ICD-9 codes used in the diagnosis of sexually transmitted diseases[a]

Epididymitis/orchitis (all codes)	
604	Orchitis and epididymitis
604.0	Orchitis, epididymitis, and epididymo-orchitis, with abscess
604.9	Other orchitis, epididymitis, and epididymo-orchitis, without mention of abscess [excludes gonococcal (098.13 and 098.33) (which is included below), mumps (072.0), tuberculous (016.4 and 016.50)]
098.13	Gonococcal epididymo-orchitis (acute)
098.33	Gonococcal epididymo-orchitis (chronic)
Urethritis not designated as due to Chlamydia trachomatis or gonococcus	
099.4	Other non-gonococcal urethritis (including 099.40 Unspecified, and 099.49 Other specified organism) but excluding 099.41 Urethritis due to *Chlamydia trachomatis*
Urethritis (all codes)	
098.0	Gonococcal infection (acute) of lower genitourinary tract
098.2	Gonococcal infection (chronic) of lower genitourinary tract
099.4	Other nongonococcal urethritis (including 099.40 Unspecified, and 099.49 Other specified organism) but excluding 099.41 Urethritis due to *Chlamydia trachomatis* (which is included below)
099.41	Other nongonococcal urethritis *Chlamydia trachomatis*

[a]Codes limited to acute manifestations of the lower genitourinary tract or external genitalia, or to sequelae due to ascension to the male upper genitourinary tract.

STD infection (epididymitis/orchitis and urethritis). Epididymitis/orchitis and urethritis were included because of the likelihood of presentation to a urologist and the fact that STD pathogens are common etiologies. Sexually transmitted organisms are the most common cause of epididymitis in heterosexual men under 35 years of age (2); approximately two-thirds of the patients in this age group with acute epididymitis have epididymitis secondary to *N. gonorrhoeae* or *C. trachomatis* (3). Most urethritis is also the result of infection with a sexually transmitted organism (4). However, we excluded cases and visits for urethritis for Reiter Syndrome, urethritis designated as "not sexually transmitted," and urethral syndrome because their association with STDs is only partial. We also excluded acute or chronic prostatitis (unless there was a diagnosis code specifically linked to gonococcus in the data we examined) because the vast majority of prostatitis cases are not associated with an STD (5). We did not include proctocolitis, which may be due to sexual transmission of enteric pathogens, because this condition is rarely managed by urologists. Finally, we excluded common urinary tract infections (UTIs) of men or women that may be associated with sexual transmission, as these are addressed in another chapter.

Because of the limitations of the datasets used to quantify much of the burden of other diseases in this compendium, we relied heavily on the peer-reviewed literature for most of the summary statements about incidence and prevalence of the STDs and syndromic presentations. Several of these datasets are valuable for quantifying the overall health care burden for STDs, changes in demographic characteristics of persons with STDs, and the impact of STDs on minority populations. However, they do not readily allow for analyses restricted to cases seen exclusively by urologists.

We briefly discuss available data on the burden of other STDs that are rarely managed by urologists or are rare in general; these include HIV infection or its clinical manifestations, infection with HPV types associated with anogenital dysplasia and cancer, and hepatitis B. We also briefly discuss trichomoniasis, which was not included in the list of STDs fully investigated for burden of illness because of resource limitations. Although *Trichomonas vaginalis* infection commonly presents as a vaginitis, it is a frequent cause of lower urogenital tract infection that urologists may see and should think of when evaluating the etiology of urethritis in men or women. We briefly discuss chancroid, but because they occur

Table 2. Estimated incidence and prevalence of sexually transmitted diseases in the United States, 1996, by strength of evidence[a]

STD	Incidence[b]	Prevalence[c]
Chlamydia	3 million -II	2 million - II
Gonorrhea	650,000 - II	
Syphilis	70,000 - II	
Herpes	1 million - II	45 million - I
Human papilloma virus	5.5 million - III	20 million - III
Hepatitis B	77,000 - II	750,000 -I
Trichomoniasis	5 million - III	
Bacterial vaginosis	No estimates	
HIV	20,000 - II	560,000 - II
Total	15.3 million	

[a]Level I (good) surveillance data come from either representative national surveys or from national reporting systems with nearly complete counts. Level II (fair) surveillance data are derived from composite prevalence figures obtained from multiple populations over time or from less complete national reporting systems. Level III (poor) surveillance data are based on even weaker evidence and rough extrapolations.

[b]Incidence is the number of new cases in a given time period.

[c]Prevalence is the total number of cases in the population.

SOURCE: Adapted from ASHA Panel to Estimate STD Incidence, Prevalence, and Cost. Available at: http://www.kff.org/womenshealth/1445-std_rep2.cfm.

rarely, we excluded lymphogranuloma venereum and granuloma inguinale. We excluded pediculosis pubis, scabies, hepatitis A virus (HAV) infection, bacterial vaginosis, and vulvovaginal candidiasis because these conditions are not necessarily the result of sexual exposure and are not usually associated with long-term sequelae managed by urologists. Finally, we excluded infection with hepatitis C virus (HCV) because it is rarely acquired through sexual exposure.

We used many claims databases to estimate aspects of the burden of STDs. Surveillance systems that capture national STD incidence data rely on cases, not medical visits; however, an episode of infection may result in more than one visit or claim. In interpreting analyses with various datasets, one must keep in mind that counts of medical visits are not the same as case counts, and that counts of both cases and office visits can reflect incident cases, prevalent cases, or a combination of the two. Given the nature of the datasets on which we performed primary analyses and given the reliance on International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) coding in these datasets, the summary statements they permit concern relative burden of disease referent to office visits rather than to case counts or numbers of infected persons. Using claims data, we counted medical visit claims as a measure of burden, since they, in association with drug claims and procedure claims, constitute a large part of the economic burden of STDs.

Databases we used include hospital claims data for all inpatient care in many states, analysis and review data for Medicare patients, VA data, and inpatient and outpatient claims data for privately insured patients. Because most of those databases included only ICD-9 diagnostic codes, not procedure codes or drug codes, we used ICD-9 codes to capture the burden of STDs for three pathogen-specific STDs (herpes, chlamydia, and gonorrhea), genital warts, and two syndromic presentations of STD infection (epididymitis/orchitis and urethritis) measured by patient visits. There were too few visits for syphilis in these datasets to allow for reliable estimates. The following are brief descriptions of the databases used in the analyses discussed here.

DEFINITION AND DIAGNOSIS

To capture aspects of the burden of various STDs, we applied selected ICD-9 codes to datasets reflecting inpatient and outpatient visits to health care providers; these datasets and the methods of analysis are described in the methods chapter of this compendium. Our analyses of all datasets included visits associated with diagnostic codes for acute manifestations of the lower genitourinary tract or external genitalia and for selected sequelae due to ascension to the male upper genitourinary tract. Table 1 lists the codes used in the diagnosis of STDs. Except in the case of syphilis, we excluded visits associated with non-genitorurinary tract diagnostic codes or procedures, herpetic infections of the oropharynx, herpetic vulvovaginitis, herpetic ulceration of the vulva, herpetic infection without specification of anatomic site, gonoccoccal arthritis, neurosyphilis, salpingitis, oophoritis, endometritis, and pelvic inflammatory disease (PID) (unless specifically associated with gonococcal or chlamydial infection). We included ICD-9 codes for chlamydial infection of other and unspecified genitourinary sites and for gonococcal infection of the *upper genital tract* in order to include infections of the male genitourinary tract that urologists would be likely to manage. There are specific ICD-9 codes for cervicitis, endometritis, and salpingitis associated with gonorrheal infection but none for chlamydial infections specific to the cervix, endometrium, or Fallopian tubes. Because we wanted to address gonorrhea and chlamydial infections of the upper genital tract as consistently as possible, and because we did not restrict our analysis to male patients, the ICD-9 codes we included may have represented cases of cervicitis, endometritis, salpingitis, and oophoritis that urologists are unlikely to manage. However, a review of data from MarketScan show that patient visits associated with ICD-9 codes for chlamydial infection of *other* and *unspecified* anatomic sites and gonorrheal cervicitis, endometritis, and salpingitis are quite rare (Table 3). Therefore, our estimates of chlamydial and gonorrheal infection should largely represent lower urogenital tract infections that urologists may encounter.

In addition, the following three points should be noted:

1. We used the National Electronic Telecommunications Surveillance System (NETSS) as the sole data source for primary and secondary cases of syphilis in adolescents and adults in this project. None of the other available datasets contained sufficient numbers of syphilis cases to describe with any confidence the demographic and geographic distribution of the disease in the population. Because many cases of primary and secondary syphilis are diagnosed only with a serologic test and because the anatomic site of signs or symptoms is not reported, we were unable to exclude from NETSS data the cases of primary and secondary syphilis that lacked genitourinary symptoms and signs (e.g., palmar rash) and that urologists would, therefore, be unlikely to encounter.

2. Some patients have multiple diagnoses and could potentially have diagnoses of both the syndromic presentation of epididymitis/orchitis and an STD (e.g., a chlamydial or gonococcal infection). Therefore, we chose to analyze the available data in a way that enabled us to evaluate both aggregate data restricted to ICD-9 codes for epididymitis/orchitis not designated as due to chlamydia or gonococcus and aggregate data for all ICD-9 codes for epididymitis/orchitis. (If one were doing a straight addition, codes not designated as due to chlamydia or gonococcus would not be included in the numbers of visits for infection with chlamydia or gonococcus in which one of these organisms was likely the etiology of the patient's disease.) Accordingly, we used two different schemes for including visits for epididymitis/orchitis, according to ICD-9 codes, as indicated in Table 1.

3. Because urethritis is often observed in association with cystitis and pyelonephritis in acute, community-acquired urinary tract infections (UTIs), most clinicians commonly code urethritis as cystitis. Some patients with urethritis of probable STD etiology have multiple diagnoses and in the datasets examined could have both a diagnosis of the syndromic presentation of urethritis and a diagnosis of an STD (e.g., herpetic, chlamydial, or gonococcal infection). We chose to analyze the available data in such a way that one could evaluate both aggregate data restricted to both ICD-9 codes for urethritis not designated as due to chlamydia or gonococcus and aggregate data for all ICD-9 codes for urethritis. No specific ICD-9 code exists for urethritis secondary to herpetic infection. Accordingly, we used two different schemes for including visits for urethritis according to ICD-9 codes, as indicated in Table 1.

Unfortunately, the use of ICD-9 coding to assess the urologic burden of disease is limited because STD pathogens can cause pathology of multiple organ systems, and diagnoses linked with specific syndromes may or may not be related to infection with an STD pathogen. Linking ICD-9 codes with Current Procedural Terminology (CPT) codes for STD tests or surgical treatments, or with National Drug Codes (NDCs) for anti-infective treatment, can help identify diagnoses more likely to be related to an STD pathogen. However, CPT codes and NDCs were analyzed in only one of the datasets examined, MarketScan. Even in MarketScan, linking CPT codes or NDCs to establish a more specific definition of a visit is problematic because the dates associated with these codes may not always coincide with those of the ICD-9 codes, raising questions about the actual clinical association of the diagnostic and procedure codes. In analyzing MarketScan data, we made assumptions about time periods of infection and constructed dates around which overlap of ICD-9 codes, CPT codes, and/or NDCs could reasonably

Table 3. The numbers of inpatient and outpatient visits identified by ICD-9 codes for genital herpes, genital warts, chlamydial infection, gonorrhea, epididymitis/orchitis, and urethritis[a]

ICD-9 codes	Number of Inpatient Visits	Number of Outpatient Visits
Genital herpes		
054.1Genital herpes (total)	33	1,505
054.10 Genital herpes, unspecified	33	1,369
054.13 Herpetic infection of penis	0	93
054.19 Other	0	43
Genital warts		
078.11 Condyloma acuminatum	18	3,813
Chlamydia		
079.98 Chlamydia	11	373
099.53 Chlamydial cystitis, lower genitourinary sites	0	91
099.54 Other genitourinary sites	0	9
099.55 Unspecified genitourinary site	0	5
099.41 *Chlamydia trachomatis*	0	45
078.88 Other specified disease due to chlamydia	9	148
079.88 Other specified chlamydia infection	1	75
Gonorrhea		
098.0 Gonococcal infection (acute) of lower genitourinary tract	7	420
098.1 Gonococcal infection (acute) of upper genitourinary tract		
098.10 Gonococcal infection (acute) of upper genitourinary tract site unspecified	0	7
098.11 Gonococcal cystitis (acute)	0	6
098.12 Gonococcal prostatitis (acute)	0	10
098.13 Gonococcal epididymo-orchitis (acute)	0	2
098.14 Gonococcal seminal vesiculitis (acute)	0	0
098.15 Gonococcal cervicitis (acute)	1	42
098.16 Gonococcal endometritis (acute)	0	1
098.17 Gonococcal salpingitis specified as acute	0	8
098.19 Other gonococcal infection (acute) of upper genitourinary tract	2	5
098.2 Gonococcal infection (chronic) of lower genitourinary tract	0	85
098.33 Gonococcal epididymo-orchitis chronic	0	3
098.31 Gonococcal cystitis chronic	0	0
098.30 Chronic gonococcal infection of upper genitourinary tract site unspecified	0	0
098.32 Gonococcal prostatitis chronic	0	3
098.34 Gonococcal seminal vesiculitis chronic	0	0
Epididymitis/orchitis not designated as due to Chlamydia or gonococcus		
604 Orchitis and epididymitis		
604.0 Orchitis, epididymitis, and epididymo-orchitis, with abscess of epididymis or testis		
604.9 Other orchitis, epididymitis, and epididymo-orchitis, without mention of abscess	0	28

Continued on next page

Table 3 (continued). The numbers of inpatient and outpatient visits identified by ICD-9 codes for genital herpes, genital warts, chlamydial infection, gonorrhea, epididymitis/orchitis, and urethritis[a]

ICD-9 Codes	Number of Inpatient Visits	Number of Outpatient Visits
Epididymitis/orchitis regardless of whether or not due to Chlamydia or gonococcus		
604 Orchitis and epididymitis		
604.0 Orchitis, epididymitis, and epididymo-orchitis, with abscess of epididymis or testis		
604.9 Other orchitis, epididymitis, and epididymo-orchitis, without mention of abscess	0	28
098.13 Gonococcal orchitis	14	1,552
098.33 Chronic gonococcal orchitis	0	1
Urethritis not designated as due to Chlamydia or gonococcus:		
099.40 Unspecified	0	355
099.49 Other specified organism	0	7
Urethritis regardless of whether or not due to Chlamydia or gonococcus:		
099.40 Unspecified	0	354
099.49 Other specified organism	0	7
099.41 Urethritis due to *Chlamydia trachomatis*	0	45
098.0 Acute gonococcal infection of the lower genitourinary tract	7	419
098.2 Chronic gonococcal infection of the lower genitourinary tract	0	85

[a]Numbers limited to enrollees who were continuously enrolled in a health plan throughout 1999.
[b]Males ages 16-35 years only.
SOURCE: MarketScan, 1999.

reflect a clinical association.

Finally, in interpreting the various claims and office visit datasets, it is important to keep in mind that ICD-9 codes for bacterial STDs tend to reflect incident cases that are treatable, whereas ICD-9 codes for viral STDs such as HPV and HSV tend to reflect prevalent cases with chronic manifestations that may involve extended therapy.

INCIDENCE, PREVALENCE, RISK FACTORS, AND HIGH-RISK GROUPS

Herpes Simplex

Background

An estimated 1 million people in the United States are newly infected each year with herpes simplex virus type two (HSV-2), the most common genital type. Since the late 1970s, the prevalence of HSV-2 infection has increased by 30%, and HSV-2 is now detectable in roughly one of every five persons over 11 years of age nationwide (6). The National Health and Nutrition Examination Surveys (1988–1994) (NHANES-III) reported that more than 25% of adults between 30 and 39 years of age were positive on serology for HSV-2 in those years (6). NHANES-III indicates that HSV-2 infection is more common in women than in men, affecting approximately one out of every four women, in contrast to fewer than one out of every five men (6). This may reflect differences in sexual behavior or more efficient transmission from male to females than from females to males (6).

HSV-2 infection increased fivefold among Caucasian teens (aged 12 to 19 years) between the 1970s and the 1990s, faster than among any other age or racial/ethnic group (6). Among Caucasians 20 to 29 years of age, the prevalence of HSV-2 infection increased twofold over that period. The percentage of people infected with either HSV-1 or HSV-2 increases with age, because people remain infected throughout their lives (7). Among persons 15 to 39 years of age, annual incidence of HSV-2 infection has been projected to increase steadily between 2000 and 2025, from 9 to 26 infections per 1,000 men and from 12 to 32 infections per 1,000 women; prevalence is projected to increase to 39% among men and 49% among women (8).

HSV-2 infection continues to spread across all social, economic, racial, and ethnic groups and is common in both urban and rural areas. There are no significant differences in prevalence among geographic regions of the United States. Although HSV-2 infection is increasing among young Caucasians, who have a seroprevalence of approximately 17%, infection is more common among African-Americans, who have a seroprevalence of 45% (6).

The principal symptoms of herpes—recurrent painful ulcers of the genitalia, perineum, and perianal area—can be treated, but the infection cannot be eliminated. However, most people with positive HSV serology do not have symptomatic infection that results in medical visits or in costs to the health care system (9). In NHANES-III, fewer than 10% who tested positive for HSV-2 had been symptomatic with genital herpes and knew they were infected (6); these numbers do not take into account the sizable percentage of genital herpes cases caused by HSV-1. With or without recognizable symptoms, HSV infection can be transmitted between sex partners and from mothers to newborns, and it is potentially fatal in infants born to infected women (6). Genital herpes can be particularly severe in people with HIV infection; it may cause genital ulcers and may increase HIV viral load, which increases the risk of HIV transmission (10).

_The cost of incident herpes infections in the United States in 2000 was estimated to be $1.8 billion, but because of the increasing incidence, this cost has been predicted to rise to $2.5 billion by 2015 and $2.7 billion by 2025 (8).

In the National Disease and Therapeutic Index (NDTI), the number of initial visits to clinicians' offices per year for genital herpes rose from fewer than 10,000 in 1966–1970 to more than 150,000 in 1995–2001. In the NDTI and in the other datasets we analyzed, the unit of analysis is health care system contacts, not the actual numbers of genital herpes cases; the exception to this is the Veterans Health Administration (VA) claims data in which the unit of analysis is the individual patient. Patients with genital herpes may seek care in public health care facilities or from private ambulatory care providers and, as a consequence, may not be captured in certain datasets. However, the datasets we analyzed are useful for describing trends in care-seeking behavior for genital herpes. For any population in a given dataset, the total numbers of patient visits for genital herpes are minimum estimates of contacts with health care providers; thus, patient visits for initial episodes do not necessarily reflect incident cases._

The Data

Healthcare Cost and Utilization Project (HCUP) data indicate that hospitalization for genital herpes is a rare event that has decreased in frequency over time, possibly due to the increased availability of outpatient medication that reduces the severity and duration of symptoms (Table 4). In 1994, 930 patients were hospitalized with a primary diagnosis of genital herpes, of whom 716 (77%) were 18 to 44 years of age. Hospitalizations decreased progressively after 1994, declining to 388 in 2000, of which 295 (76%) were women, 161 (42%) resided in the South, and 339 (87%) resided in urban areas.

Hospital outpatient and inpatient data generated by the Centers for Medicare and Medicaid Services (CMS) from 1992 through 1998 contained too few claims for genital herpes to permit detailed interpretation. According to the Medicare outpatient files, physician office visit rates increased from 12 visits per 100,000 beneficiaries in 1992 to 17 per 100,000 in 1998 (Table 5). It is likely that this increase reflects the greater use of outpatient management of genital herpes with drugs that reduce the severity and duration of symptoms. In 1998, the rates seen among male and female Medicare beneficiaries were identical (17 per 100,000); the highest rates were seen among persons under 65 years of age (42 per 100,000), those residing in the West (23 per 100,000), and Hispanics (40 per 100,000). Note that Medicare beneficiaries under age 65 include the disabled and persons with end-stage renal disease and are distinct from Medicare beneficiaries 65 and older.

Genital herpes was the most common pathogen-specific STD presentation in 2001 VA data, with a total of 118 cases per 100,000 unique outpatients (Table 6). The highest rates were seen among women (426 per 100,000), persons 25 to 34 years of age (543 per 100,000), African Americans (214 per 100,000), and those residing in the West (176 per 100,000) (Table 7). Progressive increases were noted in the counts and rates of patients diagnosed with genital herpes from

Table 4. Inpatient hospital stays by individuals with genital herpes listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	930	0.4 (0.3–0.4)	441	0.2 (0.1–0.2)	517	0.2 (0.1–0.2)	388	0.1 (0.1–0.2)
Age								
< 14	*	*	*	*	*	*	*	*
14–17	*	*	*	*	*	*	*	*
18–24	188	0.8 (0.5–1.0)	*	*	*	*	*	*
25–34	314	0.8 (0.5–1.0)	*	*	*	*	*	*
35–44	214	0.5 (0.3–0.7)	*	*	*	*	*	*
45–54	*	*	*	*	*	*	*	*
55–64	*	*	*	*	*	*	*	*
65–74	*	*	*	*	*	*	*	*
75–84	*	*	*	*	*	*	*	*
85+	*	*	*	*	*	*	*	*
Race/ethnicity								
White	359	0.2 (0.1–0.2)	220	0.1 (0.1–0.2)	151	0.1 (0.0–0.1)	*	*
Black	318	1.0 (0.6–1.4)	*	*	156	0.5 (0.3–0.7)	*	*
Asian/Pacific Islander	*	*	*	*	*	*	*	*
Hispanic	*	*	*	*	*	*	*	*
Gender								
Male	401	0.3 (0.2–0.4)	164	0.1 (0.1–0.2)	*	*	*	*
Female	529	0.4 (0.3–0.5)	277	0.2 (0.2–0.3)	400	0.3 (0.2–0.4)	295	0.2 (0.2–0.3)
Region								
Midwest	173	0.3 (0.2–0.4)	*	*	*	*	*	*
Northeast	196	0.4 (0.2–0.5)	*	*	*	*	*	*
South	494	0.6 (0.4–0.8)	*	*	234	0.2 (0.1–0.4)	161	0.2 (0.1–0.2)
West	*	*	*	*	*	*	*	*
MSA								
Rural	*	*	*	*	*	*	*	*
Urban	807	0.4 (0.3–0.5)	411	0.2 (0.2–0.2)	449	0.2 (0.2–0.3)	339	0.2 (0.1–0.2)

*Figure does not meet standard for reliability or precision; MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US civilian non-institutionalized population.

[b]Persons of other race/ethnicity are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

1999 through 2001 in most strata (age, gender, race/ethnicity, insurance status, and region).

The 1999 MarketScan data reported 1,505 outpatient visits and 33 inpatient visits accompanied by a claim for services associated with one of the ICD-9 codes listed in Table 3. A much higher rate of visits was observed among women enrollees (88 per 100,000) than among men (50 per 100,000) (Table 8). The highest rates were seen among persons aged 25 to 29 years of age (182 per 100,000). This is consistent with the serologic findings discussed below and may reflect additional diagnoses made through screening of pregnant women by medical history or HSV serologic testing. It should be noted that initial episodes of genital herpes, which tend to be most symptomatic, are more likely to prompt medical care and to represent incident infections. Later episodes are less likely to have severe symptoms, and patients with recurrent episodes who are aware of genital herpes symptoms may be less likely to seek care.

Table 5. Physician office visits by Medicare beneficiaries with genital herpes listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	4,200	12 (12–13)	5,980	17 (16–17)	5,720	17 (17–17)
Total < 65	1,280	23 (22–25)	2,220	36 (35–38)	2,580	42 (40–43)
Total 65+	2,920	10 (9.7–10)	3,760	13 (12–13)	3,140	11 (11–12)
Age						
65–74	1,980	12 (12–13)	2,440	15 (14–16)	1,820	13 (12–13)
75–84	880	9.3 (8.7–9.9)	1,180	12 (12–13)	1,180	12 (12–13)
85–94	60	2.1 (1.6–2.6)	140	4.6 (3.8–5.3)	140	4.5 (3.8–5.3)
95+	0	0.0	0	0.0	0	0.0
Race/ethnicity						
White	3,320	11 (11–12)	4,540	15 (15–15)	4,000	14 (14–15)
Black	520	18 (16–19)	1,000	31 (29–33)	1,100	35 (33–38)
Asian	…	…	40	24 (17–31)	100	32 (25–38)
Hispanic	…	…	160	40 (34–46)	280	40 (35–45)
N. American Native	…	…	…	…	…	…
Gender						
Male	2,220	15 (14–16)	2,440	16 (15–17)	2,460	17 (16–18)
Female	1,980	10.0 (9.6–10)	3,540	18 (17–18)	3,260	17 (17–18)
Region						
Midwest	620	7.1 (6.5–7.7)	980	11 (10–12)	820	9.5 (8.9–10)
Northeast	580	7.5 (6.9–8.1)	1,160	15 (14–16)	1,120	17 (16–18)
South	1,860	15 (15–16)	2,240	18 (17–18)	2,500	20 (19–21)
West	1,100	22 (20–23)	1,400	27 (26–28)	1,160	23 (22–25)

…data not available.

[a]Unweighted counts multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

Table 6. Frequency of sexually transmitted diseases as a diagnosis in VA patients seeking outpatient care, 2001, count[a], rate[b]

	Primary Diagnosis		*Any Diagnosis*	
Sexually Transmitted Disease	**Count**	**Rate**	**Count**	**Rate**
Genital herpes	2,324	63	4,357	118
Genital warts	2,224	60	2,846	77
Chlamydia	380	10	515	14
Gonorrhea	473	13	634	17
Syphilis	71	2	100	3
Epididymitis (organism unspecified)[c]	1,519	41	1,833	50
Epididymitis (all cases)[c]	1,557	42	1,889	51
Urethritis (organism unspecified)	185	5	233	6
Urethritis (all cases)	590	16	771	21

[b]The term count is used to be consistent with other UDA tables; however, the VA tables represent the population of VA users and thus are not weighted to represent national population estimates.

[b]Rate is defined as the number of unique patients with each condition divided by the base population in the same fiscal year x 100,000 to calculate the rate per 100,000 unique outpatients.

[c]Includes males only.

SOURCE: Outpatient Clinic File (OPC), VA Austin Automation Center, FY2001.

Table 7. Frequency of genital herpes[a] listed as any diagnosis in VA patients seeking outpatient care, count[b], rate[c]

	1999		2000		2001	
	Count	Rate	Count	Rate	Count	Rate
Total	**2,918**	**96**	**3,433**	**105**	**4,357**	**118**
Age						
18–24	89	351	103	438	116	504
25–34	576	382	621	437	738	543
35–44	724	219	823	264	943	315
45–54	865	126	956	133	1,262	168
55–64	340	68	491	89	693	107
65–74	245	32	309	37	445	47
75–84	73	14	124	19	148	18
85+	6	12	6	10	12	15
Race/ethnicity						
White	1,122	82	1,321	90	1,587	99
Black	598	179	649	189	758	214
Hispanic	128	112	150	122	212	164
Other	11	57	16	79	23	105
Unknown	1,059	88	1,297	98	1,777	113
Gender						
Male	2,439	84	2,844	91	3,655	104
Female	479	339	589	390	702	426
Region						
Midwest	587	85	629	84	708	85
Northeast	550	75	576	74	701	81
South	1037	102	1,326	119	1,717	133
West	744	124	902	142	1,231	176
Insurance status						
No insurance/self-pay	2,241	123	2,521	139	3,114	164
Medicare/Medicare supplemental	256	37	350	38	478	40
Medicaid	6	121	8	101	18	200
Private insurance/HMO/PPO	377	78	495	97	675	122
Other insurance	38	150	57	198	66	198
Unknown	0	0	2	81	6	66

HMO, health maintenance organization; PPO, preferred provider organization.

[a]Represents diagnosis codes for genital herpes.

[b]The term count is used to be consistent with other UDA tables; however, the VA tables represent the population of VA users and thus are not weighted to represent national population estimates.

[c]Rate is defined as the number of unique patients with each condition divided by the base population in the same fiscal year x 100,000 to calculate the rate per 100,000 unique outpatients.

NOTE: Race/ethnicity data from observation only; note large number of unknown values.

Source: Outpatient Clinic File (OPC), VA Austin Automation Center, FY1999–FY2001.

Table 8. Medical visits[a] for genital herpes in 1999, count, rate[b] (95% CI)

	Count	Rate
Age		
<10	8	3 (1–6)
10–14	8	5 (1-8)
15–19	106	57 (46–67)
20–24	162	141 (119–163)
25–29	179	182 (156–209)
30–34	244	171 (150–192)
35–39	238	125 (110–141)
40–44	198	92 (79–104)
45–54	287	61 (54–68)
55–64	105	29 (24–35)
65+	3	32 (0–69)
Gender		
Male	529	50 (46–54)
Female	1,009	88 (82–93)
Region		
Midwest	352	68 (61–75)
Northeast	271	72 (64–81)
South	644	69 (63–74)
West	111	100 (82–119)
Unknown	160	61 (51–70)
Urban/rural		
MSA	1,152	79 (74–83)
Non-MSA	226	47 (41–54)
Unknown	160	61 (51–70)

[a]The number of medical visits includes both inpatient visits and outpatient visits; however, most medical visits were outpatient visits.
[b]Rate per 100,000 enrollees who were continuously enrolled in a health plan throughout 1999.
SOURCE: MarketScan, 1999.

Recurrent episodes of genital herpes also tend to become less frequent over time. This may explain why claims and visits for symptomatic genital herpes tend to peak in the younger age groups, as visits are generated for incident cases soon after infection, while HSV infection is more prevalent in older ages, as noted above. In MarketScan data, rates of inpatient and outpatient visits for genital herpes varied by geographical region, ranging from 100 per 100,000 enrollees in the West to 61 to 72 per 100,000 in the other regions. A marked difference in rates was also seen between urban areas (79 per 100,000) and rural areas (47 per 100,000).

For the 1,505 outpatient visits for genital herpes reported in the 1999 MarketScan data, 537 drug claims were filed for acyclovir, famcyclovir, or valacyclovir on the same date as an outpatient medical claim for genital herpes, and a total of 1,025 drug claims were filed for one of these drugs within 30 days after the outpatient visit. Drug claims were not analyzed for the small number of inpatient visits ICD-9 coded for genital herpes. In addition, 87,029 drug claims were filed for one of these three same drugs, regardless of ICD-9 codes for patient visits. Another recent study has underscored the difficulty of using drug claims for acyclovir as a way to estimate the burden of symptomatic genital herpes (11). Only 2% of the persons with acyclovir claims had ICD-9 codes for genital herpes, 9% had ICD-9 codes for herpes in nongenital sites (ICD-9 code 054 excluding 054.1), 6% had ICD-9 codes for herpes zoster (ICD-9 code 053), and 80% had ICD-9 codes for other medical care. Of those with ICD-9 codes for genital herpes, 27% did not have acyclovir claims.

Genital Warts

Background

Most genital warts are the result of infection with HPV type 6 or 11. Genital warts occur in sites on the external genitalia and can also occur in the vagina, urethra, and anus. Overall, the best estimates of the prevalence of genital warts are based on selected studies with extrapolations. Approximately 1% of sexually active adults in the United States are estimated to have genital warts. This estimate is based on levels of infection ranging from 1.5% among female college students treated in student health centers to 13% of patients in selected STD clinics (12, 13). A recent analysis of health care claims data from a private US health plan found that the prevalence of (and health plan costs associated with) genital warts billed through the health plan were highest among women 20 to 24 years of age (6.2 cases and $1,692 in costs per 1,000 person-years) and men 25 to 29 years of age (5.0 cases and $1,717 in costs per 1,000 person-years) (14). Risk factors for developing genital warts have been difficult to assess because of the lack of a marketed diagnostic test specific for HPV types 6 and 11 or other types associated with warts. However, urologists and other clinicians who engage in procedures directed at ameliorating genital

Table 9. Inpatient hospital stays by individuals with genital warts listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	562	0.2 (0.2–0.3)	337	0.1 (0.1–0.2)	296	0.1 (0.1–0.1)	315	0.1 (0.1–0.2)
Age								
< 14	*	*	*	*	*	*	*	*
14–17	*	*	*	*	*	*	*	*
18–24	*	*	*	*	*	*	*	*
25–34	173	0.4 (0.2–0.6)	*	*	*	*	*	*
35–44	*	*	*	*	*	*	*	*
45–54	*	*	*	*	*	*	*	*
55–64	*	*	*	*	*	*	*	*
65–74	*	*	*	*	*	*	*	*
75–84	*	*	*	*	*	*	*	*
85+	*	*	*	*	*	*	*	*
Race/ethnicity								
White	298	0.2 (0.1–0.2)	162	0.1 (0.0–0.1)	*	*	*	*
Black	*	*	*	*	*	*	*	*
Asian/Pacific Islander	*	*	*	*	*	*	*	*
Hispanic	*	*	*	*	*	*	*	*
Gender								
Male	325	0.3 (0.2–0.3)	167	0.1 (0.1–0.2)	171	0.1 (0.1–0.2)	207	0.2 (0.1–0.2)
Female	237	0.2 (0.1–0.2)	170	0.1 (0.1–0.2)	*	*	*	*
Region								
Midwest	*	*	*	*	*	*	*	*
Northeast	195	0.4 (0.2–0.6)	*	*	*	*	*	*
South	232	0.3 (0.2–0.4)	*	*	*	*	*	*
West	*	*	*	*	*	*	*	*
MSA								
Rural	*	*	*	*	*	*	*	*
Urban	515	0.3 (0.2–0.4)	310	0.2 (0.1–0.2)	268	0.1 (0.1–0.2)	280	0.1 (0.1–0.2)

MSA, metropolitan statistical area.

*Figure does not meet standard for reliability or precision.

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US civilian non-institutionalized population.

[b]Persons of other race/ethnicity are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

warts lesions should note that the possibility exists for nosocomial disease transmission through exposure to an aerosolized plume from HPV-infected tissue when using a carbon-dioxide laser (15, 16).

The primary goal in the treatment of visible genital warts is the removal of those that obstruct the urethra, vagina, anus, or oral cavity; cause discomfort, pain, or bleeding in the anogenital areas; or cause cosmetic problems. In the National Disease and Therapeutic Index (NDTI)I, the number of initial visits to physicians' offices for genital warts has risen from about 80,000 per year in 1966–1969 to more than 150,000 in every year since 1972. As with genital herpes, data from the NDTI and the other datasets used in this analysis (with the exception of the VA claims data) reflect health care system contacts, not the actual numbers of cases. However, year-to-year NDTI data are useful for describing trends in care-seeking in private physician's offices, although not in public health care facilities or from other private ambulatory care providers. Therefore, for any population in a given dataset, the total numbers of patient visits for genital warts are minimum estimates of health care contacts.

The Data

According to HCUP data, hospitalization for genital warts (ICD-9 code 078.11 only) is a very rare event that has remained stable over time (Table 9). In 2000, there was a weighted frequency of 315 hospitalizations with a primary diagnosis of genital warts, of which 207 (66%) were men and 280 (89%) resided in urban areas.

In all CMS databases examined, the diagnosis of genital warts was too rare to permit statistically meaningful interpretation (Table 10). Hospital outpatient visit rates for genital warts increased from 1.5 per 100,000 beneficiaries in 1995 to 4.0 per 100,000 in 1998; of an estimated 1,340 visits in 1998, the highest rates were seen among men (5.7 per 100,000) and persons under 65 years of age (16 per 100,000). ICD-9 codes for genital warts were revised substantially after 1992, resulting in increased specificity.

Table 10. Outpatient hospital visits by Medicare beneficiaries with genital warts listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992[c]		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[d]	7,440	22 (21–22)	520	1.5 (1.3–1.6)	1,340	4.0 (3.8–4.2)
Total < 65	3,320	61 (59–63)	420	6.8 (6.2–7.5)	980	16 (15–17)
Total 65+	4,120	14 (14–15)	100	0.3 (0.3–0.4)	360	1.3 (1.2–1.5)
Age						
65–74	2,380	14 (14–15)	40	0.2 (0.2–0.3)	300	2.1 (1.9–2.3)
75–84	1,320	14 (13–15)	60	0.6 (0.5–0.8)	60	0.6 (0.5–0.8)
85–94	360	13 (11–14)	0	0.0	0	0.0
95+	60	18 (13–22)	0	0.0	0	0.0
Race/ethnicity						
White	5,460	19 (18–19)	400	1.3 (1.2–1.4)	900	3.2 (3.0–3.4)
Black	920	31 (29–33)	100	3.1 (2.5–3.7)	260	8.4 (7.4–9.4)
Asian	…	…	…	…	…	…
Hispanic	…	…	…	…	60	8.5 (6.4–11)
N. American Native	…	…	…	…	…	…
Gender						
Male	3,740	25 (25–26)	380	2.5 (2.2–2.7)	820	5.7 (5.3–6.1)
Female	3,700	19 (18–19)	140	0.7 (0.6–0.8)	520	2.7 (2.5–3.0)
Region						
Midwest	2,260	26 (25–27)	240	2.7 (2.3–3.0)	420	4.9 (4.4–5.3)
Northeast	2,000	26 (25–27)	140	1.8 (1.5–2.1)	280	4.2 (3.7–4.7)
South	1,080	8.8 (8.3–9.4)	60	0.5 (0.4–0.6)	420	3.4 (3.1–3.7)
West	2,080	41 (39–43)	80	1.5 (1.2–1.9)	220	4.4 (3.9–5.0)

… data not available.

[a]Unweighted counts multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]ICD-9 codes for genital warts were revised substantially after 1992, resulting in increased specificity. Counts for 1992 re ect the relative lack of specificity in coding for that year as compared to subsequent years.

[d]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTE: Counts less than 600 should be interpreted with caution.

SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

Table 11. Frequency of genital warts[a] listed as any diagnosis in VA patients seeking outpatient care, count[b], rate[c]

	1999		2000		2001	
	Count	Rate	Count	Rate	Count	Rate
Total	2,673	88	2,809	86	2,846	77
Age						
18–24	71	280	64	272	62	269
25–34	434	288	421	296	409	301
35–44	647	196	657	210	622	207
45–54	829	120	939	131	938	125
55–64	369	74	402	73	465	72
65–74	231	30	223	27	253	27
75–84	87	16	96	15	86	11
85+	5	10	7	12	11	14
Race/ethnicity						
White	1,356	99	1,378	94	1,373	85
Black	480	144	502	147	500	141
Hispanic	59	52	76	62	81	63
Other	11	57	13	64	6	27
Unknown	767	64	840	64	886	56
Gender						
Male	2,522	87	2,635	84	2,697	76
Female	151	107	174	115	149	90
Region						
Midwest	647	94	701	94	673	81
Northeast	488	67	483	62	461	53
South	983	97	1,032	92	1,098	85
West	555	92	593	93	614	88
Insurance status						
No insurance/self-pay	2,037	112	2,139	118	2,142	113
Medicare/Medicare supplemental	315	45	324	35	359	30
Medicaid	12	242	12	152	13	145
Private insurance/HMO/PPO	278	57	302	59	304	55
Other insurance	29	115	31	108	28	84
Unknown	2	105	1	41	0	0

HMO, health maintenance organization; PPO, preferred provider organization.

[a]Represents diagnosis codes for genital warts.

[b]The term count is used to be consistent with other UDA tables; however, the VA tables represent the population of VA users and thus are not weighted to represent national population estimates.

[c]Rate is defined as the number of unique patients with each condition divided by the base population in the same fiscal year x 100,000 to calculate the rate per 100,000 unique outpatients.

NOTE: Race/ethnicity data from observation only; note large number of unknown values.

Source: Outpatient Clinic File (OPC), VA Austin Automation Center, FY1999–FY2001.

Table 12. Medical visits[a] for genital warts in 1999, count, rate[b] (95% CI)

	Count	Rate
Age		
<10	61	25 (19–31)
10–14	92	53 (42–64)
15–19	390	209 (188–229)
20–24	597	520 (478–562)
25–29	458	466 (424–509)
30–34	498	349 (318–380)
35–39	445	235 (213–256)
40–44	374	173 (156–191)
45–54	601	127 (117–137)
55–64	309	87 (77–96)
65+	6	64 (13–116)
Gender		
Male	1,722	163 (156–171)
Female	2,109	183 (176–191)
Region		
Midwest	1,030	199 (187–211)
Northeast	756	201 (187–216)
South	1,475	158 (149–166)
West	141	127 (106–148)
Unknown	429	163 (147–178)
Urban/rural		
MSA	2,717	186 (179–192)
Non-MSA	685	144 (133–154)
Unknown	429	163 (147–178)

[a]The number of medical visits includes both inpatient visits and outpatient visits; however, most medical visits were outpatient visits.
[b]Rate per 100,000 enrollees who were continuously enrolled in a health plan throughout 1999.
SOURCE: MarketScan, 1999.

In 2001 VA data, genital warts were the second most common pathogen-specific STD presentation, with a total of 77 cases per 100,000 unique outpatients (Table 6). As with genital herpes, the highest rates of genital warts in 2001 were seen among women (90 cases per 100,000 unique outpatients), persons 25 to 34 years of age (301 per 100,000), and African Americans (141 per 100,000) (Table 11). However, unlike genital herpes, no consistent trend was seen when comparing case counts and rates from 1999 through 2001 across age groups, gender, race/ethnicity, insurance status, and region (Table 11).

The 1999 data from MarketScan had 3,813 outpatient visits and 18 inpatient visits for genital warts accompanied by a claim for services associated with ICD-9 code 078.11 (Table 3). There were 2,109 medical visits for genital warts by women and 1,722 by men, the rates per 100,000 enrollees being 183 and 163, respectively (Table 12). The highest rates were seen among those 20 to 24 years of age (520 per 100,000). Rates varied by geographical region, from 127 per 100,000 in the West to 201 per 100,000 in the Northeast. A difference was also seen between urban (186 per 100,000) and rural (144 per 100,000) residents.

By defining an episode of genital warts with ICD-9 code 078.10 (wart – common, digitate, filiform, infectious, viral) or 078.19 (other specified viral warts – genital warts, verruca plana, verruca plantaris) linked with CPT procedure codes for the destruction or excision of a lesion of the anus, penis, vulva, perineum, vagina, or introitus, one might identify more patients with genital warts. Claims for drugs used principally to treat genital warts could also identify many patients with the condition: in the 1999 Marketscan data, there were 5,056 drug claims for imiquimod (where the prescription was obtained from a urologist or gynecologist), podofilox, or podophyllin, and 1,356 claims in which the visits included ICD-9 code 078.10 or 78.19 accompanied by CPT codes for procedures to destroy or excise a lesion of the anus, penis, vulva, perineum, vagina, or introitus.

Using National Ambulatory Medical Care Survey (NAMCS) data, we estimated that of the 4.5 million medical visits per year for genital warts, many more were for possible cases (4 million) than for definite cases (0.25 million) or probable cases (0.25 million). Please see the methods chapter for a detailed discussion of definite, probable, and possible cases. Further exploration of this dataset as a source of information on genital warts will require an in-depth understanding of the coding practices of office-based clinicians with respect to diagnoses and procedures.

In both the MarketScan and NAMCS datasets, women made the majority of outpatient visits for genital warts. Further exploration of the datasets will be necessary to determine if this preponderance represents a greater incidence or prevalence among women, or whether it merely reflects differences in care-seeking behavior. For example, genital warts in women are more likely to come to medical attention than genital warts in men, if only because women periodically seek Pap smears. In contrast, in the HCUP data, men made the majority of inpatient visits. One possible explanation for the difference in the sex distribution of inpatients and outpatients receiving wart care may be that ablative procedures for anogenital warts in men are more commonly performed by hospital-based surgeons, while anogenital warts in women are more commonly managed with ablative and nonablative procedures by office-based gynecologists.

Chlamydia

Background

Chlamydia trachomatis infection causes inflammation of the lower and upper genital tract and presents commonly as cervicitis, salpingitis, endometritis, and urethritis in women, and urethritis, epididymitis, orchitis, prostatitis, and proctitis in men. *C. trachomatis* also causes asymptomatic infection that can result in serious and costly sequelae if acute infection is not treated promptly and properly. Congenitally exposed infants may develop neonatal inclusion conjunctivitis and pneumonitis syndromes. Over the past two decades, there has been a dramatic increase in the use of various measures for diagnostic testing of symptomatic patients and screening of asymptomatic patients. Tests include rapid, nonculture monoclonal antibody-based tests, enzyme immunoassays (EIAs), nucleic acid probe tests, and nucleic acid amplification tests (NAATs). These tests may detect *C. trachomatis* in endocervical or urethral specimens or in urine (17).

Primarily because of increased efforts to screen and treat women for chlamydial infection, the incidence of chlamydia is estimated to have decreased from well over 4 million annual infections in the early 1980s to the current level of 3 million new cases annually, of which up to 75% are asymptomatic (1). The annual economic burden of sexually transmitted chlamydial infections and related sequelae, including PID, ectopic pregnancies, and tubal infertility, was estimated to exceed $2 billion in 1994 (18).

Of the reportable STDs in the United States, chlamydia is the most widespread. In 2001, a total of 783,242 cases (278 per 100,000 population) were reported to the Centers for Disease Control and Prevention (CDC). These included cases with and without symptoms or signs detected during medical examinations or routine screening. Forty percent of the cases of chlamydia were reported among persons 15 to 19 years of age. Reported prevalence among routinely screened, sexually active women is

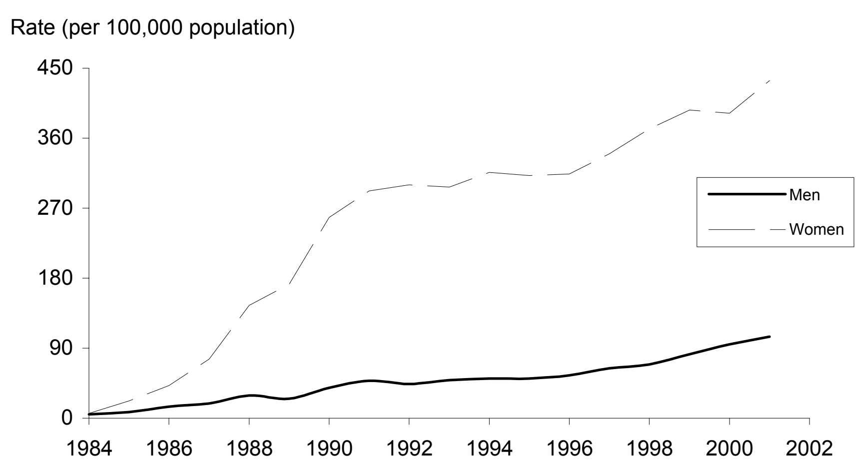

Figure 1. ***Chlamydia*** **– Rates by gender: United States, 1984–2001.**

SOURCE: Centers for Disease Control and Prevention. Adapted from Sexually Transmitted Disease Surveillance 2001 Supplement. Chlamydia Prevalence Monitoring Project - Annual Report 2001. Available at: http://www.cdc.gov/std/chlamydia2001/CT2001text.pdf.

consistently greater than 5%, and prevalence among teenage girls often exceeds 10%. In 1996–1999, 9.5% of the women 17 to 37 years of age routinely screened for STDs during their induction into the US Army tested positive for chlamydial infection (19). In addition, 15.6% of adolescent girls entering juvenile detention facilities where chlamydia screening was routine tested positive (20). Prevalence rates tend to be high in STD clinics or other settings where clients present with symptoms. Chlamydial infection is common among all races and ethnic groups, but prevalence is generally higher among women than among men (Figure 1). Using the LCx assay (Abbott Laboratories, Abbott Park, IL) for *C. trachomatis*, urine samples have been tested on a representative sample of participants 14 to 39 years of age in the 1999-2000 NHANES data (21). The prevalence of *C. trachomatis* infection was 2.6% with no significant difference between male and females. Routine screening in family planning clinics reveals that chlamydial infection is more prevalent in areas without long-standing screening and treatment programs; in 1999, 7 of the 10 states with the highest rates were in the South (13).

The advent of routine screening programs for female adolescents and young women has greatly influenced estimates of the distribution of infection. For example, there are more cases or visits based on positive laboratory tests in women than in men because of the large number of infections detected through female screening programs. Also, high rates of chlamydial infection in certain jurisdictions or among certain populations may indicate more effective screening programs and use of more sensitive tests, rather than a higher underlying incidence of disease. However, screening is not comprehensive. A Health Plan Employer Data and Information Set (HEDIS) report recently indicated that of women eligible for chlamydia screening under national screening guidelines (22), 19% of those 16 to 20 years of age and 16% of those 21 to 26 years of age received screening in managed care organizations that reported screening rates to the National Committee of Quality Assurance (NCQA) in 2000 (23). Selected public sector programs (STD clinics, prenatal clinics, and family planning clinics) screen higher percentages of women. Inclusion of screening costs for patients with positive test results must be considered in analyses of the overall economic burden of STDs.

The Data

HCUP data indicate that hospitalization for chlamydial infection is a rare event that has decreased over time (Table 13). In 1994, a total of 2,278 patients were hospitalized with a primary diagnosis of chlamydial infection; the number decreased to 183 in 2000.

Medicare data on hospital outpatient and inpatient visits for chlamydial infection from 1995 through 1998 were too sparse to permit meaningful interpretation (Table 14). For example, Medicare hospital outpatient visit rates decreased from 2.8 per 100,000 beneficiaries in 1995 to 1.4 per 100,000 in 1998.

In 2001 VA data, chlamydial infection was the fourth most common pathogen-specific STD presentation, with a total of 14 cases per 100,000 unique outpatients (Table 6). The highest rates were seen among women (76 per 100,000), persons under 25 years of age (226 per 100,000), African Americans (52 per 100,000), and persons residing in the West (16 per 100,000) (Table 15). The higher rates observed among women and persons under 25 years of age may be due in part to higher rates of screening of younger women who are asymptomatic, especially in family planning, prenatal, and STD clinics. No consistent trend was seen when comparing case counts and rates from 1999 through 2001 across age groups, gender, race/ethnicity, insurance status, and region.

The 1999 MarketScan data had 746 outpatient visits and 21 inpatient visits accompanied by a claim for services associated with one of the ICD-9 codes for chlamydial infection listed in Table 3. Of these 767 visits, 558 were by women and 209 were by men, the rates being 49 and 20 per 100,000 enrollees, respectively (Table 16). The highest rates of visits were by persons 20 to 24 years of age (105 per 100,000). The higher rates observed among women and persons under 25 years of age may be due in part to higher rates of screening of younger asymptomatic women during family planning and prenatal care. Rates did not vary greatly by geographical region, ranging from 31 per 100,000 in the Midwest to 39 per 100,000 in the Northeast. However, a marked difference was seen between urban (38 per 100,000) and rural (24 per 100,000) residents. The higher rates observed among urban residents may be due in part to higher rates of screening in urban areas, not greater

Table 13. Inpatient hospital stays by individuals with *Chlamydia* listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	2,278	0.9 (0.6–1.2)	684	0.3 (0.2–0.3)	272	0.1 (0.1–0.1)	183	0.1 (0.0–0.1)
Age								
< 14	1,548	2.9 (1.4–4.4)	268	0.5 (0.3–0.6)	*	*	*	*
14–17	*	*	*	*	*	*	*	*
18–24	172	0.7 (0.4–1.0)	*	*	*	*	*	*
25–34	*	*	*	*	*	*	*	*
35–44	*	*	*	*	*	*	*	*
45–54	*	*	*	*	*	*	*	*
55–64	*	*	*	*	*	*	*	*
65–74	*	*	*	*	*	*	*	*
75–84	*	*	*	*	*	*	*	*
85+	*	*	*	*	*	*	*	*
Race/ethnicity								
White	411	0.2 (0.2–0.3)	337	0.2 (0.1–0.2)	*	*	*	*
Black	434	1.4 (0.9–1.9)	154	0.5 (0.3–0.6)	*	*	*	*
Asian/Pacific Islander	*	*	*	*	*	*	*	*
Hispanic	*	*	*	*	*	*	*	*
Other	*	*	*	*	*	*	*	*
Gender								
Male	1,052	0.8 (0.4–1.3)	231	0.2 (0.1–0.2)	*	*	*	*
Female	1,226	1.0 (0.6–1.2)	453	0.3 (0.2–0.4)	224	0.2 (0.1–0.2)	164	0.1 (0.1–0.2)
Region								
Midwest	315	0.5 (0.3–0.7)	*	*	*	*	*	*
Northeast	1,364	2.7 (1.0–4.3)	317	0.6 (0.4–0.8)	*	*	*	*
South	430	0.5 (0.3–0.7)	*	*	*	*	*	*
West	169	0.3 (0.2–0.4)	*	*	*	*	*	*
MSA								
Rural	*	*	*	*	*	*	*	*
Urban	2,022	1.1 (0.6–0.5)	566	0.3 (0.2–0.3)	229	0.1 (0.1–0.2)	163	0.1 (0.0–0.1)

*Figure does not meet standard for reliability or precision.

MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US civilian non-institutionalized population.

[b]Persons of other race/ethnicity are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 14. Outpatient hospital visits by Medicare beneficiaries with *Chlamydia* listed as primary diagnosis, count[a], rate[b] (95% CI)

	1995		1998	
	Count	Rate	Count	Rate
Total all ages[c]	980	2.8 (2.6–2.9)	460	1.4 (1.2–1.5)
Total < 65	440	7.2 (6.5–7.8)	240	3.9 (3.4–4.3)
Total 65+	540	1.8 (1.7–2.0)	220	0.8 (0.7–0.9)
Age				
65–74	380	2.3 (2.1–2.6)	120	0.8 (0.7–1.0)
75–84	160	1.7 (1.4–1.9)	100	1.1 (0.8–1.3)
85–94	0	0.0	0	0.0
95+	0	0.0	0	0.0
Race/ethnicity				
White	540	1.8 (1.6–1.9)	280	1.0 (0.9–1.1)
Black	260	8.1 (7.1–9.1)	100	3.2 (2.6–3.9)
Asian	…	…	…	…
Hispanic	100	25 (20–30)	20	2.8 (1.6–4.1)
N. American Native	…	…	20	37 (20–54)
Gender				
Male	400	2.6 (2.4–2.9)	220	1.5 (1.3–1.7)
Female	580	2.9 (2.6–3.1)	240	1.3 (1.1–1.4)
Region				
Midwest	80	0.9 (0.7–1.1)	60	0.7 (0.5–0.9)
Northeast	460	6.0 (5.4–6.5)	180	2.7 (2.3–3.1)
South	240	1.9 (1.7–2.1)	120	1.0 (0.8–1.1)
West	180	3.5 (3.0–4.0)	80	1.6 (1.3–2.0)

… data not available.

[a]Unweighted counts multiplied by 20 to arrive at values in the table.

[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.

[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.

NOTES: Counts less than 600 should be interpreted with caution. Coding changes make comparison with data from 1992 impossible.

SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

Table 15. Frequency of *Chlamydia*[a] listed as any diagnosis in VA patients seeking outpatient care, count[b], rate[c]

	1999		2000		2001	
	Count	**Rate**	**Count**	**Rate**	**Count**	**Rate**
Total	636	21	572	17	515	14
Age						
18–24	55	217	44	187	52	226
25–34	202	134	150	106	152	112
35–44	179	54	182	58	120	40
45–54	139	20	140	20	119	16
55–64	29	6	24	4	40	6
65–74	25	3	23	3	22	2
75–84	6	1	9	1	10	1
85+	1	2	0	0	0	0
Race/ethnicity						
White	145	11	122	8	110	7
Black	214	64	226	66	183	52
Hispanic	12	10	18	15	16	12
Other	2	10	0	0	3	14
Unknown	263	22	206	16	203	13
Gender						
Male	519	18	445	14	389	11
Female	117	83	127	84	126	76
Region						
Midwest	131	19	137	18	75	9
Northeast	185	25	134	17	134	15
South	183	18	191	17	197	15
West	137	23	110	17	109	16
Insurance status						
No insurance/self-pay	557	31	488	27	422	22
Medicare/Medicare supplemental	20	3	29	3	27	2
Medicaid	1	20	0	0	4	45
Private insurance/HMO/PPO	49	10	53	10	51	9
Other insurance	9	36	2	7	11	33
Unknown	0	0	0	0	0	0

HMO, health maintenance organization; PPO, preferred provider organization.

[a]Represents diagnosis codes for chlamydia.

[b]The term count is used to be consistent with other UDA tables; however, the VA tables represent the population of VA users and thus are not weighted to represent national population estimates.

[c]Rate is defined as the number of unique patients with each condition divided by the base population in the same fiscal year x 100,000 to calculate the rate per 100,000 unique outpatients.

NOTE: Race/ethnicity data from observation only; note large number of unknown values.

Source: Outpatient Clinic File (OPC), VA Austin Automation Center, FY1999–FY2001.

Table 16. Medical visits[a] for chlamydial infection in 1999, count, rate[b] (95% CI)

	Count	Rate
Age		
<10	64	26 (20–33)
10–14	24	14 (8–19)
15–19	165	88 (75–102)
20–24	120	105 (86–123)
25–29	68	69 (53–86)
30–34	80	56 (44–68)
35–39	69	36 (28–45)
40–44	45	21 (15–27)
45–54	80	17 (13–21)
55–64	52	15 (11–19)
65+	0	0
Gender		
Male	209	20 (17–22)
Female	558	49 (44–53)
Region		
Midwest	163	31 (27–36)
Northeast	145	39 (32–45)
South	322	34 (31–38)
West	41	37 (26–48)
Unknown	96	36 (29–44)
Urban/Rural		
MSA	557	38 (35–41)
Non-MSA	114	24 (20–28)
Unknown	96	36 (29–44)

[a]The number of medical visits includes both inpatient visits and outpatient visits; however, most medical visits were outpatient visits.
[b]Rate per 100,000 enrollees who were continuously enrolled in a health plan throughout 1999.
SOURCE: MarketScan, 1999.

incidence of infection.

In the 767 medical visits coded as being for chlamydial infection in the 1999 MarketScan data, 178 drug claims were filed for a recommended or alternate medication regimen from the CDC STD treatment guidelines (36 for amoxicillin, 73 for azithromycin, 46 for doxycycline, 14 for erythromycin, and 9 for ofloxacin) within 7 days before or 20 days after the date of the medical visit. Thus, in only 23% of the cases in which chlamydia was diagnosed was a drug prescribed that was consistent with CDC STD treatment guidelines. In the same dataset, an additional 3,654 medical claims were associated with ICD-9 codes, CPT codes, or NDCs for chlamydial infections. All those claims had at least one of the ICD-9 or CPT codes listed in Table 17 and a drug claim for amoxicillin, azithromycin, doxycycline, erythromycin, or ofloxacin within the 7 days before and 20 days after the date of the medical visit. This analysis indicates that the use of ICD-9 codes alone in the absence of CPT codes for *Chlamydia* testing and NDC codes for *Chlamydia* treatment in claims-based datasets substantially underestimates the numbers of provider visits for chlamydial infections. Because CPT codes for STDs are not available in HCUP or VA data and are presumably uncommon in Medicare data, they were not included in analyses for this chapter.

Gonorrhea

Background

Neisseriae gonorrhoeae is the cause of gonorrhea and its related clinical syndromes. Uncomplicated *N. gonorrhoeae* infection is usually confined to the mucosa of the cervix, urethra, rectum, and throat. The infection is often asymptomatic among females; untreated, it can lead to PID, tubal infertility, ectopic pregnancy, and chronic pelvic pain (24). *N. gonorrhoeae* usually causes symptomatic urethritis among males and occasionally results in epididymitis. Rarely, local infection disseminates to cause an acute dermatitis tenosynovitis syndrome, which can be complicated by arthritis, meningitis, or endocarditis (24).

In symptomatic patients, *N. gonorrhoeae* infection can be diagnosed presumptively using a gram stain of urethral or endocervical exudates if the smear contains typical gram-negative diplococci within polymorphonuclear leukocytes. However, other Neisseria species, including those normally in the flora of the oro- and nasopharynx, have a similar appearance. Culture testing has been the standard against which all other tests for *N. gonorrhoeae* have been compared. However, there are problems in maintaining the viability of organisms during transport and storage in the diverse settings in which culture testing is indicated. Nonculture tests are now available, including EIAs that detect specific gonococcal antigens, nucleic acid hybridization tests (NAATs) that detect *N. gonorrhoeae*-specific deoxyribonucleic acid (DNA) or ribonucleic acid (RNA) sequences, and NAATs that amplify and detect *N. gonorrhoeae*-specific DNA or RNA sequences.

Table 17. Codes used to identify additional medical visits for chlamydial infection[a] in MarketScan data

ICD-9 Codes	
V73.88	Screening for other specified chlamydial disease
V73.98	Screening, unspecified urethritis
099.40	Other nongonococcal urethritis, unspecified
099.49	Other nongonococcal urethritis, other specified organism
CPT codes	
86631	Chlamydia
86632	Chlamydia, IgM
87110	Chlamydia, culture
97270	*Chlamydia trachomatis*
87320	Infectious agent antigen detection by enzyme immunoassay technique, qualitiative or semiquantitative, multiple-step method; *Chlamydia trachomatis*
87490	Infectious agent detection by nucleic acid (DNA or RNA); *Chlamydia trachomatis*, direct probe technique
87491	Infectious agent detection by nucleic acid (DNA or RNA); *Chlamydia trachomatis*, amplified probe technique
87492	Infectious agent detection by nucleic acid (DNA or RNA); *Chlamydia trachomatis*, quantification
87810	Infectious agent detection by immunoassay with direct optical observation; *Chlamydia trachomatis*

[a]A medical visits was identified as an additional chlamydia visit if the date of a claim for amoxicillin, azithromycin, doxycyline, erythromycin, or o oxacin was within the interval of 7 days before and 20 days after the date of the medical visit, and if the visit was associated with one of these ICD-9 or CPT codes.

These tests are substantially more sensitive than the first-generation nonculture tests were (17, 24-29).

Of the reportable STDs, gonorrhea is second only to chlamydial infections in the number of cases reported annually to CDC; 361,705 cases were reported in 2001, with an age distribution similar to that for *C. trachomatis* infections (30). The number of reported cases of gonorrhea in the United States increased steadily from 1964 to 1977, fluctuated through the early 1980s, increased until 1987, decreased starting in 1987, and has leveled off since 1998. Antimicrobial resistance in *N. gonorrhoeae* contributed to the increase in cases in the 1970s and 1980s. The decline in prevalence that began in 1987 may be attributable to recommendations by CDC (31) that only highly effective antimicrobial agents be used to treat gonorrhea. Using the LCx assay for *N. gonorrhoeae*, urine specimens were tested on a representative sample of participants 14- to 39- years of age in the 1999 to 2000 NHANES data (32); the prevalence of *N. gonorrhoeae* was 0.25%. The prevlance of gonorrhea among non-Hispanic black (1.3%) was over 25 times that among non-Hispanic white (0.05%). Among those infected with *N. gonorrhoeae*, 57% were also infected with *C. trachomatis*.

The incidence of gonorrhea is highest in high-density urban areas among persons under 24 years of age who have more than one sex partner in a 6-month period and who engage in unprotected sexual intercourse. Increases in gonorrhea prevalence have been noted recently among men who have sex with men (MSM) (33). Up to 50% of infected men and women lack symptoms, and routine screening for gonococcal infection is not common except in public STD clinics. Thus, reported cases of gonorrhea substantially underestimate the true burden of the disease and may not accurately represent the true underlying trends over time or differences in disease rates by demographic characteristics. Because gonorrhea screening is more commonly offered in public STD clinics that are frequented by low-income men, gonorrhea rates may appear higher in these demographic groups merely as a result of the enhanced screening.

Infected women are more likely to be asymptomatic than infected men, and screening for gonococcal infection in asymptomatic women is uncommon; therefore, cases in women are less likely to be identified and reported. Reported gonorrhea rates have leveled off overall. From 1998 through

Figure 2. Gonorrhea – Reported rates: United States, 1970–2001.

SOURCE: Centers for Disease Control and Prevention. Adapted from Sexually Transmitted Disease Surveillance 2001 Supplement. Gonococcal Isolate Surveillance Project (GISP) - Annual Report 2001. Available at: http://www.cdc.gov/std/GISP2001/GISP2001Text&Fig.pdf.

2001, the gonorrhea rate in the United States persisted at around 129 cases per 100,000 population (Figure 2) (30). The South continues to have the highest rates of any region. Rates were highest among young women 15 to 19 years of age and men 20 to 24, regardless of race or ethnicity (13). Reported rates of gonorrhea among African Americans are more than 30 times higher than rates among Caucasians and more than 11 times higher than rates among Hispanics (13). As with chlamydia, high reported rates of gonorrhea in certain areas or among certain populations may indicate more effective screening programs and the use of more sensitive tests, rather than higher underlying rates of disease.

The annual economic burden of gonorrhea and related sequelae was estimated to exceed $1 billion in 1994 (18).

The Data

According to HCUP data, hospitalization for a primary diagnosis of gonorrhea is a rare event that decreased from 2,154 hospitalizations in 1994 to 969 in 2000 (Table 18). Although other data indicate that chlamydial infection is more common than gonorrhea (30), infection with *N. gonorrhoeae* is more likely to result in hospitalization because it tends to cause more severe symptoms and may require more sophisticated diagnostic assessment, intravenous antibiotics, or surgical intervention (e.g., abscess drainage).

Medicare data on hospital outpatient and inpatient visits for gonorrhea from 1992 through 1998 are too sparse to permit meaningful interpretation. Hospital outpatient visit rates of approximately 1 per 100,000 Medicare beneficiaries were observed in all three years of data.

In the 2001 VA data, gonorrhea was the third most common pathogen-specific STD clinical presentation, with a total of 17 cases per 100,000 unique outpatients (Table 6). As with chlamydia, the highest rates were seen among women (29 per 100,000), persons under 25 years of age (109 per 100,000), and African Americans (71 per 100,000); this may be due in part to higher rates of screening of younger asymptomatic women in family planning, prenatal, and STD clinics (Table 19). Geographic distribution throughout the country was relatively uniform (15 to 19 per 100,000). A generalized decreasing trend was noted when comparing case counts and rates from 1999 through 2001; this trend was most consistent among persons 25- to 54- years of age, among Caucasians and African Americans, and among persons living in the Northeastern, Southern, and Midwestern regions. In

Table 18. Inpatient hospital stays by individuals with gonorrhea listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	2,154	0.8 (0.7–1.0)	1,250	0.5 (0.4–0.6)	1,115	0.4 (0.3–0.5)	969	0.4 (0.3–0.4)
Age								
< 14	*	*	*	*	*	*	*	*
14–17	542	3.8 (2.8–4.8)	272	1.8 (1.2–2.3)	221	1.4 (1.0–1.8)	221	1.4 (0.9–1.8)
18–24	739	3.0 (2.3–3.7)	448	1.8 (1.4–2.3)	457	1.8 (1.4–2.2)	403	1.5 (1.2–1.9)
25–34	519	1.3 (1.0–1.6)	321	0.8 (0.6–1.0)	280	0.7 (0.5–0.9)	229	0.6 (0.4–0.8)
35–44	215	0.5 (0.4–0.7)	*	*	*	*	*	*
45–54	*	*	*	*	*	*	*	*
55–64	*	*	*	*	*	*	*	*
65–74	*	*	*	*	*	*	*	*
75–84	*	*	*	*	*	*	*	*
85+	*	*	*	*	*	*	*	*
Race/ethnicity								
White	381	0.2 (0.2–0.3)	258	0.1 (0.1–0.2)	195	0.1 (0.1–0.1)	193	0.1 (0.1–0.1)
Black	1,294	4.1 (3.2–5.0)	794	2.4 (1.9–2.9)	555	1.6 (1.3–2.0)	494	1.4 (1.1–1.8)
Asian/Pacific Islander	*	*	*	*	*	*	*	*
Hispanic	*	*	*	*	*	*	*	*
Gender								
Male	173	0.1 (0.1–0.2)	*	*	*	*	*	*
Female	1,975	1.5 (1.2–1.8)	1,120	0.8 (0.7–1.0)	995	0.7 (0.6–0.9)	920	0.7 (0.5–0.8)
Region								
Midwest	539	0.9 (0.5–1.3)	254	0.4 (0.2–0.6)	279	0.4 (0.3–0.6)	295	0.5 (0.3–0.6)
Northeast	363	0.7 (0.5–1.0)	226	0.4 (0.2–0.6)	172	0.3 (0.2–0.5)	184	0.4 (0.2–0.5)
South	1,082	1.3 (0.9–1.6)	688	0.8 (0.5–1.0)	601	0.6 (0.5–0.8)	408	0.4 (0.3–0.5)
West	170	0.3 (0.1–0.5)	*	*	*	*	*	*
MSA								
Rural	*	*	*	*	*	*	*	*
Urban	1,865	1.0 (0.8–1.2)	1,066	0.5 (0.4–0.6)	978	0.5 (0.4–0.6)	882	0.4 (0.3–0.5)

MSA, metropolitan statistical area.

*Figure does not meet standard for reliability or precision.

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US civilian non-institutionalized population.

[b]Persons of other race/ethnicity are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 19. Frequency of gonorrhea[a] listed as any diagnosis in VA patients seeking outpatient care, count[b], rate[c]

	1999		2000		2001	
	Count	Rate	Count	Rate	Count	Rate
Total	708	23	660	20	634	17
Age						
18–24	25	99	29	123	25	109
25–34	153	101	138	97	123	91
35–44	216	65	180	58	163	54
45–54	201	29	187	26	189	25
55–64	41	8	59	11	71	11
65–74	46	6	42	5	38	4
75–84	25	5	23	4	24	3
85+	1	2	2	3	1	1
Race/ethnicity						
White	144	11	130	9	127	8
Black	299	90	287	84	251	71
Hispanic	18	16	19	16	32	25
Other	1	5	2	10	2	9
Unknown	246	20	222	17	222	14
Gender						
Male	654	23	599	19	586	17
Female	54	38	61	40	48	29
Region						
Northeast	237	32	159	20	164	19
Midwest	125	18	139	19	128	15
South	250	25	234	21	232	18
West	96	16	128	20	110	16
Insurance status						
No insurance/self-pay	588	32	559	31	507	27
Medicare/Medicare supplemental	46	7	43	5	42	4
Medicaid	1	20	1	13	2	22
Private insurance/HMO/PPO	68	14	54	11	69	12
Other insurance	5	20	3	10	11	33
Unknown	0	0	0	0	3	33

HMO, health maintenance organization; PPO, preferred provider organization.

[a]Represents diagnosis codes for gonorrhea.

[b]The term count is used to be consistent with other UDA tables; however, the VA tables represent the population of VA users and thus are not weighted to represent national population estimates.

[c]Rate is defined as the number of unique patients with each condition divided by the base population in the same fiscal year x 100,000 to calculate the rate per 100,000 unique outpatients.

NOTE: Race/ethnicity data from observation only; note large number of unknown values.

Source: Outpatient Clinic File (OPC), VA Austin Automation Center, FY1999–FY2001.

Table 20. Medical visits[a] for gonorrhea in 1999, count, rate[b] (95% CI)

	Count	Rate
Age		
<10	16	7 (3–10)
10–14	6	3 (1–6)
15–19	104	56 (45–66)
20–24	82	71 (56–87)
25–29	70	71 (55–88)
30–34	87	61 (48–74)
35–39	64	34 (25–42)
40–44	57	26 (20–33)
45–54	71	15 (12–18)
55–64	44	12 (9–16)
65+	1	11 (0–32)
Gender		
Male	203	19 (17–22)
Female	399	35 (31–38)
Region		
Midwest	159	31 (26–35)
Northeast	87	23 (18–28)
South	278	30 (26–33)
West	19	17 (9–25)
Unknown	59	22 (17–28)
Urban/rural		
MSA	430	29 (27–32)
Non-MSA	113	24 (19–28)
Unknown	59	22 (17–28)

[a]The number of medical visits includes both inpatient visits and outpatient visits; however, most medical visits were outpatient visits.

[b]Rate per 100,000 enrollees who were continuously enrolled in a health plan throughout 1999.

SOURCE: MarketScan, 1999.

each year examined, the highest rates of gonorrhea occurred among those who had no insurance or were self-paying patients.

The 1999 MarketScan data had 592 outpatient visits and 10 inpatient visits which were accompanied by a claim for services associated with one of the ICD-9 codes listed in Table 1 for gonorrhea (Table 3). There were 399 medical visits for gonococcal infection by women and 203 by men, the rates being 35 and 19 per 100,000, respectively (Table 20). The highest rates were seen equally among those 20 to 24 years of age and those between 25 and 29 (71 per 100,000). Again, the higher rates of gonococcal infection observed among women and those under 25 may be due in part to higher rates of screening of younger asymptomatic women. Rates varied by geographical region, ranging from 17 per 100,000 enrollees in the West to 31 per 100,000 in the Midwest. A difference was also seen between urban (29 per 100,000) and rural (24 per 100,000) residents. The 602 medical visits that were ICD-coded as being for gonococcal infection resulted in 169 (28%) claims for one of the drugs recommended by CDC for treatment of uncomplicated, lower urinary tract gonococcal infection filed within 7 days before or 20 days after the date of the medical visit. However, in the same dataset, 2,530 visits resulted in drug claims for one of these same drugs filed within 7 days before or 20 days after the date of the medical visit and were *either* ICD-coded as being for gonorrhea *or* included a CPT code that referred to a test for gonorrhea. Thus, defining probable and possible visits for gonococcal infection based only on ICD-9 codes would substantially underestimate the number of visits for treatment of gonococcal infection. Clinicians tend not to use gonococcus-specific ICD-9 codes when simply ruling out gonococcal infection with a test; in the case of a test later found to be positive, the original ICD-9 code is not customarily altered to reflect gonococcal infection.

Syphilis

Background

Syphilis is a systemic disease caused by *Treponema pallidum*. Patients with syphilis may seek treatment for signs or symptoms of primary infection (i.e., ulcer or chancre at the infection site), secondary infection (e.g., skin rash, mucocutaneous lesions, or lymphadenopathy), or tertiary infection (e.g., cardiac, ophthalmic, or auditory abnormalities, or gummatous lesions) (31). Signs of primary and secondary syphilis that most commonly would be seen by a urologist include chancre and rash. Latent infections are detected by serologic testing. Latent syphilis acquired within the preceding year is referred to as early latent syphilis; all other cases of latent syphilis are classified as either late latent syphilis or latent syphilis of unknown duration. The latent stages of syphilis begin with disappearance of the secondary symptoms. Unless they have cause to screen patients, urologists rarely see latent syphilis or its manifestations that occur outside the genitourinary system.

The diagnosis of syphilis depends on clinical findings and directly visualizing *T. pallidum* organisms in secretions or tissue or on serology. Darkfield examinations and direct fluorescent antibody tests of lesion exudate or tissue are the definitive methods for diagnosing early syphilis, but such testing is rarely performed outside STD clinics. A presumptive diagnosis is possible with the use of two types of serologic tests for syphilis: nontreponemal tests (e.g., Venereal Disease Research Laboratory [VDRL] and Rapid Plasma Reagin [RPR]) and treponemal tests (e.g., fluorescent treponemal antibody absorbed [FTA-ABS] and *T. pallidum* particle agglutination [TP-PA]). The use of only one type of serologic test is insufficient for diagnosis because false-positive nontreponemal test results may occur secondary to various medical conditions. Routine serologic screening is done in only a few settings, including blood banks, prenatal care and STD clinics, and some HIV care clinics; it is also required in premarital testing in some states.

Staging of syphilis is based on serology results and relies on knowledge of past titers and treatment history. This can be challenging if no information on past titers or treatment is available, as is often the case when patients pursue care in more than one setting. Treatment with penicillin is often provided based on a single, isolated serologic result because such treatment is generally safe, effective, and inexpensive. If a patient is successfully treated, the titer of the nontreponemal serologic test will fall, usually within the 6 months following treatment. Primary, secondary, and early latent stages are all infectious stages; primary and secondary stages in adults and congenital syphilis are subject to national surveillance because their infectious nature or origin makes them important to public health. Other stages are not under national surveillance but add to the overall burden of disease.

In 1996, 11,400 new cases of primary and secondary syphilis and 53,000 new cases of all stages of syphilis were reported to CDC; if we assume 20% underreporting, approximately 70,000 total syphilis infections were diagnosed in that year (34). However, the rate of primary and secondary syphilis reported in the United States decreased 90% between 1990 and 2000, from 20.34 to 2.12 cases per 100,000 population (Figure 3). In 2001, the overall rate (2.17 per 100,000) represented a 2% increase over the 2000 rate, which was the lowest rate since reporting began in 1941 (35), and the first annual increase since 1990. In 1999,

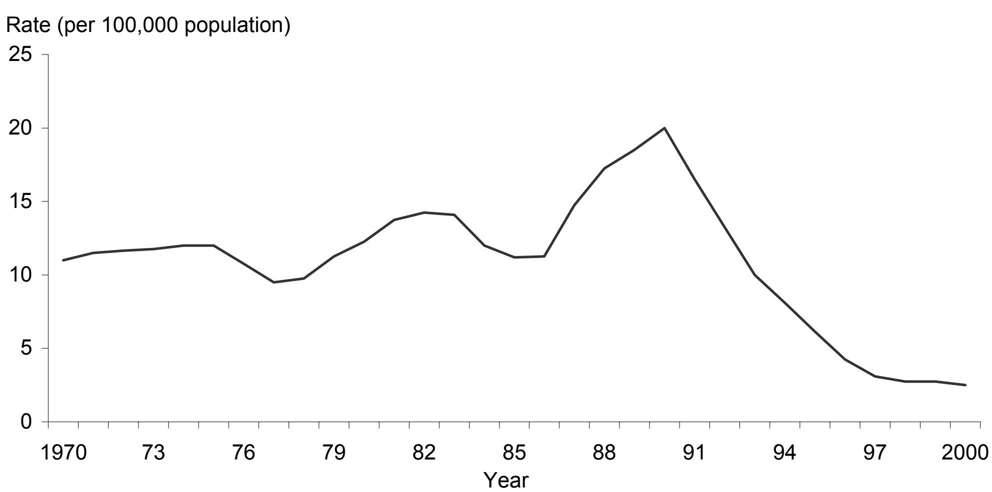

Figure 3. Primary and secondary syphilis – Reported rates: United States, 1970–2001.

SOURCE: Centers for Disease Control and Prevention. Adapted from Sexually Transmitted Disease Surveillance 2001 Supplement. Syphilis Surveillance Report - February 2003. Available at: http://www.cdc.gov/std/Syphilis2001/2001SyphSuppText.pdf.

CDC estimated that the annual direct medical costs for adult and congenital syphilis were $213 million, with an additional cost of $752 million for syphilis-attributable HIV infection (36).

The Data

During 2001, 6,103 primary and secondary syphilis cases were reported to state and local health departments in the United States. The highest rate of primary and secondary syphilis among women was seen in those 20 to 24 years of age (3.8 per 100,000 population); the highest rate among men was seen in those 35 to 39 years of age (7.2 per 100,000). The 2001 rate for men was 15.4% higher than the rate in 2000, and the rate for women was 17.7% lower. The male-to-female case ratio of primary and secondary syphilis rose from 1.1:1 in 1996 to 2.1:1 in 2001. Current efforts to eliminate syphilis in the United States are focused on communities in which relatively elevated rates of STDs are being observed among men who have sex with men (MSM) and on heterosexual communities with high prevalence, many of which are in the South. The recent increase in cases in men, the growing disparity in case numbers between men and women observed across all racial and ethnic groups, and reported outbreaks of syphilis among MSM in large urban areas all suggest that increases in syphilis are occurring among MSM. Rates have also remained disproportionately high in the South (3.4 per 100,000) and among non-Hispanic blacks (11 per 100,000) (37, 38). Urologists who care for MSM or work in communities with a high incidence of syphilis may diagnose and treat patients with primary or secondary stages of syphilis, especially when they present with genital ulcers.

Epididymitis/Orchitis

Background

Epididymitis, or inflammation of the epididymis, commonly occurs as a complication of urethral infection with *N. gonorrhoeae*, *C. trachomatis*, or *Pseudomonas aeruginosa*. It may also occur as a complication of systemic infection with *Mycobacterium tuberculosis*, *Brucella spp.*, *Streptococcus pneumoniae*, *Neisseria meningiditis*, *Treponema pallidum*, and various fungi (3). Epididymitis causes considerable morbidity in terms of pain, suffering, and loss of productivity. The condition is common in the United States; in 1977, an estimated 634,000 patients sought treatment for it (39). Changes in the incidence of epididymitis have not been consistently monitored over time because the condition is not subject to national surveillance.

Orchitis is an inflammation of the testicles, which may be caused by any of several bacteria or viruses. Orchitis tends to occur in conjunction with infections of the prostate or epididymis and, like those conditions, may occur as a manifestation of STDs such as gonorrhea or chlamydial infection. The most common viral cause of orchitis is mumps, a non-sexually-transmissible virus (2). The incidence of orchitis is not subject to national surveillance. Because orchitis tends to occur commonly in conjunction with epididymitis, most ICD-9 codes do not distinguish between the two conditions. There are only two unique orchitis codes—one for gonococcal orchitis and one for chronic gonococcal orchitis; there is no unique code for gonococcal epididymitis (Table 1). Summary analyses of cases and visits in national datasets suggest that only about 60% of the cases of epididymitis and orchitis are attributable to STDs (3).

The Data

HCUP data indicate that since 1996 there has been little change over time in hospitalizations for both epididymitis/orchitis using all ICD-9 codes (Table 21) and epididymitis/orchitis not specified as due to Chlamydia or gonococcus (organism unspecified) (Table 22). In 1996, 8,954 hospitalizations had epididymitis/orchitis (all cases) listed as the primary diagnosis; there was a steady increase in rates of stays across all 10-year age categories from 25 to 34 through 85+ (Table 21). In 2000, there were 8,448 hospitalizations for epididymitis/orchitis, with increasing rates of stays across 10-year age categories from <14 through 85+ (Table 21. Over 99% of the cases were for epididymitis/orchitis not designated as due to Chlamydia or gonococcus (Table 22); it appears that clinicians rarely code patients specifically as having acute or chronic gonococcal orchitis (ICD codes 098.13 or 098.33).

Medicare hospital outpatient data indicate that rates of epididymitis/orchitis (organism unspecified) increased from 14 per 100,000 beneficiaries in 1992 to 26 per 100,000 in 1998 (Table 23). An inverse relationship was seen in the Medicare inpatient data, where hospitalizations for epididymitis/orchitis

Table 21. Inpatient hospital stays by individuals for epididymitis/orchitis (all cases) listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	10,235	8.3 (7.8–8.8)	8,954	7.0 (6.5–7.4)	8,954	6.8 (6.4–7.3)	8,448	6.3 (5.9–6.8)
Age								
< 14	657	2.4 (1.8–2.9)	526	1.8 (1.4–2.3)	396	1.4 (1.0–1.7)	435	1.5 (1.1–1.9)
14–17	423	5.8 (4.3–7.3)	277	3.5 (2.4–4.7)	208	2.6 (1.8–3.4)	182	2.2 (1.5–2.9)
18–24	586	4.8 (3.7–5.9)	385	3.1 (2.4–3.9)	428	3.4 (2.6–4.2)	420	3.2 (2.5–3.9)
25–34	1,660	8.3 (7.1–9.4)	1,161	5.8 (5.0–6.7)	1,072	5.6 (4.7–6.5)	872	4.8 (3.9–5.6)
35–44	1,586	8.0 (6.9–9.1)	1,565	7.4 (6.4–8.5)	1,668	7.6 (6.7–8.6)	1,490	6.8 (5.9–7.7)
45–54	1,223	8.7 (7.4–10)	1,251	8.1 (6.9–9.2)	1,336	8.1 (7.0–9.2)	1,354	7.6 (6.6–8.6)
55–64	1,205	12 (11–14)	1,029	10 (8.8–12)	1,159	11 (9.3–13)	1,042	9.3 (8.1–11)
65–74	1,507	19 (16–22)	1,427	18 (15–20)	1,171	15 (12–17)	1,324	16 (14–19)
75–84	1,098	29 (25–33)	1,059	25 (21–29)	1,205	27 (23–30)	1,079	22 (19–26)
85+	291	32 (21–44)	275	32 (22–41)	311	32 (23–40)	252	25 (17–32)
Race/ethnicity								
White	5,370	5.9 (5.4–6.4)	5,118	5.5 (5.1–5.9)	4,892	5.2 (4.8–5.7)	4,374	4.6 (4.2–5.0)
Black	1,568	11 (9.3–12)	1,102	7.2 (6.0–8.4)	1,070	6.8 (5.7–8.0)	1,054	6.6 (5.6–7.7)
Asian/Pacific Islander	*	*	*	*	*	*	*	*
Hispanic	718	5.5 (4.2–6.8)	684	4.8 (3.8–5.7)	670	4.3 (3.2–5.3)	820	5.0 (4.1–6.0)
Region								
Midwest	2,310	7.9 (7.0–8.8)	2,280	7.6 (6.7–8.5)	2,133	7.0 (6.1–7.8)	2,010	6.4 (5.7–7.2)
Northeast	2,789	11 (10–13)	2,161	8.7 (7.5–9.9)	2,029	8.2 (6.9–9.5)	1,684	6.8 (5.8–7.8)
South	3,642	8.8 (7.8–9.8)	3,257	7.3 (6.6–8.1)	3,428	7.5 (6.8–8.3)	3,392	7.3 (6.4–8.1)
West	1,494	5.4 (4.5–6.3)	1,256	4.3 (3.7–4.9)	1,365	4.5 (3.7–5.4)	1,363	4.5 (3.7–5.3)
MSA								
Rural	2,351	7.5 (6.5–8.6)	2,035	7.0 (6.0–8.0)	2,052	7.0 (6.1–7.9)	1,763	6.0 (5.1–6.9)
Urban	7,812	8.5 (7.9–9.1)	6,919	7.0 (6.5–7.4)	6,865	6.8 (6.2–7.3)	6,676	6.4 (5.9–6.9)

MSA, metropolitan statistical area.

*Figure does not meet standard for reliability or precision.

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US civilian non-institutionalized population.

[b]Persons of other race/ethnicity are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 22. Inpatient hospital stays by individuals with epididymitis/orchitis not designated as due to *Chlamydia* or gonococcus listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	10,082	8.2 (7.7–8.7)	8,894	6.9 (6.5–7.4)	8,882	6.8 (6.3–7.2)	8,387	6.3 (5.9–6.7)
Age								
< 14	650	2.3 (1.8–2.9)	521	1.8 (1.3–2.3)	396	1.4 (1.0–1.7)	435	1.5 (1.1–1.9)
14–17	377	5.2 (3.7–6.7)	256	3.3 (2.1–4.4)	176	2.2 (1.5–2.9)	177	2.1 (1.4–2.9)
18–24	512	4.2 (3.2–5.2)	363	3.0 (2.3–3.7)	422	3.4 (2.6–4.2)	388	3.0 (2.3–3.7)
25–34	1,649	8.2 (7.0–9.4)	1,156	5.8 (5.0–6.7)	1,047	5.4 (4.6–6.3)	852	4.7 (3.8–5.5)
35–44	1,577	8.0 (6.9–9.0)	1,558	7.4 (6.3–8.4)	1,664	7.6 (6.7–8.6)	1,490	6.8 (5.9–7.7)
45–54	1,223	8.7 (7.4–10)	1,251	8.1 (6.9–9.2)	1,336	8.1 (7.0–9.2)	1,354	7.6 (6.6–8.6)
55–64	1,199	12 (10–14)	1,029	10 (8.8–12)	1,154	11 (9.3–12)	1,042	9.3 (8.1–11)
65–74	1,507	19 (16–22)	1,427	18 (15–20)	1,171	15 (12–17)	1,319	16 (14–19)
75–84	1,098	29 (25–33)	1,059	25 (21–29)	1,205	27 (23–30)	1,079	22 (19–26)
85+	291	32 (21–44)	275	32 (22–41)	311	32 (23–40)	252	25 (17–32)
Race/ethnicity								
White	5,323	5.8 (5.3–6.4)	5,099	5.5 (5.0–5.9)	4,887	5.2 (4.8–5.6)	4,374	4.6 (4.2–5.0)
Black	1,471	10 (8.7–11)	1,071	7.0 (5.8–8.2)	1,043	6.7 (5.6–7.8)	1,004	6.3 (5.3–7.3)
Asian/Pacific Islander	*	*	*	*	*	*	*	*
Hispanic	718	5.5 (4.2–6.8)	679	4.7 (3.8–5.7)	654	4.2 (3.1–5.2)	820	5.0 (4.1–6.0)
Region								
Midwest	2,284	7.8 (6.9–8.7)	2,270	7.5 (6.6–8.4)	2,118	6.9 (6.0–7.8)	1,984	6.4 (5.6–7.1)
Northeast	2,743	11 (9.8–12)	2,137	8.6 (7.4–9.8)	2,001	8.1 (6.8–9.4)	1,679	6.8 (5.8–7.8)
South	3,569	8.6 (7.7–9.6)	3,240	7.3 (6.5–8.1)	3,408	7.5 (6.7–8.2)	3,371	7.2 (6.4–8.1)
West	1,485	5.3 (4.4–6.2)	1,247	4.3 (3.7–4.9)	1,355	4.5 (3.7–5.4)	1,354	4.4 (3.6–5.3)
MSA								
Rural	2,300	7.4 (6.3–8.4)	2,028	7.0 (6.0–8.0)	2,046	7.0 (6.1–7.9)	1,752	6.0 (5.1–6.9)
Urban	7,710	8.4 (7.8–9.0)	6,866	6.9 (6.4–7.4)	6,798	6.7 (6.2–7.2)	6,626	6.4 (5.9–6.9)

MSA, metropolitan statistical area.

*Figure does not meet standard for reliability or precision.

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US civilian non-institutionalized population.

[b]Persons of other race/ethnicity are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 23. Outpatient hospital visits by Medicare beneficiaries with epididymitis/orchitis not designated as due to *Chlamydia* or gonococcus listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	2,100	14 (14–15)	3,320	22 (21–23)	3,740	26 (25–27)
Total < 65 yrs	320	10 (9.2–12)	1,060	31 (29–33)	1,060	31 (29–33)
Total 65+	1,780	15 (15–16)	2,260	19 (18–20)	2,680	24 (23–25)
Age						
65–74	940	13 (12–14)	1,380	19 (18–20)	1,740	27 (26–28)
75–84	660	19 (17–20)	600	16 (15–18)	820	22 (21–24)
85–94	180	23 (19–26)	240	28 (25–32)	100	12 (9.2–14)
95+	0	0.0	40	49 (34–63)	20	23 (13–33)
Race/ethnicity						
White	1,480	12 (11–13)	2,300	18 (17–18)	2,900	24 (23–25)
Black	440	35 (31–38)	740	53 (50–57)	460	34 (31–38)
Asian	…	…	…	…	80	58 (45–71)
Hispanic	…	…	140	71 (59–82)	80	24 (18–29)
N. American Native	…	…	…	…	80	286 (222–351)
Region						
Midwest	800	22 (20–23)	1,120	29 (27–31)	1,400	38 (36–40)
Northeast	240	7.6 (6.6–8.5)	640	20 (19–22)	480	17 (16–19)
South	680	13 (12–14)	1,140	21 (20–22)	1,200	22 (21–24)
West	320	14 (13–16)	420	18 (16–20)	660	30 (27–32)

… data not available.
[a]Unweighted counts multiplied by 20 to arrive at values in the table.
[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.
[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.
NOTE: Counts less than 600 should be interpreted with caution.
SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

(organism unspecified) decreased from 26 per 100,000 beneficiaries in 1992, to 19 per 100,000 in 1995, to 14 per 100,000 in 1998 (Table 24).

VA data for 2001 report 50 cases of epididymitis/orchitis (organism unspecified) per 100,000 unique outpatients (Table 25). Comparably high rates were seen in all 10-year age categories from 25 to 34 through 55 to 64 (61 per 100,000 to 73 per 100,000). The highest rates were seen among African Americans (87 per 100,000) and persons residing in the West (57 per 100,000). When the definition of epididymitis/orchitis was expanded to include all cases (organism both specified and unspecified), there were 51 cases per 100,000 unique outpatients, similar to the incidence of epididymitis/orchitis (organism unspecified alone).

The 1999 MarketScan data report that 1,580 outpatient visits and 14 inpatient visits were accompanied by a claim for services associated with one of the ICD-9 codes listed in Table 1 for epididymitis and/or orchitis not designated as due to chlamydia or gonococcus (Table 3); among males 16- to 35- years of age, rates of epididymitis/orchitis varied by region, from 556 per 100,000 enrollees in the Midwest to 715 per 100,000 enrollees in the Northeast (Table 26). A small difference was also seen between urban (617 per 100,000) and rural (670 per 100,000) residents. While 1,594 visits were identified as epididymitis/orchitis not designated as due to chlamydia or gonococcus (organism unspecified), only one visit for gonococcal orchitis was identified; as in the HCUP data, it appears that clinicians rarely code patients specifically as having acute or chronic gonococcal orchitis (ICD-9 code 098.13 or 098.33). This may be due to a low underlying prevalence of gonococcal orchitis or to the use of other ICD-9

Table 24. Inpatient stays by Medicare beneficiaries with epididymitis/orchitis not designated as due to *Chlamydia* or gonococcus listed as primary diagnosis, count[a], rate[b] (95% CI)

	1992		1995		1998	
	Count	Rate	Count	Rate	Count	Rate
Total all ages[c]	3,760	26 (25–26)	2,840	19 (18–19)	2,020	14 (13–15)
Total < 65 yrs	540	17 (16–19)	680	20 (18–21)	500	15 (13–16)
Total 65+	3,220	28 (27–29)	2,160	18 (18–19)	1,520	14 (13–14)
Age						
65–74	1,680	23 (22–24)	1,200	17 (16–18)	640	10 (9.2–11)
75–84	1,200	34 (32–36)	780	21 (20–23)	620	17 (16–18)
85–94	320	40 (36–45)	160	19 (16–22)	240	28 (24–31)
95+	20	26 (14–37)	20	24 (13–35)	20	23 (13–33)
Race/ethnicity						
White	3,220	26 (25–27)	2,360	18 (17–19)	1,500	12 (12–13)
Black	320	25 (22–28)	360	26 (23–29)	400	30 (27–33)
Asian	…	…	40	55 (38–71)	0	0.0
Hispanic	…	…	40	20 (14–26)	40	12 (8.3–16)
N. American Native	…	…	20	99 (55–144)	0	0.0
Region						
Midwest	1,000	27 (25–29)	800	21 (19–22)	460	12 (11–14)
Northeast	660	21 (19–22)	440	14 (13–15)	460	17 (15–18)
South	1,380	26 (25–28)	1,160	21 (20–22)	780	15 (14–16)
West	580	26 (24–28)	420	18 (16–20)	280	13 (11–14)

… data not available.
[a]Unweighted counts multiplied by 20 to arrive at values in the table.
[b]Rate per 100,000 Medicare beneficiaries in the same demographic stratum.
[c]Persons of other races, unknown race and ethnicity, and other region are included in the totals.
NOTE: Counts less than 600 should be interpreted with caution.
SOURCE: Centers for Medicare and Medicaid Services, 5% Carrier and Outpatient Files, 1992, 1995, 1998.

codes to capture gonococcal orchitis (604, 604.0, 098.1, 098.10, or 098.30).

Urethritis

Background

Urethritis, or urethral inflammation of any etiology, causes urethral discharge, dysuria, or pruritis at the end of the urethra (40). In heterosexual men, the most common causes of urethritis are gonococcal and chlamydial infections, and infection is limited to the distal urethra (41). In women, urethritis is often observed in association with cystitis and pyelonephritis. *Escherichia coli* remains the predominant uropathogen (80%) isolated in acute community-acquired uncomplicated UTIs, followed by *Staphylococcus saprophyticus* (10% to 15%) (42), but clinicians more commonly code such UTIs as cystitis, rather than as urethritis. Sexually transmitted infections that may result in urethritis include *N. gonorrhoeae* and *C. trachomatis*, but the resulting inflammation creates nonspecific symptoms and signs that cannot be used to identify the etiologic pathogen (2, 40, 41). As with epididymitis and orchitis, there are no systematic national surveillance systems for urethritis, so its incidence cannot be tracked over time. However, because reported cases of gonorrhea in men tend to be cases of urethritis (24, 43), trends in urethritis resemble those in the reporting of gonorrhea.

Urethritis causes considerable morbidity in terms of pain, suffering, and loss of productivity. In the United States, men and women with symptoms of lower UTIs account for an estimated 7 million office visits per year to physicians in office practice (44). In the NDTI, the number of initial visits to physicians' offices per year for nonspecific urethritis in men and women averaged about 250,000 in 1996–1997 and decreased to about 200,000 in 2001.

Table 25. Frequency of epididymitis/orchitis not designated as due to *Chlamydia* or gonococcus[a] listed as any diagnosis in VA patients seeking outpatient care, count[b], rate[c]

	1999		2000		2001	
	Count	Rate	Count	Rate	Count	Rate
Total	1,853	61	1,921	59	1,833	50
Age						
18–24	19	75	17	72	15	65
25–34	122	81	110	77	99	73
35–44	277	84	257	82	198	66
45–54	515	75	568	79	540	72
55–64	330	66	350	63	394	61
65–74	258	34	377	46	357	38
75–84	213	40	216	34	211	26
85+	19	39	26	45	19	24
Race/ethnicity						
White	957	70	1,019	69	956	59
Black	315	94	342	100	309	87
Hispanic	88	77	91	74	100	78
Other	7	36	9	44	8	37
Unknown	486	40	460	35	460	29
Region						
Midwest	370	54	412	55	377	46
Northeast	421	57	415	53	377	43
South	674	66	704	63	681	53
West	388	65	390	61	398	57
Insurance status						
No insurance/self-pay	1,246	68	1,254	69	1,186	62
Medicare/Medicare supplemental	338	49	389	43	414	35
Medicaid	1	20	5	63	3	33
Private insurance/HMO/PPO	247	51	251	49	211	38
Other insurance	20	79	22	76	19	57
Unknown	1	52	0	0	0	0

HMO, health maintenance organization; PPO, preferred provider organization.

[a]Represents diagnosis codes for epididymitis (organism unspecified).

[b]The term count is used to be consistent with other UDA tables; however, the VA tables represent the population of VA users and thus are not weighted to represent national population estimates.

[c]Rate is defined as the number of unique patients with each condition divided by the base population in the same fiscal year x 100,000 to calculate the rate per 100,000 unique outpatients.

NOTE: Race/ethnicity data from observation only; note large number of unknown values.

Source: Outpatient Clinic File (OPC), VA Austin Automation Center, FY1999–FY2001.

Table 26. Medical visits[a] for epididymitis/orchitis not designated as due to *Chlamydia* or gonococcus, by males aged 16–35 years, 1999, count, rate[b] (95% CI)

	Count	Rate
Region		
Midwest	382	556 (500–611)
Northeast	291	715 (633–797)
South	691	654 (605–702)
West	84	567 (446–687)
Unknown	146	491 (412–571)
Urban/rural		
MSA	1,092	617 (581–654)
Non-MSA	356	670 (601–739)
Unknown	146	491 (412–571)

[a]The number of medical visits includes both inpatient visits and outpatient visits; however, most medical visits were outpatient visits.
[b]Rate per 100,000 enrollees who were continuously enrolled in a health plan throughout 1999.
SOURCE: MarketScan, 1999.

The Data

The HCUP data report a small decrease in the number of hospitalizations for all urethritis (using all urethritis ICD-9 codes). In 1994, there were 1,313 hospitalizations with a urethritis diagnosis, and a progressive decrease in each year of data to 687 hospitalizations in 2000 (Table 27). Analysis of Medicare hospital outpatient data from 1992 to 1998 yielded counts for cases of urethritis that were too small to calculate meaningful rates.

VA data indicate that in 2001, urethritis (organism unspecified) was diagnosed in 6 cases per 100,000 unique outpatients (Table 30), with the highest rates seen among men (7 per 100,000), those under the age of 25 (39 per 100,000), and African Americans (20 per 100,000). There was a fairly even distribution of case rates across the country (6 to 7 per 100,000 in each region). Urethritis (using all urethritis ICD-9 codes) was diagnosed in 21 per 100,000 unique outpatients, with the highest rates seen among those under the age of 25 (135 per 100,000), women (35 per 100,000), and African Americans (85 per 100,000); there was a fairly even distribution across the country (19 to 24 per 100,000 in each region) (Table 31). Comparing the frequencies in Tables 30 and 31 indicates that in all three years of study approximately 70% of urethritis cases were classified as due to *Chlamydia* or gonococcus.

The 1999 MarketScan data reported 362 outpatient visits and no inpatient visits accompanied by a claim for services associated with one of the ICD-9 codes listed in Table 1 for nonchlamydial or nongonococcal urethritis (Table 3). Women made 74 medical visits for urethritis (organism unspecified), and men made 288, for rates of 6 and 27 per 100,000 enrollees, respectively (Table 32). The highest rate was seen among those 30 to 34 years of age (39 per 100,000). Rates varied greatly by geographical region, with the highest rate seen in the South (21 per 100,000). There was a minimal difference between the rates for urban (16 per 100,000) and rural (18 per 100,000) residents. In addition to the 362 visits for urethritis not due to chlamydia or gonococcus, 45 outpatient visits were reported for chlamydial urethritis, and 504 outpatient and 7 inpatient visits were reported for gonococcal urethritis. Combining these cases with cases of urethritis not specified as due to *Chlamydia* or gonococcus, a total of 425 women and 492 men made medical visits for all urethritis, yielding rates of 37 per 100,000 and 47 per 100,000, respectively (Table 33). The highest rate was seen among those 25 to 29 years of age (104 per 100,000). Rates varied greatly by geographical region, with the highest rate seen in the South (47 per 100,000). Again, there was a minimal difference between the rates for urban (43 per 100,000) and rural (41 per 100,000) populations.

THE BURDEN OF OTHER STDs NOT COMMONLY MANAGED BY UROLOGISTS

Several other presentations account for a large burden of STD (in terms of both morbidity and cost) that is not quantified in these analyses. These include the other manifestations of infection with HPV and infection with HIV/AIDS, hepatitis B virus (HBV), and *Haemophilus ducreyi*. Although we did not perform any new analyses of these diseases using the datasets described above, we provide here a brief overview of the overall burden of each of them from the published literature.

Table 27. Inpatient hospital stays by individuals with urethritis (all cases) listed as primary diagnosis, count, rate[a] (95% CI)

	1994		1996		1998		2000	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
Total[b]	1,313	0.5 (0.4–0.6)	778	0.3 (0.2–0.4)	752	0.3 (0.2–0.3)	687	0.2 (0.2–0.3)
Age								
< 14	*	*	*	*	*	*	*	*
14–17	321	2.3 (1.5–3.0)	184	1.2 (0.8–1.6)	*	1 (1–1)	163	1.0 (0.6–1.4)
18–24	352	1.4 (1.0–1.8)	260	1.0 (0.7–1.4)	314	1.2 (0.9–1.6)	286	1.1 (0.8–1.4)
25–34	345	0.8 (0.6–1.1)	220	0.5 (0.4–0.7)	160	0.4 (0.3–0.6)	161	0.4 (0.3–0.6)
35–44	171	0.4 (0.3–0.6)	*	*	*	*	*	*
45–54	*	*	*	*	*	*	*	*
55–64	*	*	*	*	*	*	*	*
65–74	*	*	*	*	*	*	*	*
75–84	*	*	*	*	*	*	*	*
85+	*	*	*	*	*	*	*	*
Race/ethnicity								
White	212	0.1 (0.1–0.2)	*	*	*	*	*	*
Black	788	2.5 (1.9–3.1)	473	1.4 (1.1–1.8)	347	1.0 (0.8–1.3)	365	1.1 (0.8–1.4)
Asian/Pacific Islander	*	*	*	*	*	*	*	*
Hispanic	*	*	*	*	*	*	*	*
Gender								
Male	185	0.2 (0.1–0.2)	*	*	*	*	*	*
Female	1,128	0.9 (0.7–1.1)	651	0.5 (0.4–0.6)	636	0.5 (0.4–0.6)	648	0.5 (0.4–0.6)
Region								
Midwest	341	0.6 (0.3–0.8)	165	0.3 (0.2–0.4)	190	0.3 (0.2–0.4)	189	0.3 (0.2–0.4)
Northeast	189	0.4 (0.2–0.5)	*	*	*	*	159	0.3 (0.1–0.5)
South	635	0.7 (0.5–1.1)	422	0.5 (0.3–0.6)	416	0.4 (0.3–0.6)	283	0.3 (0.2–0.4)
West	148	0.3 (0.1–0.4)	*	*	*	*	*	*
MSA								
Rural	*	*	*	*	*	*	*	*
Urban	1,156	0.6 (0.5–0.8)	664	0.3 (0.3–0.4)	656	0.3(0.2–0.4)	632	0.3 (0.2–0.4)

*Figure does not meet standard for reliability or precision; MSA, metropolitan statistical area.

[a]Rate per 100,000 based on 1994, 1996, 1998, 2000 population estimates from Current Population Survey (CPS), CPS Utilities, Unicon Research Corporation, for relevant demographic categories of US civilian non-institutionalized population.

[b]Persons of other race/ethnicity are included in the totals.

NOTE: Counts may not sum to totals due to rounding.

SOURCE: Healthcare Cost and Utilization Project Nationwide Inpatient Sample, 1994, 1996, 1998, 2000.

Table 28. Frequency of urethritis not designated as due to *Chlamydia* or gonococcus[a] listed as any diagnosis in VA patients seeking outpatient care, count[b], rate[c]

	1999		2000		2001	
	Count	Rate	Count	Rate	Count	Rate
Total	275	9	230	7	233	6
Age						
18–24	11	43	8	34	9	39
25–34	52	34	40	28	30	22
35–44	73	22	59	19	62	21
45–54	66	10	74	10	63	8
55–64	29	6	20	4	32	5
65–74	26	3	16	2	19	2
75–84	16	3	12	2	17	2
85+	2	4	1	2	1	1
Race/ethnicity						
White	82	6	74	5	73	5
Black	90	27	74	22	72	20
Hispanic	9	8	5	4	5	4
Other	0	0	1	5	1	5
Unknown	94	8	76	6	82	5
Gender						
Male	268	9	227	7	230	7
Female	7	5	3	2	3	2
Region						
Midwest	85	12	85	11	49	6
Northeast	40	5	39	5	52	6
South	98	10	63	6	84	6
West	52	9	43	7	48	7
Insurance status						
No insurance/self-pay	208	11	176	10	169	9
Medicare/Medicare supplemental	32	5	26	3	27	2
Medicaid	0	0	2	25	1	11
Private insurance/HMO/PPO	35	7	25	5	35	6
Other insurance	0	0	1	3	1	3
Unknown	0	0	0	0	0	0

HMO, health maintenance organization; PPO, preferred provider organization.

[a]Represents diagnosis codes for urethritis (organism unspecified).

[b]The term count is used to be consistent with other UDA tables; however, the VA tables represent the population of VA users and thus are not weighted to represent national population estimates.

[c]Rate is defined as the number of unique patients with each condition divided by the base population in the same fiscal year x 100,000 to calculate the rate per 100,000 unique outpatients.

NOTE: Race/ethnicity data from observation only; note large number of unknown values.

Source: Outpatient Clinic File (OPC), VA Austin Automation Center, FY1999–FY2001.

Table 29. Frequency of urethritis (all cases)[a] listed as any diagnosis in VA patients seeking outpatient care, count[b], rate[c]

	1999		2000		2001	
	Count	Rate	Count	Rate	Count	Rate
Total	919	30	835	25	771	21
Age						
18–24	39	154	36	153	31	135
25–34	207	137	169	119	149	110
35–44	273	83	235	75	210	70
45–54	237	34	249	35	225	30
55–64	61	12	67	12	85	13
65–74	62	8	51	6	40	4
75–84	37	7	26	4	29	4
85+	3	6	2	3	2	3
Race/ethnicity						
White	205	15	179	12	167	10
Black	366	110	351	102	301	85
Hispanic	25	22	23	19	25	19
Other	1	5	2	10	3	14
Unknown	322	27	280	21	275	17
Gender						
Male	858	30	769	25	714	20
Female	61	43	66	44	57	35
Region						
Northeast	259	35	188	24	205	24
Midwest	188	27	214	29	159	19
South	323	32	271	24	268	21
West	149	25	162	25	139	20
Insurance status						
No insurance/self-pay	757	41	693	38	612	32
Medicare/Medicare supplemental	68	10	56	6	54	5
Medicaid	1	20	3	38	4	45
Private insurance/HMO/PPO	87	18	79	15	90	16
Other insurance	6	24	4	14	9	27
Unknown	0	0	0	0	2	22

[a]Represents diagnosis codes for urethritis (all urethritis codes).
[b]The term count is used to be consistent with other UDA tables; however, the VA tables represent the population of VA users and thus are not weighted to represent national population estimates.
[c]Rate is defined as the number of unique patients with each condition divided by the base population in the same fiscal year x 100,000 to calculate the rate per 100,000 unique outpatients.
NOTE: Race/ethnicity data from observation only; note large number of unknown values.
Source: Outpatient Clinic File (OPC), VA Austin Automation Center, FY1999–FY2001.

Table 30. Medical visits[a] for urethritis not designated as due to *Chlamydia* or gonococcus in 1999, count, rate[b] (95% CI)

	Count	Rate
Age		
<10	11	5 (2–7)
10–14	6	3 (1–6)
15–19	23	12 (7–17)
20–24	30	26 (17–35)
25–29	35	36 (24–47)
30–34	55	39 (28–49)
35–39	66	35 (26–43)
40–44	34	16 (10–21)
45–54	66	14 (11–17)
55–64	36	10 (7–13)
65+	0	0
Gender		
Female	74	6 (5–8)
Male	288	27 (24–30)
Region		
Midwest	66	13 (10–16)
Northeast	44	12 (8–15)
South	193	21 (18–24)
West	21	19 (11–27)
Unknown	38	14 (10–19)
Urban/rural		
MSA	235	16 (14–18)
Non-MSA	88	18 (15–22)
Unknown	39	15 (10–19)

[a]The number of medical visits includes both inpatient visits and outpatient visits; however, most medical visits were outpatient visits.
[b]Rate per 100,000 enrollees who were continuously enrolled in a health plan throughout 1999.
SOURCE: MarketScan, 1999.

Table 31. Medical visits[a] for urethritis (all cases), 1999, count, rate[b] (95% CI)

	Count	Rate
Age		
<10	27	11 (7–15)
10–14	10	6 (2–9)
15–19	110	59 (48–70)
20–24	111	97 (79–115)
25–29	102	104 (84–124)
30–34	139	97 (81–114)
35–39	127	67 (55–79)
40–44	88	41 (32–49)
45–54	133	28 (23–33)
55–64	69	19 (15–24)
65+	1	11 (0–32)
Gender		
Female	425	37 (33–40)
Male	492	47 (43–51)
Region		
Midwest	226	44 (38–49)
Northeast	112	30 (24–35)
South	441	47 (43–51)
West	41	37 (26–48)
Unknown	97	37 (29–44)
Urban/rural		
MSA	623	43 (39–46)
Non-MSA	196	41 (35–47)
Unknown	98	37 (30–45)

[a]The number of medical visits includes both inpatient visits and outpatient visits; however, most medical visits were outpatient visits.
[b]Rate per 100,000 enrollees who were continuously enrolled in a health plan throughout 1999.
SOURCE: MarketScan, 1999.

Human Papillomavirus (HPV) Infections Other Than Genital Warts

We discussed HPV infection in conjunction with genital warts (for which HPV types 6 and 11 are the principal causes) above. In addition, multiple types of HPV are carcinogenic (high-risk). Using polymerase chain reaction (PCR), investigators report an overall prevalence of HPV-DNA of 42% in penile carcinomas and 50% in vulvar carcinomas (45). HPV is detectable in 80% to 100% of lesions in basaloid and warty penile cancers (of which Bowen's disease, erythroplasia of Queyrat, and bowenoid papulosis are precursor lesions), whereas it is detectable in only 33% of keratinizing and verrucous penile carcinomas (46).

Cervical cancer is the second most common female malignancy worldwide and the principal cause of cancer in women in most developing countries (47). Certain types of HPV have been identified as the principal causes of invasive cervical cancer and cervical intraepithelial neoplasia (48, 49). Despite the widespread implementation of cancer screening, 13,000 new cases of cervical cancer were diagnosed in the United States in 2002, and there were an estimated 4,100 associated deaths (50).

The major known risk factors for acquiring genital HPV infection include having multiple sex partners (51, 52) and having sex partners who have had multiple partners (51). The cumulative 3-year incidence of genital HPV infection of all types among college-age students has been found to be 43%, and the mean duration of new infections is 8 months (53). Extrapolating these data to the US population, we estimate that there are at least 5.5 million new genital HPV infections each year (34) and that approximately 20 million people have productive genital HPV (that is, active shedding of HPV DNA) (12). In 1994, the economic burden of genital HPV infection and related sequelae, including cervical cancer, in the United States was estimated to exceed $4.5 billion per year (18).

Human Immunodeficiency Virus (HIV)/AIDS

In all US states and territories, data on persons with AIDS are reported to state or local health departments, which forward the data, without personal identifiers, to CDC. Data concerning sex, race/ethnicity, behavioral risk, and state and county of residence are abstracted from medical records of persons who meet either the clinical (opportunistic illness) criteria or the immunologic AIDS-defining criteria that were added to the definition in 1993 (54).

As of the end of December 2001, more than 816,000 cases of AIDS had been reported to CDC. Adult and adolescent AIDS cases totaled 807,000, of which 666,000 were in men and 141,000 were in women. More than 9,000 of the reported AIDS cases were in children under 13 years of age. As of the same date, more than 467,000 persons reported to have AIDS had died—462,000 adults and adolescents and more than 5,000 children under 15 years of age. Current, detailed estimates of the numbers of persons in the United States living with AIDS, by region of residence and year, are available at http://www.cdc.gov/hiv/stats/htm.

The widespread use of highly active antiretroviral therapy (HAART) resulted in substantial decreases in AIDS deaths between 1995 and 1999 in all demographic and risk groups, as well as decreases in new AIDS diagnoses. Further decreases in AIDS diagnoses and deaths in the United States at this point will require better access to therapy, simpler drug regimens, and the continued development of effective drugs. Unfortunately, HIV continues to be transmitted among MSM, among intravenous drug users, and via heterosexual contact. Between 1990 and 1999, the number of living persons diagnosed with AIDS increased fourfold in the United States. The proportions of persons with AIDS are increasing among women, African Americans, Hispanics, intravenous drug users, heterosexuals, and residents of the South, reflecting earlier trends in HIV transmission, differences in testing behaviors, and differential effects of HAART. The poor are disproportionately affected, and HIV incidence rates remain especially high among African Americans with high-risk behaviors.

Hepatitis B

Hepatitis B is caused by infection with hepatitis B virus (HBV). In adults, only 50% of acute HBV infections are symptomatic, and about 1% of cases result in acute liver failure and death. Risk for chronic infection is associated with age at infection. About 90% of infected infants and 60% of infected children under the age of 5 become chronically infected, compared with 2% to 6% of adults. The risk of death from cirrhosis or hepatocellular carcinoma among persons with chronic HBV infection is 15% to 25%.

An estimated 181,000 persons in the United States were infected with HBV during 1998, and about 5,000 deaths occurred from HBV-related cirrhosis or hepatocellular carcinoma. According to NHANES-III data, an estimated 1.25 million people are chronically infected with HBV, serve as a reservoir for infection, and are at increased risk for death from chronic liver disease (31).

HBV is efficiently transmitted by percutaneous or mucous membrane exposure to infectious body fluids. Sexual transmission among adults accounts for about two-thirds of the incident HBV infections in the United States. In the 1990s, transmission among heterosexual partners accounted for about 40% of the infections, and transmission among MSM accounted for another 15%. The most common risk factors for heterosexual transmission include having more than one sex partner in a 6-month period and having a recent history of an STD.

Among MSM, risk factors for HBV infection include having more than one sex partner in a 6-month period, engaging in unprotected receptive anal intercourse, and having a history of other STDs. Changes in sexual practices among MSM to prevent HIV infection have resulted in a lower risk for HBV infection than was observed in the late 1970s, when studies found HBV markers among up to 70% of adult MSM. Recent surveys of young MSM (15 to 22 years of age) indicated that 11% had serologic evidence of past or current HBV infection (anti-HBc or HbsAg) and that 9% had evidence of having been immunized against HBV (anti-HBs alone among persons reporting having received one or more doses of hepatitis B vaccine) (55).

Up to 70% of persons with acute hepatitis B have previously received care in settings where they could have been vaccinated (e.g., STD clinics, drug treatment programs, and correctional facilities). A 1997 survey of STD clinics demonstrated that hepatitis B vaccine was routinely offered in only 5% of these settings (56).

Chancroid

Chancroid, caused by *Haemophilus ducreyi*, is one of the genital ulcerative STDs, along with syphilis and HSV. Chancroid is prevalent in Africa and Asia and has been shown to be a risk factor in the transmission of HIV. It is a reportable disease in some states and territories but tends to be underreported because laboratory diagnosis of chancroid is difficult, and most laboratories are incapable of culturing H. ducreyi (57). National surveillance data collated by CDC reveal that reported cases of chancroid in the United States rose from about 1,000 per year in 1981–1984 to 5,000 in 1987 but have decreased steadily since then to fewer than 100 cases in 2001 (30).

Trichomoniasis

Trichomonas vaginalis is another common cause of lower urogenital tract infection that urologists may see when evaluating the etiology of urethritis in men or women or urinary symptoms (with or without vaginitis and cervicitis) in women. *T. vaginalis* is a microscopic parasite found worldwide, and trichomoniasis is one of the most common STDs, affecting mainly 16- to 35-year-old women. Signs and symptoms of infection in women range from no symptoms to foul-smelling or frothy green discharge from the vagina, vaginal itching, and redness. Other symptoms can include painful sexual intercourse, lower abdominal discomfort, and the urge to urinate. Most men with this infection do not have symptoms, but those who are symptomatic most commonly have a discharge from the urethra, the urge to urinate, and a burning sensation with urination.

In the NDTI, the number of initial visits to physicians' offices per year for trichomonal vaginitis declined from more than 500,000 in 1966 to fewer than 100,000 in 2001. Vaginal infections caused by *T. vaginalis* are among the most common conditions found in women visiting reproductive health facilities. In 1996, between 3% and 48% of sexually active young women requesting routine care at prenatal, family planning, and college health clinics were diagnosed with trichomoniasis (58). Currently, there are no national surveillance data on this disease (13), but it has been estimated that 5 million persons in the United States become infected with *T. vaginalis* each year, with infection being more common in women who have had more than one sex partner in a 6-month period (1).

THE ADDITIONAL BURDEN OF STDs DUE TO SEQUELAE OF ACUTE INFECTIONS AND PERINATAL TRANSMISSION

Several bacterial and viral STDs can cause serious and costly complications if they are not detected and treated promptly. In women, sequelae of acute lower genital tract bacterial STDs that are not promptly treated include PID and its consequences of ectopic pregnancy, infertility, and chronic pelvic pain. Pregnant women can perinatally transmit several STDs, including syphilis resulting in congenital syphilis, gonorrhea resulting in ophthalmia neonatorum, chlamydial infection resulting in pneumonitis and conjunctivitis, HSV resulting in neonatal herpes, HIV resulting in neonatal infection, hepatitis B resulting in neonatal infection, and HPV resulting in respiratory papillomatosis. Bacterial vaginosis in women has been associated with preterm delivery. Infection with certain HPV types can result in dysplasia or cancer of the cervix, penis, vulva, vagina, and anus. Although these complications are far less common than acute cases of bacterial STD and cases of chronic viral STD, they tend to be more complicated and expensive to manage and therefore contribute substantially to the overall clinical and economic burden of STDs. (For details on the burden of these diverse sequelae, see references (59-66)).

MSM: A HIGH-RISK POPULATION FOR STD

Studies demonstrate that MSM with a large number of sexual partners are at higher risk of infection with STDs, including HIV, hepatitis A virus (HAV), and HBV, than are homosexual, bisexual, or heterosexual men who have fewer sexual partners. Although the frequency of unsafe sexual practices and reported rates of bacterial STDs and incident HIV infection have declined substantially in MSM during the past several decades, recent outbreaks of syphilis and gonorrhea have been observed among MSM in several US cities, contributing to increased rates among men (67). MSM, many of whom have been HIV-infected, accounted for most of the new syphilis cases in many urban areas in 2001. These trends threaten to reverse the marked declines in syphilis morbidity seen over the past decade.

Several factors may explain the recent increases in STD and HIV infection observed among MSM. Increases in unsafe sexual behavior by this population have been seen in several US cities, including those with recent outbreaks. Possible reasons for these relapses in safe behaviors include confidence in the effectiveness of antiretroviral therapy in reducing or eliminating transmission risk, "prevention fatigue," lack of awareness of how STDs increase HIV transmission, and increased use of the Internet to identify new sexual partners.

Inadequate provision of STD services to MSM may also play an important role in the recent increases in STD and HIV infection. Anecdotes suggest that many programs provide syphilis serology to MSM only at the initial patient visit because it can be performed readily using blood collected for HIV viral load tests. However, routine risk assessment of sexual risks, clinical assessment and screening for gonorrhea and chlamydial infection, and provision of hepatitis B vaccine at initial or follow-up visits appears to be less common. Thus, many clinicians are missing opportunities to assess risk, encourage risk reduction, educate patients about the risks of HIV transmission despite antiretroviral therapy, and treat STDs that could promote HIV transmission to others.

Urologists who care for MSM should be aware of common symptoms and signs of STDs, e.g., urethral discharge, dysuria, anorectal symptoms (such as pain, pruritis, discharge, and bleeding), genital or anorectal ulcers, other mucocutaneous lesions, lymphadenopathy, and skin rash. Urologists should consider the unique variations in signs that may be encountered in this population such as oral and perianal chancres in those who practice oral and anal sex. Urologists should also be aware of recent trends in STDs in MSM and recent guidelines for risk assessment, diagnosis, and treatment of HIV-uninfected and HIV-infected patients (31). Clinicians should assess sexual risk for all male patients, including routinely inquiring about the gender of patients' sex partners. MSM, including those with HIV infection, should routinely undergo straightforward, nonjudgmental STD/HIV risk assessment and client-centered prevention counseling to reduce the likelihood of acquisition or transmission of HIV and other STDs (31). In addition, screening for STDs and vaccination for HAV and HBV should be considered for MSM at risk for STDs (31, 68, 69).

ECONOMIC IMPACT

Patient visits, claims for testing, diagnostic procedures, drugs, and other treatment account for the majority of direct medical costs. Most published literature on the economic burden of STDs is based on cost per case, not cost per visit. To calculate the direct medical cost of STDs, one must consider unit costs of medical visits that may involve diagnoses, procedures, drugs, and other treatments. Such unit costs can be estimated from special cost studies or by using claims data (such as MarketScan data). Projections of the economic costs for selected populations could be made using some of the datasets that we examined, but with multiple caveats and assumptions. For example, assuming that Medicare and VA costs are lower than the commercial costs reflected in MarketScan data, one could apply a slightly lower average unit cost when estimating actual "costs" rather than "charges." All the visit/drug costs—weighted across the various datasets—could then be applied to the total number of visits to obtain a national estimate of direct medical costs.

The most recent aggregate estimates of the direct medical costs of STDs were published in 1998 (54). These estimates included the STDs examined in this report, as well as manifestations of STDs rarely managed by urologists (e.g., salpingitis) and other

STDs not addressed here. Direct medical costs for STD treatment in the United States were estimated (adjusted to 1997 dollars) to be in excess of $8 billion per year (Tables 34 and 35). This figure does not include lost wages and productivity, out-of-pocket costs, costs related to STD screening programs, or costs resulting from perinatal transmission. Of all STDs other than HIV, HPV has the highest incidence and accounts for the highest direct medical costs (more than $1.6 billion annually), most or which are associated with treating precancerous and cancerous cervical lesions (34). Estimates of direct medical costs will vary over time as screening, diagnostic, treatment, and prevention practices change.

RECOMMENDATIONS

In the United States, estimates of incidence and prevalence of the more common STDs depend on convenience samples; incomplete national reporting (for chlamydial infection, HBV, syphilis, and gonorrhea); inconsistent, non-representative prevalence data; and rough extrapolations. None of the datasets we examined provides data for accurately estimating the incidence or prevalence of any STD. For example, if we use of only ICD-9 codes to define a case or visit, we substantially underestimate the costs of chronic STDs, such as genital herpes and genital warts, which commonly result in multiple claims for medical visits that may involve diagnoses, procedures, drugs, and surgical treatment. In addition, ICD-9 codes and CPT codes do not readily capture screening for the several STDs that may be asymptomatic and are commonly detected through screening. However, most of the available datasets do provide data that describe basic trends in incidence, populations at highest risk, types of clinicians who provide STD care, and care-seeking behavior for various STDs.

Truly reliable estimates of prevalence based on representative national surveys are limited to HSV-2, C. trachomatis infection, and gonorrhea; similarly reliable estimates of incidence based on fairly complete national surveillance are limited to HIV. Estimates of the burden of HPV have tended to underestimate the oncogenic types of the disease and will change as new guidelines are implemented for Pap smears, with primary testing of women under the age of 30. Population-based serologic surveys, such as NHANES, appear to have the greatest potential for estimating the prevalence of viral STDs in various segments of the population. For estimating the incidence of bacterial STDs, extrapolations from passive surveillance data provide the most reliable data at a population level. Based on our review of the literature and the analyses of numerous datasets, the overall estimate of the STD burden of the early 21st century should approximate that of the late 1990s, with 15 million new cases of STDs occurring annually. The magnitude of this figure underscores the importance

Table 32. Estimated annual medical costs of the major curable STDs in the United States adjusted to 1997 dollars

STD	Total Cost[a] ($ millions)
Chlamydia	374.6
Gonorrhea	56.0
Pelvic in ammatory disease	1,125.2
Trichomoniasis	375.0
Syphilis	43.8
Total costs, bacterial STDs	1,974.6

[a]All cost figures are adjusted to 1997 dollars using the Consumer Price Index, from the US Department of Labor's Bureau of Labor Statistics.

SOURCE: Adapted from ASHA Panel to Estimate STD Incidence, Prevalence and Cost. Available at: http://www.kff.org/womenshealth/1445-std_rep2.cfm.

Table 33. Estimated annual medical costs of the major viral STDs in the United States adjusted to 1997 dollars

STD	Total Cost[a] ($ millions)
Genital herpes	208.0
HPV	1,622.8
Hepatitis B	51.4
HIV	4,540.0
Total costs, viral STDs	6,422.2

[a]All cost figures are adjusted to 1997 dollars using the Consumer Price Index, from the US Department of Labor's Bureau of Labor Statistics.

SOURCE: Adapted from ASHA Panel to Estimate STD Incidence, Prevalence and Cost. Available at: http://www.kff.org/womenshealth/1445-std_rep2.cfm.

of understanding the burden of STDs—by clinicians, public health agencies, persons at risk for STDs, the general public, and persons with STDs (31).

Urologists and other clinicians who see persons at risk for or infected with STDs stand to profit by understanding the incidence, prevalence, subclinical shedding, and transmission modes and risks of STDs. They should also be aware of prevention measures, risk assessment, screening, diagnostic testing, treatment, diagnosis and management of complications, counseling, patient education, sex partner services, and reporting of cases mandated by public health law. As more urologists pursue specialization in gynecological urology, issues of the detection, management, and impact of STDs on upper genitourinary sites may become more central to urologic practice. For all sexually active adolescent and adult patients, urologists and other clinicians should consider STDs as an etiology of genitourinary symptoms and signs and should screen or diagnose and treat according to national guidelines (17, 31). Urologists and other clinicians should also provide appropriate counseling, patient education, follow-up, and medical referral for sex partners and should report cases of notifiable diseases. Fortunately, resources for improving knowledge and skills are available for the clinician through commercial continuing medical education programs and through government-supported training networks (including CDC-sponsored Prevention Training Centers in all regions), on-line training courses, and various clinical decision support tools (such as the STD treatment guidelines that are available online) (31). In addition, continued commitment and advocacy for resources are needed to reduce the burden of STDs and to provide access to high-quality prevention and treatment services in the United States. For additional resources, including recommendations, guidelines, and statistical reports, the reader is referred to the website of the Division of STD Prevention at CDC: http://www.cdc.gov/nchstp/dstd/dstp.html.

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CHAPTER 10

Methods

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OVERVIEW

The purpose of the Urologic Diseases in America (UDA) project was to assess the burden of illness imposed upon the United States by the major urologic diseases. To accomplish this task, the UDA team reviewed a large number of existing public and private datasets. Component elements of these databases were evaluated to compare their specific characteristics, uses, benefits, and limitations. Criteria for selecting the preliminary set of databases included (a) availability of information on key features of the data collection process, e.g., the unit of observation, reliability of the data, etc.; (b) issues related to the study design, e.g., the target population selected, whether incidence or prevalence data were available, etc.; (c) analytic information, e.g., whether adjustment for sample design characteristics such as clustering was necessary, etc.; (d) the robustness of the dataset relative to others available to assess the same UDA condition; and (e) an estimate of the time required to procure and analyze the dataset. Ultimately, a complementary set of data sources was selected for this project (see Appendix B), in coordination with approval from various experts in the field of urologic illnesses, as well as at the National Institute of Diabetes and Digestive and Kidney Diseases. Together, these datasets allowed us to paint a broad picture of the burden of urologic diseases in America.

DATABASE SOURCES

Databases selected to study the UDA conditions included in this compendium fall into three categories. The first group describes the Medicare program's experience with the UDA conditions. The datasets were derived from Centers for Medicare and Medicaid Services (CMS) administrative records as either a complete or a 5% sample (which was then appropriately weighted to represent the national Medicare population). These datasets include the Medicare inpatient (MEDPAR) sample, the Medicare carrier file (previously referred to as the Physician/ Part B file), and the hospital outpatient file. Finally, the Medicare denominator file, which includes all Medicare beneficiaries enrolled in a given year, was used to supply denominator data for analysis.

The second group of datasets allows computation of national estimates of health care utilization, costs, and, for some conditions, prevalence. Data for inpatient utilization measures were obtained from the Healthcare Cost and Utilization Project – Nationwide Inpatient Sample (HCUP-NIS), conducted by the Agency for Healthcare Research and Quality. Data for physician office and hospital outpatient utilization measures were obtained from two surveys conducted by the National Center for Health Statistics: the National Ambulatory Medical Care Survey (NAMCS) and the outpatient and emergency department components of the National Hospital Ambulatory Medical Care Survey (NHAMCS). These databases contain data on national samples of visits to physician offices, outpatient hospital departments, and emergency departments, respectively, and yield a higher number of patients with diagnoses and procedures of interest than do population-based surveys. We supplemented our analyses of these databases with the household component of the Medical Expenditure Panel Survey (MEPS), a population-based survey. We used the MEPS data to create nationally representative estimates of expenditures on diseases of interest. Finally, we examined the National Health and Nutrition Examination Survey (NHANES), a population-based survey, for items that could be used to create estimates of true nationally representative disease prevalence.

The third group of datasets was selected to provide greater depth on special populations and topics of interest. This group included the National Association of Children's Hospitals and Related Institutions (NACHRI) dataset, the National Nursing Home Survey (NNHS), the Veterans Health Administration Outpatient Clinic (VA OPC) dataset, the urology subset of the MarketScan Health and Productivity Management (HPM) database, private claims data from the Center for Health Care Policy and Evaluation (CHCPE), and the Ingenix claims dataset. Data from CHCPE and NACHRI were used to enhance analysis of the burden of urologic illnesses on the pediatric population. The NNHS provided information on individuals residing in nursing homes. The VA OPC database allowed description of veterans' use of outpatient services for urologic care. Data from Ingenix were used to model costs of care for various urologic illnesses. Because some urologic conditions have costs that accrue to employers of affected individuals, we felt it important to measure indirect costs of illness as well. Data from MarketScan provided unique information on indirect costs, e.g., work absences associated with medical services for urologic conditions.

The combination of databases (Medicare, nationally representative datasets, and special populations and topics) allowed us to complete a comprehensive evaluation of the following primary service utilization categories: (1) inpatient stays, (2) physician office visits, (3) hospital outpatient visits, (4) emergency room visits, and (5) ambulatory surgery center visits for the UDA conditions in this compendium. The data also enabled us to derive estimates of disease prevalence for some conditions. Following is a detailed description of the databases analyzed in this compendium and an in-depth discussion of the analytic approach we used for each data source.

MEDICARE DATA

Description

Medicare enrollment and claims data are available from the Centers for Medicare and Medicaid Services (CMS). Data from 1992, 1995, and 1998 claims were used for the tables in this compendium. The enrollment file contains information on all Medicare beneficiaries enrolled or entitled in the year, and these data were used to generate counts for the denominator when calculating rates. The Medicare claims data consist of three separate files: MEDPAR, which contains records for Medicare beneficiaries who used hospital inpatient services during the given year; the carrier file (previously referred to as the Physician (Part B) claims file); and the outpatient claims file (which contains hospital outpatient, laboratory, radiology, nursing home, and various other facility charges). For our analyses, we used 5% random samples drawn from these files. Previous work using CMS data has found that this sample size is adequate to detect significant racial and ethnic differences in use of cardiac procedures and tests (1). The carrier and outpatient files contained individual claims for provider services, and the MEDPAR sample contained information on hospitalizations incurred by those same Medicare enrollees.

Analytic Approach

Data from the three Medicare files (MEDPAR, carrier, and outpatient) were linked to determine inpatient, ambulatory surgery center, hospital outpatient, physician office, and emergency room (ER) utilization, as well as to calculate average payments for the various UDA conditions by place of service. The procedure we used is described below.

First, personal identifiers and dates from facility records in the inpatient and outpatient files were evaluated to ascertain the number of visits to inpatient hospitals, ERs, hospital outpatient departments, and ambulatory surgery centers. Next, person identifiers and dates of service for these visits were linked to the matching line items listing payment for those services recorded in the carrier file. An algorithm was developed to assign the remaining carrier file line items and outpatient file records to the appropriate place of service. Utilization of physician office visits was determined by examining line items in the carrier file for appropriate place-of-service and physician-evaluation-and-management billing codes.

Remaining unmatched line items and claims (primarily laboratory charges) from the outpatient file were totaled by disease entity and by place of service (physician office, hospital outpatient, hospital inpatient, ambulatory surgery, or ER). Total dollars of expenditure associated with these unmatched items were then added to the total expenditure calculation for each place of service, stratified by disease. Average cost per service unit was calculated by dividing this total by the number of disease-related visits to that place of service.

At the completion of the matching process, descriptive tables were generated using appropriate International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) diagnosis codes for the conditions of interest. Hospitalization or facility visit was used as the unit of analysis for the number of claims for each type of service. Denominators were derived using the CMS enrollment file. Because a 5% sample of Medicare records was utilized, national estimates of service use were obtained by multiplying counts by a constant weight of 20 to represent use in the entire Medicare-eligible population. The data were stratified by age, gender, and race variables. Confidence intervals were calculated using standard methods for proportions (2). In Medicare data analyses, 5% samples are considered adequate for meaningful comparisons among different minority, geographic, and age groups (1).

The analytic methodology is described in more detail in Appendix A, Technical Programming for Medicare Data.

NATIONALLY REPRESENTATIVE HEALTH CARE UTILIZATION AND COST DATA

Description

We used five datasets to derive nationally representative estimates of disease-specific service use, disease prevalence, and health care payments. These datasets include data for inpatient stays or hospitalizations (HCUP-NIS) and data for outpatient and ambulatory care utilization (NAMCS and NHAMCS). In addition, MEPS, a population-based survey, was used to evaluate costs. Finally, NHANES was used to determine the prevalence of urinary incontinence and urinary tract infection.

The databases assessed had different designs, depending on the goals of the surveys they represented. The NAMCS and NHAMCS databases used a nationally representative multi-stage probability sample. The sample design consisted of a number of stages that subcategorized the sample into units. First, counties or groups of counties were selected. Next, a probability sample of hospitals and their associated clinics or physicians (depending on the database) was selected within each county. Finally, a systematic sampling of patient visits to those physicians or clinics was selected within a randomly assigned window of time during the year. The sample size for the years of data evaluated in these two databases ranged from approximately 22,000 to 35,000 patient visits per year, and the sample was used to describe utilization of physician office visit, hospital outpatient, and ER services in the United States.

The HCUP database is also a nationally representative probability sample, but rather than using a multistage approach, the design is based on a sample stratified on five characteristics: geographic area (US Census Region), location (Metropolitan Statistical Area (MSA), the teaching status of the hospital (teaching or nonteaching), the control of the hospital (public, voluntary, or proprietary), and size, by number of beds (small, medium, or large). Much larger than the NAMCS or NHAMCS, this database contains from 6 million to 7.5 million discharge records from community hospitals for any given year of our analysis. HCUP data are thus adequate to describe utilization of hospital inpatient services in the United States.

The benefits of using this combination of data sources are numerous. First, the databases are nationally representative samples that allow for the evaluation of genitourinary conditions even within special subpopulations (e.g., pediatric or ER patients). Demographic information is also available to complement the clinical data provided. However, the datasets have some limitations; for example, they use an inpatient stay or clinic visit, not an individual patient, as the unit of analysis, thus making it impossible to follow patients over time. Also, some of the databases sample a small fraction of total service use, so rare or more-chronic conditions may be missed.

MEPS is a nationally representative survey of health care service use and expenditures conducted under the auspices of the Agency for Healthcare Research and Quality (AHRQ). MEPS relies on self-reports and medical record abstraction and describes utilization of all health care services, expenditures, sources of payment, and insurance coverage by individuals in the US civilian noninstitutionalized population. The data are collected five times per year, the first collection having been made in 1996. The years evaluated for this compendium are 1996, 1997, and 1998. The sample includes approximately 10,000 families, or 24,000 individuals, per year. Medical expenditure data at both the person and the household level are continuously collected for the database, which has an overlapping panel design. Two calendar years of data are collected from each household in a series of five rounds. These data are then linked with additional information collected from the respondents' medical providers, employers, and insurance providers. The series of data collection activities is repeated each year on a new sample of households, resulting in overlapping panels of survey data from 195 communities across the nation.

The MEPS database is particularly valuable for the purposes of this compendium because it contains detailed information on utilization and payments across treatment settings. In addition, the medical provider component supplements and validates self-reported information in the household component. However, to preserve respondent confidentiality, nearly all of the condition codes in the MEPS file have been collapsed from fully specified (five-digit) ICD-9 codes into three-digit code categories. This limits the ability to examine certain conditions, such as urinary incontinence and urinary tract infection. Also, the sample sizes are relatively small, so unusual urologic conditions are not captured well in the data. Finally, underreporting of some conditions may occur because the data are obtained from self-reports of illness (though these reports are later followed up by abstraction of medical charts and financial data).

The NHANES, conducted by the National Center for Health Statistics (NCHS), collects data by household interview, supplemented by medical examination and laboratory testing in a mobile center. The sample design is a stratified, multi-stage, probability sample of clusters of persons representing the civilian non-institutionalized population; African Americans and Mexican Americans are oversampled. Data include medical histories in which specific queries are made regarding urological symptoms and conditions. These items were selected for analysis. NCHS releases public use data sets from the continuous NHANES in two-year cycles. In our analyses, we present data from NHANES III, 1988 to 1994, and NHANES data from 1999 to 2000.

Analytic Approach (NAMCS, NHAMCS, HCUP, MEPS, NHANES)

The years of NHAMCS and HCUP data analyzed are 1994, 1996, 1998, and 2000. In addition, the 1992 NAMCS data were reviewed. The MEPS data we evaluated were for 1996 through 1998.

First, we identified individuals with visits for specific urologic conditions, based on the ICD-9 diagnosis codes that defined each of the conditions and any age and gender specifications necessary to create subpopulations for the analyses (for MEPS data, three-digit ICD-9 diagnosis codes were used). Analytical files for outpatient visits included records of visits with a relevant diagnosis code listed as one of any reasons for the visit. Tables were produced reflecting service use both when the diagnosis codes in question were listed as any of the reasons for the visit and when they were listed as the primary reason for the visit. Analytical files for inpatient stays included only those records of inpatient hospitalizations for which a relevant diagnosis code was listed as the primary diagnosis during the hospitalization. The raw number of visits in each subset varied by condition and by year. Analyses were conducted at the visit level or the stay level, depending on which database was being analyzed. The MEPS database was used to calculate payments for all services, as well as to derive nationally representative estimates of outpatient prescription drug use.

For the NHANES, cases were identified on the basis of answers to specific questions asked in the survey. The frequency of individual "yes" answers and answers regarding the intensity of symptoms were tabulated by gender, age, and other demographic variables. Using the weights provided by the NCHS, raw counts were weighted to give nationally representative estimates of disease prevalence.

National estimates of the annual frequency of visits for the demographic groups studied for each of the UDA conditions were calculated when the raw counts were deemed large enough to produce reliable estimates. Under NCHS guidelines, two conditions must be met for creation of reliable national estimates: (1) there must be at least 30 unweighted counts, and (2) estimates must have a relative standard error (RSE) of less than 30%[1]. When insufficient data were available, subgroups (e.g., age categories) were combined to create adequate unweighted counts. In some instances, unweighted corresponding counts for conditions in NHAMCS Outpatient (NHAMCS–OP) and NAMCS were combined to provide reliable estimates of overall outpatient service use. HCUP cell sizes were always large enough to produce reliable estimates ($N \geq 30$), and therefore no combining or regrouping of stratification variables was necessary.

Population weights were applied to unweighted counts, according to the methodology provided by each organization sponsoring a survey, to obtain national estimates of the frequency of visits in the entire population and in subpopulations of interest. SAS (3) was used to derive the standard errors and compute the 95% confidence intervals (CIs) for these estimates. The sample design of the database was taken into account when computing statistics to ensure the proper estimation of variance in each case.

To create an estimate of the burden of outpatient visits for urologic conditions in relation to the total burden of illness represented by outpatient visits, national estimates of visits for urologic conditions within various subpopulations were divided by national estimates of the total number of outpatient visits for the demographic groups of interest. This number was multiplied by 100 to generate a percentage. National annual outpatient visit rates were calculated using the US Census non-institutionalized civilian population estimates corresponding to demographic and visit-characteristic groupings for each survey year used. Population estimates were obtained from the Current Population Survey (CPS)[2] for select demographic categories of the US civilian non-institutionalized population.

Stratification variables evaluated for all databases include age, race/ethnicity, gender, region and/or MSA, and other variables selected as appropriate for the database of interest.

SPECIAL POPULATION DATA

Description

The data sources used for special-population analyses target an array of unique populations not completely captured in the databases described above. These include children, the elderly, veterans, and two populations that allow us to combine data to conduct a cost analysis—the privately insured and the employed. Together, these datasets, along with the others described in this compendium, provide a unique picture of the relationship between urologic diseases in America and their impact on health care utilization, services, and costs.

NACHRI

The National Association of Children's Hospitals and Related Institutions (NACHRI) maintains a dataset containing information on all inpatient stays at member hospitals, including approximately 2 million pediatric inpatient discharges. Data have been collected annually since 1999. Fifty hospitals located in 30 states participated in 1999, 55 participated in 2000, and 58 participated in 2001. Data include the age, race, sex, and ICD-9 code for the principal diagnosis of each pediatric inpatient cared for at participating facilities. Information on length of stay, total charges, and cost-to-charge ratio is also collected. Because it collects data from children's hospitals, the NACHRI dataset provides a unique opportunity to study the inpatient burden placed on the health care system by relatively uncommon pediatric urologic conditions. The dataset is rigorously edited and cleaned to ensure data quality. However, because NACHRI collects data from specialized facilities, its information on such topics as length of stay, patient demographics, and treatment costs may not be representative of the national experience.

NNHS

The National Nursing Home Survey (NNHS) is a series of national sample surveys of nursing homes, the providers of care, and their residents. The dataset contains information on a sample of approximately 1,500 facilities, 8,100 residents, and 6,800 discharge records. The data are collected using a nationally representative, stratified, two-stage probability sampling design. All nursing homes in this sample have at least three beds and are certified by Medicare or Medicaid or have a state license to operate as a nursing home. Characteristics of each facility, including size, ownership, occupancy rate, number of days of care provided, and expenses, are collected. Additionally, information is provided on the recipients of care, including demographics, health status, and services received. One of the unique aspects of using this database is that it provides information on nursing homes from two perspectives: that of the nursing home facility and that of the residents themselves. However, the survey does not provide detailed information on the health services provided. It indicates only whether the patient received a service from within a general service category. Also, the records for the survey years reviewed for this compendium do not contain facility numbers to allow linkage of the records to the facilities.

VA-OPC

The Department of Veterans Affairs (VA) delivers health care to eligible veterans through the Veterans Health Administration. The VA is the largest health care system in the United States, comprising more than 160 hospitals (>45,000 beds), more than 600 community-based outpatient clinics, and more than 100 nursing homes. The VA maintains a centralized data repository reflecting health care utilization by the population of veteran users. This repository, known as the Austin Automation Center, contains computerized utilization data on many types of health services, including outpatient visits. The SAS files created from this database allow for file linkages of patients.

The VA outpatient clinic (VA-OPC) files, on which the UDA analyses were performed, include demographics, visits, and clinic stops (i.e., different clinic appointments and services attended in a given visit day) and are available for 1980 to the present. Ambulatory procedures were added to the OPC in 1990, and outpatient diagnoses (ICD-9-CM) were added in FY1997. These datasets provide a rich resource for assessing the prevalence of disease among VA health care users. The ability to link files across VA health care facilities and across settings within facilities allows a relatively complete portrait of utilization and patterns of care to be obtained. However, the VA datasets do not provide comprehensive information about veterans' health care utilization *outside* the VA health care system.

The diagnosis codes were derived from outpatient visits from recent physician/patient encounters and thus *do not re ect all existing or historical cases among veteran users*; instead, they reflect the population for whom care was sought during the year being reviewed. Therefore, prevalence based on counts of cases in a given fiscal year of outpatient utilization data is likely to underestimate prevalence in the total population of users.

MarketScan HPM

The MarketScan Health and Productivity Management Database (HPM) is an integrated inpatient and outpatient medical claims database that provides information on productivity losses associated with medical services. The data contain key information on short-term disability, absence, and worker's compensation resulting from urologic conditions. Absence data are derived from employee time-reporting records collected through employer payroll systems and contain detailed information on when employees were out of work, the number of work hours missed, and the reasons for the absences. Information on work absence can be linked to eligibility files and medical claims data. The linked files allow users to examine medical treatment and its association with work loss and disability. Although the database includes employers from all areas of the country, the data are not nationally representative.

Ingenix Data

Data for individual-level analyses were obtained from Ingenix, Inc., a health care information company that provides cost management and benefit consulting services to employers, health plans, pharmaceutical manufacturers, and others. Data were obtained on insurance eligibility and medical claims for the employees of 25 large (Fortune 500) companies and their dependents. All individuals had private, employer-sponsored health insurance coverage, including prescription drug benefits. Out of concern that data on health care use and costs might be incomplete for the employees' dependents (e.g., in cases of dual coverage), we excluded dependents from the analysis. The sample we used consisted of 278,950 primary beneficiaries 18 to 64 years of age who were continuously enrolled for the entire 1999 calendar year.

The medical claims include detailed financial information, dates of service, diagnosis and procedure codes, types of facility, and providers. Drug claims include prescription fill date, patient and plan costs, and, in most cases, national drug codes (NDC), which were used to examine utilization of specific drugs and therapeutic classes. Claims data contain records only for those who used services. To identify those who may not have used services, enrollment data were also obtained. Enrollment files included each person's age, sex, plan type (FFS, PPO, POS, HMO), zip code of residence, and relationship to employee.

The claims data were linked with information about plan benefits. For each plan, photocopies of the summary of benefits provided by the companies to their employees were obtained, and the benefit information, including the salient features of each plan's covered benefits, was abstracted from its summary-plan design. Drug benefits typically included co-payments or co-insurance rates for both retail and mail-order pharmacies; the data on drug benefits included generic substitution rules and a list of drugs or drug classes excluded from coverage. Characteristics of the medical benefit included plan deductibles and patient cost-sharing arrangements for inpatient and ambulatory settings.

CHCPE

The Center for Health Care Policy and Evaluation (CHCPE) of UnitedHealthcare Group maintains a centralized research database (RDB) that contains current and historical medical and pharmaceutical claims and enrollment data for 27 geographically distinct health plans—more than 22 million member-years of data. The majority of UnitedHealthcare members are enrolled through employers (i.e., they are commercially insured), although membership also includes Medicaid and Medicare beneficiaries. The health plans contract with broad networks of physicians, pharmacies, and facilities to provide health care to enrollees. Most providers are reimbursed on a fee-for-service basis; pharmacies receive dispensing fees; and most facilities have contracted per diem rates or prospective payments (DRGs). Because information on pediatric urologic diseases in the nationally representative data sources was sometimes limited, data from CHCPE were used to enhance understanding of the burden of urologic disease on the pediatric population. One limitation of this data source is that it is drawn from an insured population, which may differ in important ways from the uninsured population. CHCPE does collect information on children with Medicaid, and these data were reported.

The RDB contains automated utilization data from all types of health care sites (e.g., hospital inpatient, hospital outpatient, physician office, emergency department, surgery center) and for all types of services, including care from out-of-network providers. CHCPE assembles enrollment and claims data generated by UnitedHealthcare operations

Table 1. Health plan member count, by year, region, and insurance type

	1994		1996		1998		2000	
Region	**Commercial**	**Medicaid**	**Commercial**	**Medicaid**	**Commercial**	**Medicaid**	**Commercial**	**Medicaid**
Midwest	637,093	46,009	887,957	39,192	1,186,702	274	1,350,819	442
Northeast	151,405	816	159,953	34,986	200,994	36,079	164,354	41,604
Southeast	205,934	11,590	471,528	59,600	976,050	46,452	1,099,531	8,266
West	76,084	563	90,689	13,318	109,654	20,599	134,537	29,451
Total	1,070,516	58,978	1,610,127	147,096	2,473,400	103,404	2,749,241	79,763

into the RDB as four component files (enrollment, physician, facility, and pharmacy). Table 1 shows the total number of members enrolled in the 15 plans selected for this project, stratified by year, region, and type of insurance.

Analytic Approach
NACHRI

After obtaining a list of ICD-9 diagnosis codes used to define the pediatric UDA conditions of interest, researchers at NACHRI created an analytic file containing all inpatient discharges reported at member institutions for which a UDA diagnosis code appeared as a primary diagnosis for admission. Information was analyzed for FY 1999-2001. Data were imported into SPSS 4.0 (4), and available stratification variables were examined. Mean values and counts for these variables were compared with those provided by NACHRI to ensure data integrity after importation. One-way ANOVA was used to generate confidence intervals for frequencies and means of desired variables.

NNHS

The years of data evaluated for this dataset were 1995, 1997, and 1999, and the unit of analysis was the individual. The analytic approach follows that used for the nationally representative datasets, with the exception that urolithiasis, sexually transmitted diseases (STDs), and pediatric conditions were excluded due to small sample sizes.

VA-OPC

The VA-OPC file was used to identify all unique cases of each urologic condition. The event (SE) files of the OPC, which combine the diagnostic and procedural information, were used for generating these data. Three consecutive years of data, 1999 through 2001, were examined. A unique count of cases was generated by identifying the cohort of veterans with each qualifying ICD-9 code within each UDA urologic condition under review. Redundant cases (i.e., individual patients with more than one qualifying diagnosis code) were then eliminated in order to generate a count of unique cases. Two cohort files were created: prevalence estimates (1) by *first (or primary) diagnosis* and (2) by *all diagnosis* codes (i.e., any mention of eligible diagnostic codes from our case definition).

Given the size of the national VA utilization datasets, all initial diagnosis groups and linkage procedures were pilot-tested on *local regional data* to examine preliminarily the prevalence of the selected conditions for one year of data. An initial set of tables was created showing the national prevalence of the first four UDA conditions (benign prostatic hyperplasia, urolithiasis, urinary tract infection, and urinary incontinence) for *all diagnoses*. Prevalence rates were presented in total and by selected demographic characteristics (e.g., age, gender, race/ethnicity) and geographic features (e.g., region) as unique cases per 100,000 population of veteran users served by VA in fiscal year 2001 (October 1, 2000, through September 30, 2001). These analyses were then expanded to the other data years. The unit of analysis in the Austin Automation Center (AAC) SAS datasets is the patient. A patient who had more than one qualifying diagnosis code was counted as only a single case. Similarly, a patient with one or more of the qualifying diagnosis codes at more than one VA health care facility was counted only once. Prevalence rates were stratified by patient characteristics (i.e., age, gender, race/ethnicity, insurance status[3], and region).

Where possible, the VA sociodemographic categories (e.g., 10-year age groups for adults, such as 25–34, 35–44, etc.) were made consistent with those applied to the CMS data. Categories were regrouped as necessary to maintain adequate cell sizes for analysis.

The VA data represent the population of all veteran users of VA health care services during the years under study (pediatric cases are excluded from the VA database). Therefore, confidence intervals were included for the calculated rates. Denominator data were obtained for all veteran outpatient users and then refined, based on age, gender, or other restrictions of the UDA conditions, to generate unadjusted prevalence rates for the number of cases per 100,000 population.

The VA data presented are unweighted frequencies representing population prevalence rates among all veteran users of VA health care in a given fiscal year. No effort was made to weight veteran users of VA health care services to the total

Table 2. Base population of veteran users of VA health care and total veteran population by age, gender, and race/ethnicity

	Veteran Population			
	Veteran Users of VA Health Care (VA Outpatient Clinic file)			Total Veteran Population (US Census, 2000)[a]
	1999	2000	2001	2000
Total population	3,039,688	3,276,298	3,691,533	26,403,703[b]
Age groups				
18–24	25,328	23,526	23,033	16,740,194
25–34	150,809	142,082	135,854	
35–44	330,512	312,179	299,820	
45–54	689,196	716,638	753,251	
55–64	501,642	554,117	648,880	
65–74	758,809	825,990	950,660	9,663,506
75–84	536,269	643,466	801,677	
85+	49,123	58,305	78,358	
Gender				
Male	2,898,582	3,125,448	3,526,627	24,810,000
Female	141,106	150,850	164,906	1,593,000
Race/ethnicity				
White	1,366,295	1,472,022	1,610,947	21,888,669[c]
Black	333,719	342,547	354,807	2,561,159[c]
Hispanic	114,386	122,469	128,930	1,135,359[c]
Other	19,356	20,248	21,822	1,240,974[c]
Unknown	1,205,932	1,319,017	1,575,027	

[a]SOURCE: US Census 2000, Veterans (May 2003). Questions on veteran status asked, "Has this person ever served on active duty in the U.S. Armed Forces, military Reserves, or National Guard?" The question was followed by a note: "Active duty does not include training for the Reserves or National Guard, but DOES include activation, for example, for the Persian Gulf War." Response categories included the following:

•Yes, now on active duty

•Yes, on active duty in past, but not now

•No, training for Reserves or National Guard only • skip

•No, never served in the military • skip

[b]Veterans comprised approximately 12.7% of 208.1 million civilians 18 years and older in the US in 2000.

[c]Derived from U.S. Census table as 82.9% White alone (not Hispanic or Latino), 9.7% (Black or African American alone), 4.3% (Hispanic or Latino, of any race), 4.7% other (combined American Indian and Alaskan Native alone, Asian alone, Native Hawaiian and Other Pacific Islander alone, some other race alone, or two or more races) as a percentage of total veteran population in 2000. Note that the percentage for Hispanic includes any race because the available veteran census breakdown did not cross-tabulate race and ethnicity, yielding an overcount in these cells.

US veteran population. Table 2 presents denominator data on this base population analyzed in VA tables that appear in this compendium.

CHCPE

Records from component files maintained by the CHCPE were linked, using common fields such as member and physician identifiers and dates of service, as described below.

CHCPE enrollment records serve to track plan membership for billing premiums. The enrollment file includes date of birth, gender, and dates of enrollment and disenrollment. The physician file contains information submitted by physicians and other health care practitioners, using the CMS-1500 claim form. This file includes the member identifier, unique provider identifier, the service or procedure performed, up to four diagnosis codes, the place of service, billed amounts and payments, and the insurance product under which the service falls. Diagnoses are coded according to the ICD-9-CM, and procedures are coded using the Current Procedural Terminology (CPT™) coding system. The facility file contains information submitted by facilities, using the CMS-145 claim form. This file includes the member identifier, unique facility identifier, facility type, revenue codes, up to nine diagnosis codes, the place of service (inpatient, outpatient, ER, etc.), DRG payments, and the insurance product under which the service falls. As with physician claims, diagnoses are coded using ICD-9-CM codes, and procedures are coded using ICD-9-CM procedure codes or CPT-4 procedure codes. Claims from out-of-network facilities are included.

The period of analysis for the UDA project included 1994, 1996, 1998, and 2000. Analyses were conducted on members of 15 commercial and Medicaid health plans located in four regions (Midwest, Northeast, Southeast, West) of the United States. Data on commercial and Medicaid health plan members were reported separately, as these populations tend to differ in socioeconomic status.

SPECIAL NOTES ON THE SEXUALLY TRANSMITTED DISEASES CHAPTER

The datasets used extensively for other urologic diseases throughout this compendium (HCUP, CMS, VA, and NAMCS) describe hospital discharge data, inpatient and outpatient medical claims data, and health survey data. For sexually transmitted diseases (STDs), these datasets provide sparse, incomplete, or non-representative data on numbers of cases and patient visits (Table 2) and on patient visit rates (Table 3). Several databases did not capture services rendered to many Medicaid patients; uninsured patients; or patients attending public STD, prenatal, family planning, military, or other clinics that provide a substantial amount of STD care. The inpatient datasets are limited because they enumerate hospitalizations for conditions that rarely require hospitalization. We, therefore, used additional data from three other databases and from the published literature to obtain more reliable estimates of the burden of the STDs discussed.

National Electronic Telecommunications Surveillance System (NETSS)

The NETSS includes reports of all cases of notifiable diseases, including STDs, sent to CDC by state health departments. After removing personal identifiers, US states and territories report cases of *Chlamydia trachomatis* or *Neisseriae gonorrhoeae* infection, primary and secondary syphilis, HIV, and hepatitis B virus (HBV). This passive surveillance system has notifiable-disease regulations and is limited because of underreporting by clinicians and laboratories. Barriers to reporting include lack of awareness or priority given to public health reporting, patient or clinician concerns about violation of confidentiality for stigmatized diseases, lack of routine reporting systems, insufficient incentives, and administrative costs (5). Reporting by laboratories of cases confirmed by positive STD test results is far more complete than reporting of clinically diagnosed cases by clinicians. However, because of minimal variation in the level of completeness of such reporting from year to year, case reports provided to public health departments have historically been the best source of information about the temporal and geographic trends of STDs and the characteristics of infected persons (6, 7). Although a few states have had reporting requirements for herpes simplex infection, pelvic inflammatory disease (PID), and unspecified STDs (8), most states do not have reporting requirements for several STD pathogens, clinical manifestations, and syndromes for which etiologic causes or therapeutic interventions have only relatively recently been identified. These include HSV infections or genital herpes, HPV infections or their manifestations of genital warts and cervical dysplasia, and non-specific urethritis, epididymitis/orchitis, prostatitis, cervicitis, vaginitis, salpingitis, and STD-related skin disorders. In the NETSS, pathogen-specific codes, not ICD-9 diagnostic codes, are used.

National Disease and Therapeutic Index (NDTI)

The NDTI is a private survey of a random sample of office visits to US physicians in office-based practices, using ICD-9 coding. It allows estimation of the burden and trends of diseases that are not reported by states to the national surveillance systems; these diseases include genital HSV, genital warts, non-gonococcal urethritis, and trichomoniasis.

However, because the NDTI does not include visits to public health, hospital outpatient, or military medical facilities, it does not permit accurate estimates of the total number of consultations in the United States for these conditions. With ICD-9 codes for abstraction, NDTI data can be used to estimate the diagnosis-specific volumes of office visits to private practitioners for various STDs (including those of reportable diseases such as syphilis, gonorrhea, and chlamydial infection). Because the NDTI is a national survey based on a sample rather than on the entire universe of patient visits to physician offices, patient visits must be weighted to produce unbiased national estimates.

VA-OPC

Regarding analyses of VA data, medical visits for two syndromic conditions, epididymitis/orchitis and urethritis, were classified according to whether an STD pathogen was specified in any of the four listed ICD-9 codes. For example, the visit was classified as "epididymitis, organism specified" if the first four ICD-9 codes for a given outpatient visit included ICD-9 code 604 for orchitis or epididymitis as well as one of many ICD-9 codes for gonorrhea or chlamydia or if any of the first four ICD-9 codes were specific to gonoccocal epididymitis/orchitis (098.13 or 098.33). The medical visit was classified as "epididymitis, organism unspecified" if the first four ICD-9 codes for a given outpatient visit included ICD-9 code 604 for orchitis or epididymitis but did not include ICD-9 codes for gonorrhea or chlamydial infection or for gonoccocal epididymitis/orchitis (098.13 or 098.33).

In addition, to capture aspects of the burden of various STDs, we applied the ICD-9 codes in Table 3 to data from HCUP, MarketScan, Medicare (MEDPAR, Outpatient, and Physician-Supplier), and the VA (Inpatient and Outpatient). The burden of each STD examined (per 1,000 population) was stratified by demographic variables. The demographic variables considered in HCUP include sex, age, race/ethnicity, region, urban/rural, and expected primary source of payment. The demographic variables considered in Medicare include sex, age, race/ethnicity, region, and setting of care (inpatient, ambulatory). The demographic variables considered in MarketScan include sex, age, region, and urban/rural.

Additional analytic comments specific to each STD or condition evaluated are presented below.

Herpes

With MarketScan data, we evaluated the extent to which medical claims for genital herpes using ICD-9 codes can estimate the burden of the disease. Some care for genital herpes may not result in a diagnostic claim (ICD-9 code) for herpes but may result in a drug claim, e.g., to refill a prescription for a chronic condition. In addition, some clinicians may be reluctant to document a claim coded as genital herpes to protect the confidentiality of patient information. Therefore, we also analyzed claims for drugs (acyclovir, famcyclovir, and valacyclovir) used to treat genital herpes.

Genital Warts

Because MarketScan includes NDCs, we were able to evaluate the use of drugs for treating genital warts. We estimated claims for podofilox and podophyllin, two medications used almost exclusively to treat genital and perianal warts, regardless of ICD-9 codes assigned. We also estimated drug claims for imiquimod regardless of ICD-9 codes assigned, but only if the prescription was obtained from a urologist or gynecologist, since imiquimod is also commonly used for nongenital warts and other cutaneous lesions commonly managed by other clinical specialties.

A diagnosis of genital warts may be coded with ICD-9 code 078.11 (condyloma acuminata); this was the sole code used in routine analysis of data from HCUP, MarketScan, Medicare, and the VA. However, genital warts may also be coded with ICD-9 code 078.10 (wart - common, digitate, filiform, infectious, viral) or 078.19 (other specified viral warts - genital warts, verruca plana, verruca plantaris), two codes that are also used for nongenital warts. Using MarketScan data, we identified the proportion of those two codes that were likely to represent genital warts. We assumed that medical visits with ICD-9 code 078.10 or 078.19 were for genital warts if the CPT code (listed in Table 3) indicated that the patient had procedures related to destruction or excision of lesions of the anus, penis, vulva, perineum, vagina, or introitus. However, classifying only ICD-9 claims with these procedures as genital warts probably substantially underestimates the number of visits for genital warts;

Table 3. Codes used to identify additional medical visits for genital warts[a] in MarketScan data

Any persons having one of the following two ICD-9 Codes and at least one of the following CPT procedure codes:	
ICD-9 Codes:	
078.10	Viral warts unspecified
078.19	Other specified viral warts
and	
CPT Procedure Codes:	
00900	Anesthesia for procedures on perineal integumentary system
00902	Anesthesia for anorectal procedure
00910	Anesthesia for transurethral procedures
00920	Anesthesia for procedures on male genitalia
00940	Anesthesia for vaginal procedures
45100	Biopsy of anorectal wall, anal approach
45905	Dilation of anal sphincter under anesthesia other than local
45999	Unlisted procedure, rectum
46030-46999	Surgery of anus
52000-52318	Endoscopy-cystoscopy, urethroscopy, cystourethroscopy, transurethral surgery
53000-53899	Surgery for urethra
54000-55899	Surgery for male genital system
56350-56363	Hysteroscopy
56405-58285	Surgery for female genital system
74400-74485	Radiology, urinary tract
74710-74775	Radiology, gynecological and obstetrical

[a]A medical visit was identified as an additional visit for genital warts if the visit was associated with at least one of these ICD-9 codes and at least one of these CPT codes.

many warts do not require any medication or ablative procedures (and associated NDCs or CPT codes) because they do not create annoying symptoms or cosmetic problems. Restricting our analysis to warts that require ablative procedures may result in minimal estimates of the burden of warts that result in the highest health care costs.

Using NAMCS data from 1995–1996, we also estimated the burden of genital warts as follows. We classified medical visits that may or may not have been for genital warts into three groups: definite cases (having ICD-9 code 078.11); probable cases (having ICD-9 code 078.10 or 078.19 and having either NDCs for medication with podofilox, podophyllin, or imiquimod or CPT procedure codes for destruction or excision of lesions of the anus, penis, vulva, perineum, vagina, or introitus); and possible cases (having ICD-9 code 078.10 or 078.19 and no surgical procedure code).

Chlamydia

Using MarketScan data, which include NDCs and CPT codes, we estimated the burden of Chlamydia trachomatis using information on drugs for treating chlamydial infection and tests used to identify symptomatic *C. trachomatis* infection or to screen for asymptomatic *C. trachomatis* infection. First, we selected medical visits with any of the codes listed in Table 17 for nongonococcal urethritis or tests used for *C. trachomatis*. Then, we defined the selected visits as being for *C. trachomatis* infection if the date of drug claims was within 7 days before or 20 days after the date of the medical visit. The drug claims included amoxicillin, azithromycin, doxycycline, erythromycin, and ofloxacin, the drugs recommended by the Centers for Disease Control and Prevention (CDC) for treatment of uncomplicated, lower genital tract *C. trachomatis* infection in 1998 (9). Note that amoxicillin is a recommended regimen in the CDC's guidelines when pregnancy is a consideration and that the recommended drugs are not necessarily the same ones recommended for upper-tract infections such as pelvic inflammatory disease (PID).

Gonorrhea

Using MarketScan data, which include NDCs and CPT codes, we estimated the gonorrhea burden using information on drugs for treating gonorrhea and tests used to identify symptomatic gonococcal infection or to screen for asymptomatic gonococcal infection. First, we selected medical visits with the following codes: ICD-9 code V02.7 (carrier or suspected carrier of gonorrhea) or CPT codes 87590 (gonorrhea, direct probe technique), 87591 (gonorrhea, amplified probe technique), 87592 (gonorrhea, quantification), or 87850 (*N. gonorrhoeae*). Then, we identified the selected visits having a specific drug claim within 7 days before or 20 days after the date of the medical service claims. The drug claims included cefixime, ceftriaxone, ciprofloxacin, ofloxacin, or levofloxacin, the drugs recommended by the CDC for treatment of uncomplicated lower-tract gonococcal infection.

Syphilis

Data from HCUP, MarketScan, NAMCS, Medicare, and the VA were not useful for estimating the incidence of syphilis because the numbers of cases were too low to permit statistically reliable estimates. For example, in the VA data, an ICD-coded syphilis diagnosis was recorded for only 3 per 100,000 unique outpatients. Therefore, we used NETSS data, which include as variables sex, age, race/ethnicity, geographic region, and urban/rural, to estimate the incidence of primary and secondary syphilis. We included data only on individuals with primary and secondary syphilis because they are the most likely to be seen by urologists for genitourinary symptoms and signs. However, primary and secondary syphilis cases enumerated in national data include many symptomatic cases more commonly seen by family practitioners, internists, obstetrician/gynecologists, and dermatologists, as well as asymptomatic cases identified through routine serologic screening.

Epididymitis/Orchitis

To estimate the incidence of epididymitis/orchitis, we analyzed ICD-9 codes for epididymitis/orchitis not designated as due to chlamydia or gonococcus as well as all ICD-9 codes for epididymitis/orchitis associated with *C. trachomatis* or gonococcus. We took this approach because some patients could have both a diagnosis of the syndromic presentation of epididymitis/orchitis and a diagnosis of chlamydial or gonococcal epididymitis/orchitis. We applied the definitions to data from HCUP, MarketScan, and Medicare. Epididymitis/orchitis data from the VA were available in dichotomous categories of organism specified (e.g., chlamydia, gonorrhea, other) and organism unspecified; there is no ICD-9 code to describe orchitis without epididymitis in which the organism is not specified. With HCUP, MarketScan, Medicare, and VA data, the same variables were explored as those considered for genital herpes (see above).

Urethritis

To estimate the incidence of urethritis, we analyzed the available data for urethritis not designated as due to *C. trachomatis* or gonococcus as well as aggregate data for all ICD-9 codes for urethritis, including those for *Chlamydia* or gonococcus, listed in Table 1. We took this approach because some patients could have both a diagnosis of the syndromic presentation of urethritis and a diagnosis of gonococcal or chlamydial urethritis. We applied the definitions to data from HCUP, MarketScan, and Medicare. Inpatient and outpatient VA data report urethritis in dichotomous categories of organism specified (e.g., gonococcal, chlamydial, other) and organism unspecified. With HCUP, Medicare, VA, and MarketScan data, the same variables were explored as were considered for genital herpes (see above).

ESTIMATING COSTS ASSOCIATED WITH UROLOGIC DISEASES

MarketScan and Ingenix Data

General Methodology for Estimating Costs

Most cost-of-illness studies distinguish between the direct costs of treating a medical condition and the indirect costs associated with lost work days, reduced quality of life, and premature mortality. Direct costs typically include expenditures for medical treatments, such as hospitalizations, emergency care, ambulatory visits, nursing home and home health care, medical supplies, prescription drugs, and other services provided by medical professionals. Indirect costs usually refer to disability days, work loss, and other labor-market consequences associated with medical illness.

In this analysis, we were interested in costs as a dollar-denominated measure of resource utilization. Costs are closely linked to other important financial concepts, including charges, out-of-pocket expenses, and payments. These other concepts are more easily measured and can be used to approximate costs, but they are not necessarily equivalent. Since the majority of the databases we examined lacked cost information, direct medical costs were imputed by assigning prices to a comprehensive list of utilization and services. Prices of medical services and pharmacy claims were estimated based on average payments made by the enrollee (co-payments, deductibles, excluded expenses) and by all third-party payers (primary and secondary coverage, net of negotiated discounts). The sources of utilization data were national surveys and claims records.

Deriving reliable estimates of indirect costs requires detailed information rarely included in survey data or medical claims. Even when these data are available, converting outcomes such as premature mortality, disability days, and productivity losses into costs requires a set of assumptions about the causal effects of the illness, future wage rates and retirement decisions, and the value of time for heterogeneous patient populations. The available evidence suggests that these underlying assumptions have a considerable effect on the magnitude and reliability of the cost estimates. Because of these limitations, the indirect costs of urologic conditions were not estimated. Rather, administrative data from a large number of employers were used to impute the average work loss associated with each condition.

A key issue in cost-of-illness studies is the determination of how to attribute costs to a specific condition in an appropriate and consistent way. Ideally, one would like to capture the costs of treating a urologic condition regardless of the primary diagnosis attached to the service. For estimation purposes, this means *excluding* treatment costs of other conditions incurred during a visit or hospitalization for a urologic illness and *including* urology-related costs that are secondary to the primary diagnosis. Medicare claims data permit this level of detail, reporting reimbursements associated with each unit of service, or "line-item." However, this level of specificity is not available in most claims-based datasets and surveys. Thus for the non-Medicare population, average expenses per unit of service were estimated solely on the basis of hospitalizations or visits with a primary diagnosis of a specific urologic condition. This approach overstates average expenditures by including treatment costs of non-urologic conditions. At the same time, it understates reimbursements by excluding costs of urologic conditions that are secondary to the principal diagnosis. The net effect of this measurement error is uncertain, but it is unlikely to constitute a large fraction of the total economic burden of each condition.

Measuring Direct Costs

Measuring resource costs depends on having appropriate measures of both utilization and unit cost. Medical expenditures were estimated by assigning prices to a comprehensive list of utilization and services. For the non-Medicare population, average prices of a hospitalization, an ER admission, a hospital outpatient visit, and a physician office visit were imputed, based on average payments reported in the 1996–1998 MEPS. In cases where MEPS lacked adequate statistical power to reliably estimate prices for specific services, average payments from a large administrative database of private employers or Medicare claims were imputed. Average prices for outpatient prescription drugs were based on published compilations from First Data Bank (10) and *RedBook* (11).

Medicare claims from 1992 through 1998 were used to impute average annual growth rates in expenditures over this period. These rates were then applied to 1996–1998 prices derived from MEPS. All expenditures for medical and pharmacy services were reported in nominal dollars.

National surveys and claims-based databases were relied upon for deriving estimates of medical service utilization by the non-Medicare population, where the data source depends on the type of service provided (Table 4).

Medicare claims were used to estimate utilization and average reimbursements for the Medicare population. Medicare does not provide full coverage for all services. Moreover, beneficiaries pay

Table 4. Primary data source for medical care utilization (non-Medicare population)	
Type of Service	**Primary Data Source**
Hospital inpatient	HCUP
Hospital outpatient	NHAMCS
Emergency room	NHAMCS
Physician office	NAMCS
Outpatient prescription drugs	MEPS
Nursing home	NNHS

deductibles and co-insurance expenses under Part A and Part B, and these expenses are not included in the Medicare claims. In order to capture these costs, the recommendations of CMS' Office of the Actuary were followed: Part A payments were inflated by 8%, and Part B payments were inflated by 38% (12).

Computing Work Absences

The MarketScan Health and Productivity Management (HPM) database was used to derive the average work loss associated with each condition. The HPM data are collected through employer payroll systems and include detailed information on when employees are out of work, the number of hours missed, and the reasons for the absences. Reasons for absence include sickness, disability, vacation, and other types of leave. The absence data are linked to eligibility files and medical claims to estimate hours of work loss associated with each condition.

Assigning work absences to specific medical treatments required a complex algorithm using all three databases. In general, the dates of an ambulatory visit or an inpatient stay for a specific urologic condition were matched to the individual's absence data. Absences associated with a hospitalization included any work loss reported between the admission and discharge dates, including days contiguous to those dates. For example, if a person was admitted to the hospital on June 1 with a primary diagnosis of upper tract urolithiasis and was discharged on June 5, any sick time or short-term disability in that period, as well as on contiguous days prior to June 1 or after June 5, was counted. Any work loss on June 7 was not included, however, in the absence of work loss on June 6.

As underscored by this example, appropriately assigning absences to specific treatments is very difficult. Therefore, a set of decision rules and exclusion criteria were established for computing these estimates. The most important criteria were the following:

1. To be included, persons had to be fully enrolled in the health plan throughout the year and had to have an inpatient or outpatient medical claim for a specific urologic condition.
2. Individuals in the top 0.5% of total absences during the year and persons on long-term disability or COBRA were excluded.
3. Work absences were capped at 12 hours if the beginning and end dates of the absence were the same.
4. If two outpatient visits occurred in the span of one absence, then hours absent before the first visit counted toward the first visit, and hours absent after the second visit counted toward the second visit. The hours of work lost between the visits counted toward the closest visit. In the event of a tie, the hours were assigned to the first visit. For example, consider an employee absent from work due to sickness from January 1 to January 10, with physician office visits on January 3 and January 7. In this case, work hours missed between January 1 and January 5, were assigned to the first visit and hours missed between January 6 and January 10 were assigned to the second visit.
5. Short-term disability hours for persons whose start date coincided with a hospital admission and for whom there was a return-to-work date were included.
6. Work absences associated with outpatient visits were calculated in two ways. The first method included absences contiguous to the date of the visit. The second approach excluded contiguous dates. For example, the first method would count a work absence on Wednesday associated with a medical visit on Tuesday. The second approach would not count Wednesday's work loss unless there was also an absence on Tuesday.

Computing Costs at the Individual Level

The Ingenix data were used to estimate the incremental medical costs incurred by persons with urologic conditions. The data link medical and pharmacy claims to health plan benefits for more than 275,000 primary beneficiaries 18 to 64 years of age with employer-provided insurance. Individuals with an inpatient or outpatient claim for specific urologic conditions were identified. Multivariate regression models were used to predict medical and pharmacy spending in 1999 for persons with and without a particular condition, controlling for differences in patient demographics, health status, and insurance coverage.

The primary outcomes of interest included annual medical and pharmacy expenditures for each person. Expenditures consisted of total annual payments made by the enrollee (co-payments, deductibles, excluded expenses) and by all third-party payers (primary and secondary coverage, net of negotiated discounts) for medical services and outpatient prescription drug claims.

The covariates included a set of variables to describe the medical and drug benefits, including individual plan deductibles, co-payments or co-insurance rates, and a binary indicator for plan type (FFS, PPO, POS, HMO). Other covariates included age, sex, work status (active or retired), urban residence, and median household income in the zip code of residence. Observed differences in comorbid conditions were controlled for, based on ICD-9 diagnostic codes from the medical claims files. The medical claims were used to identify individuals treated for any of 26 chronic conditions, including hypertension, diabetes, congestive heart failure, asthma, and depression, and included a binary indicator for each condition.

The statistical analyses used a two-part model. The first part of the model used probit regression to estimate the probability that a member of the study sample had at least one medical or pharmacy claim. The second part of the model used a generalized linear model with a logarithmic link function to estimate the level of spending among members with at least one claim for the outcome of interest.

The two parts of the model were combined to predict average annual spending for persons with and without a urologic condition, controlling for other factors known to affect utilization. Specifically, estimates from the first part of the model were used to predict the probability of nonzero expenditures for persons with and without a specific urologic condition. Similarly, the second part of the model was used to predict expenditures, conditional upon having at least one claim, for each of the two groups. Total expenditures were calculated as the product of the two parts of the model and were averaged over all individuals in the sample, both those with and those without a urologic condition.

LIMITATIONS

We found that for many urologic conditions, population-based datasets contained limited information on true prevalence. Many conditions were not studied in prevalence surveys or were studied in a limited fashion. To buttress our analysis, we turned to published estimates of prevalence and incidence drawn from specific population-based studies focusing on various urologic conditions. For de novo analyses, we relied heavily on datasets that use administrative coding systems such as the ICD-9-CM to identify disease burden. Reliance on such administrative codes can result in both underestimation and overestimation of utilization, depending on the sensitivity and specificity of the disease code in question.

DATA QUALITY

A systematic approach was developed to evaluate the quality of the data generated for this project. A multitiered effort was made to ensure that the data met a high level of accuracy and consistency throughout. Data generated from each database were subjected to multiple levels of examination.

The first level of review required confirmation that the base populations used for each database were correct for each condition being evaluated (e.g., the population at risk for BPH included only males aged 40 years and older, whereas both sexes are at risk for STDs). Also, the total frequencies were checked to ensure that they were correctly reported (e.g., that there was no double counting of cases).

Next, individual frequencies were evaluated within patient subgroups to ensure that the counts were appropriate. Any numbers that appeared inconsistent were flagged for a programmer to recheck and review. For example, one would not expect to find greater incidence of a particular condition among divorced persons than among married persons, and this inconsistency might be identified for further review.

Third, the rates were compared over all years for which data were available. This allowed for an evaluation of whether any unusual rates were reported for a particular year or service. Any rates that appeared out of range were flagged for further review. To this end, a comprehensive literature review was performed using the relevant disease search terms. Rates generated from the datasets were compared with published estimates, and clinical experts adjucated whether discrepancies signaled analysis errors. Also, confidence interval calculations were reviewed to ensure that they were within the appropriate range for all rates reported.

For the next level of verification, a mean-annual-payment summary table was produced to compare payments across years and services. Again, any payments that appeared out of range were flagged for further evaluation. In many cases, a small sample size explained a wide variation in reported payments

Finally, summary base population tables were generated for all conditions and years. These tables were examined to ensure that the sum of subpopulations equaled the base population for any given year, and that the correct base populations were used for each year.

This systematic approach to reviewing data quality successfully uncovered issues that were later remedied at all levels of evaluation.

Table 4. Databases selected for analysis

Database	Acronym	Category	Purpose
Centers for Medicare and Medicaid Services - Medicare Provider Analysis and Review	CMS - MEDPAR	Medicare	Records of hospital inpatient services for Medicare beneficiaries
Centers for Medicare and Medicaid Services - Carrier File	CMS - Carrier	Medicare	Claims submitted by non-institutional providers for Medicare beneficiaries
Centers for Medicare and Medicaid Services - Outpatient File	CMS - Outpatient	Medicare	Claims submitted by institutional outpatient providers for Medicare beneficiaries
Centers for Medicare and Medicaid Services - Denominator File	CMS- Denominator	Medicare	Demographic and enrollment information on Medicare beneficiaries
Healthcare Cost and Utilization Project - Nationwide Inpatient Sample	HCUP - NIS	Health care utilization and cost	National sample of inpatient stays and hospitalizations
National Ambulatory Medical Care Survey	NAMCS	Health care utilization and cost	National sample of ambulatory care utilization
National Hospital Ambulatory Medical Care Survey - Outpatient and Emergency Room Components	NHAMCS - OP NHAMCS - ER	Health care utilization and cost	National sample of ambulatory care services in hospital emergency and outpatient departments
Medical Expenditure Panel Survey	MEPS	Health care utilization and cost	National sample of health care use, expenditures, and sources of payment
National Association of Children's Hospitals and Related Institutions	NACHRI	Target populations	Pediatric inpatient stays at member hospitals only
National Nursing Home Survey	NNHS	Target populations	National sample of nursing homes, the providers of care, and their residents
Department of Veterans Affairs - Outpatient Clinic Files	VA - OPC	Target populations	National sample of veterans and outpatient services utilization
MarketScan Health and Productivity	MarketScan	Cost of disease	Fortune 500 company inpatient and out-patient
Management Database			Medical claims providing productivity and pharmacy data for employees and their dependents
Ingenix Database	Ingenix	Cost of disease	Medical claims database providing utilization and cost data for 75 large em-ployers

APPENDIX A: TECHNICAL PROGRAMMING FOR MEDICARE DATA

This appendix describes the process by which data from the Medicare MEDPAR, carrier, and outpatient files were combined to assign number of visits and costs to five separate types of service: inpatient stays, physician office visits, hospital outpatient visits, ambulatory surgery visits, and emergency room (ER) visits.

The MEDPAR files contain summary records for all stays. The carrier and outpatient files contain a 5% random sample of the Medicare population. The same 5% sample of stays was used in building the files for this research effort[4]. The carrier file contains detailed information at the line-item level, which provided information on payment and place of service by line item[5]. Therefore, the carrier records were processed by line item rather than claim for this project. The outpatient file also contains detailed information, but not about payments or place of service[6].

An iterative process was used to build the analysis files. First, inpatient stays were identified, using MEDPAR records. Next, ER, outpatient surgery, and ambulatory surgery visits shown in the outpatient file were defined and selected, using appropriate revenue center codes. Finally, the line items and outpatient records that were not facility charges were matched to these visits and inpatient stays, using the following procedure: (a) person and exact dates of service were matched; (b) unassigned line items and outpatient records were assigned, using place of service and date ranges; (c) remaining line items with place of service listed as office and procedure codes with a range of 99024-99058 or 99199-99999 became the physician office visit core records; payments from other line items with the same patient identifier, provider, and date of service were added to these physician office visit records; and (d) payments from any line item or facility records that had not yet been assigned were aggregated by place of service. These "orphan" payments were included only in the calculation of cost per visit.

CREATING THE FILES

The Inpatient Analysis File

Inpatient stays were identified in MEDPAR as those stays in which a UDA diagnosis was the primary diagnosis. This number is the count of inpatient stays for the UDA utilization tables. All other data added to the stay were used to track payments that were occasioned by the stay.

Assigning Payments from Carrier Line Items to Inpatient Stays

Line items were matched to stays, using person identifiers and dates of service. Each stay had an admission date and a discharge date. Each line item also had a begin date and an end date (although for most line items they were equivalent). The rules for assigning line item payments to stays varied by whether the line item matched the admission date, the discharge date, or a date in between (or an interim stay date).

Payments from any line item that matched a person and an admission or interim stay date were assigned to the stay. Payments from line items that matched a person and discharge date and had place of service equivalent to inpatient or ambulance were assigned to the stay. Payments from any line item with a place of service equivalent to emergency room that matched a stay on admission date or any interim dates were included with the stay. If the line item also matched an emergency room facility, the payments were included with the emergency room visit.

Matching Outpatient Files with Inpatient Stays

Outpatient claims were matched to inpatient stays using HICs[7], inpatient admission and discharge dates, and outpatient begin and end dates. Outpatient dollars were added to the inpatient stay if at least one of the following rules was met:

- The outpatient claim began and ended between (or including) the inpatient admission and discharge dates.
- The outpatient claim began during an inpatient stay and ended after the stay.
- The outpatient claim began and ended on the inpatient admission date.
- The outpatient claim began and ended on the inpatient discharge date.

An outpatient claim with an ER revenue center "flag" that occurred on the same day as an admission date counted both as an ER visit in the ER facility of service and also had its associated dollars rolled into the inpatient stay. In other words, it was double-counted.

Facility claims matching the discharge date of one stay and the admission date of a second stay were assigned to the second stay. These were generally ambulance services related to hospital transfers.

Inpatient payments were inflated by 8% (12) to account for deductible expenses.

The Hospital Outpatient, Ambulatory Surgery, and ER Analysis Files

Each of these files was created using the revenue center codes found on the claims. The reason for the visit to one of these places of service was determined by the UDA condition found at the revenue center, not on the condition shown in data imported from the carrier file.

The revenue centers used to define a *hospital outpatient visit* were:

- Clinic-general classification
- Clinic-chronic pain center
- Clinic-psychiatric
- Clinic-OB-GYN
- Clinic-pediatric
- Clinic-urgent care
- Clinic-family practice
- Clinic-other

- Free standing clinic-general classification
- Free standing clinic-rural health, clinic
- Free standing clinic-rural health, home
- Free standing clinic-family practice
- Free standing clinic-urgent care

The revenue centers used to define an *ambulatory surgery visit* were:

- Ambulatory surgical care-general
- Ambulatory surgical care-other
- Operating room services-general classification[8]
- Operating room services-minor surgery[8]
- Operating room services-other operating room services[8]

The revenue centers used to define an *emergency room visit* were:

- Emergency room-general classification
- Emergency room-EMTALA[9] emergency medical screening services
- Emergency room-emergency room beyond EMTALA screening
- Emergency room-urgent care (effective 10/96)
- Emergency room-other

If an individual had two ER visits on the same day, they were counted as separate encounters.

There could be up to 45 revenue centers on a single outpatient claim record. For some claims, the revenue center fell into more than one facility of service. They were then assigned to the appropriate facility of service based on their HCPCS[10] codes.

Physician services were next drawn from the line-item file (carrier), and the payments associated with these services were assigned to an emergency room visit, hospital outpatient visit, or ambulatory surgery visit, using place of service, HIC, and exact date matches, as follows.

Payments from line items that matched an ER visit by person and exact date and had a place of service that included ER, ambulance, or independent laboratory or had a CPT code ranging from 99281 to 99285 were assigned to the emergency room facility of service. Payments from line items that matched a hospital outpatient visit by person and exact date and had a place of service that included outpatient hospital, ambulatory surgery center, ambulance, or independent laboratory were assigned to the hospital outpatient facility of service. Similarly, payments from line items that matched an ambulatory surgery visit by person and exact date and had a place of service equivalent to outpatient hospital, ambulatory surgery center, ambulance, or independent laboratory were assigned to the ambulatory surgery facility of service.

The remaining line items on the carrier file that had a place of service that included inpatient, ER, outpatient, or ambulatory surgery were examined. The number of days between each line item and each visit for a person were reviewed, and payments for remaining line items (most of which were laboratory services) were matched to the payment total for the type of service encounter that occurred closest in time to the date of the line item[11]. For example, the payment for a line item with a place of service listed as hospital outpatient that occurred within seven days of a hospital outpatient visit was added to the grand total of all hospital outpatient payments, but was not assigned to the cost of that particular visit. The mean payment for a hospital outpatient visit would be calculated by dividing the grand total for all hospital outpatient payments by the total number of hospital outpatient visits. If the nearest date for a service encounter was more than seven days from the date of the line item, the line item was dropped from further analysis.

The Physician Office Analysis File

After the above steps were performed, the remaining line items, having procedure codes equivalent to 99024–99058 or 99199–99999, formed the core physician office visit file. Payments from any line items from the carrier file or remaining facility records from the outpatient file that matched by patient, provider, and exact date of service were added to this visit file.

Remaining Carrier and Outpatient Payment Items

Remaining facility records that were not matched in the steps outlined above were matched to ER visits, hospital outpatient visits, or ambulatory surgery visits based on exact date of service. Payments from these facility records were added to the payment total for the relevant visit. If a record matched more than one such place of service, its payment amount was split between them. All remaining ambulance service revenue center payments were added to the total payments for ER visits. All radiation therapy revenue center payments were added to the total for hospital outpatient visits.

The remaining facility records were those that did not match a place of service by exact date, and hence were considered "orphan" records. These records payments were added to the established total payments for physician office visits, ambulatory surgery visits, hospital outpatient visits, and ER visits by HIC to the nearest date of service, using the following rules:

- Any facility records more than seven days from an existing date of service were deleted.
- Matches were allowed to the ER only by plus or minus one day.
- Records that matched more than one place of service by the same number of days were assigned in the following order: physician office, hospital outpatient, ER, ambulatory surgery.

Counts—Units of Analysis

Counts presented in the tables of this compendium are claims for each type of service. An individual could be counted more than once in each table if he or she had multiple events during the year. Within each facility of service, group counts, as well as payments, were tabulated for all persons and were stratified by age group, gender, race, and region. Gender and race codes used were those found on the claims record. The age category was derived from the age recorded on the claim record. The region code used was the census region, with claims re-coded to region, using the state of residence.

Calculation of Denominators

Denominators for tables were derived from the CMS denominator file. This file includes the entire Medicare-eligible population and contains one record for each individual. Data from the denominator file can be linked to all other CMS files, using a unique identifier (ID) common to all files. In addition to eligibility status, the denominator file contains information about HMO membership. Individuals who were members of an HMO at any time during a year were dropped from the analysis because HMO claim records contain no payment information.

Weighting

The carrier file and the outpatient file are simple 5% random samples of the Medicare-eligible population. The sample was drawn using the last two digits of enrollees' SSNs. Individuals were selected from the 100% MEDPAR and denominator files, using the same criteria. National estimates presented in the tables were obtained by multiplying counts by a constant weight of 20 to represent the entire Medicare-eligible population.

Computing Confidence Intervals for Proportions

Ninety-five percent confidence intervals were calculated using the normal approximation to the binomial distribution (2). The confidence interval is

$$(p- 1.96\ \mathrm{sqrt}(pq/n),\ p + 1.96\ \mathrm{sqrt}(pq/n))$$

where p is the estimated proportion of interest, q=1-p, n is the number of observations, and sqrt refers to the square-root function.

APPENDIX B: SUMMARY OF DATASETS

Centers for Medicare and Medicaid Services (CMS)

Sponsor:
Robyn Thomas, Director
Division of Quality Coordination and Data Distribution (DQCDD)
OIS/EDG/DQCDD N1-15-03
Centers for Medicare and Medicaid Services (CMS)
7500 Security Blvd.
Baltimore, MD 21244-1850

Design: The Medicare dataset contains a number of files, including the Medicare provider analysis and review (MEDPAR) file, the carrier file, the outpatient file, and the denominator file. The *MEDPAR file* contains records for Medicare beneficiaries who used hospital inpatient services during the given year. Each record summarizes a stay. The *carrier file* contains final action claims data submitted by non-institutional providers, such as physicians, physician assistants, nurse practitioners, and standalone ambulatory surgical centers. Each observation in this file is at the claim level. The *outpatient file* contains final action claims data submitted by institutional outpatient providers, such as hospital outpatient departments, rural health clinics, and outpatient rehabilitation facilities. The unit of observation is also at the claim level. Finally, the *denominator file* contains demographic and enrollment information about each beneficiary enrolled in Medicare during the calendar year.

Time Frame: Data are available for 1991 through 2000, except in the denominator file, which contains data for 1984 through 2000. The years of data used for the conditions evaluated in this compendium were 1992, 1995, and 1998.

Sample Size: The MEDPAR dataset contains 100% of the Medicare beneficiaries and contains approximately 11 million records annually. For our analyses, a 5% MEDPAR sample was used. The carrier and outpatient dataset samples we used were based on a 5% simple random sample of the HIC numbers from each database. The carrier file contains

30 million records, and the outpatient file contains 5 million records

Use: MEDPAR provides in-depth information on all Medicare beneficiaries, including information on their diagnoses and procedures, along with a breakdown of charges for the year.

Benefits: Longitudinal tracking is possible, given the continuous data collection and large sample size. The detailed breakdown of charges allows for calculation of expenditures over a given year. The database also includes multiple diagnosis/procedure codes, thereby allowing for a more detailed level of analysis of charges associated with the urologic conditions under review.

Limitations: These data contain limited demographic information. Most beneficiaries are at least 65 years of age.

Healthcare Cost and Utilization Project (HCUP)—Nationwide Inpatient Sample (NIS)

Sponsor:
Healthcare Cost and Utilization Project (HCUP) — Nationwide Inpatient Sample (NIS)
Agency for Healthcare Research and Quality
HCUP Central Distributor
Social and Scientific Systems
8757 Georgia Ave., 12th Floor
Silver Spring, MD 20910
(866) 556-4287

Design: The Nationwide Inpatient Sample (NIS) is a subsample of the State Inpatient Databases (SID). NIS represents a 20% sample of hospital discharges from SID that includes all ages. The database utilizes a nationally representative stratified sample of approximately 6 million to 7.5 million records for the time period analyzed in this study.

Time Frame: The database contains data for 1988 through 2000.

Sample Size: Initially, the database covered only eight states; it has since grown to 28 states. It contains discharge data from 994 hospitals, approximating a 20% stratified sample of US community hospitals. The 2000 sample of hospitals comprises about 80% of all hospital discharges in the United States.

Use: Data on hospital inpatient stays can be used to identify, track, and analyze national trends in access, charges, quality, and outcomes and is the only national hospital database with charge information on all patient stays, regardless of payer.

Benefits: This large, nationally representative sample allows for the evaluation of trends over time. It can also be used to evaluate rare conditions and special populations (e.g., pediatric), and it includes charge information on all patient stays.

Limitations: Only hospitalizations are included, thereby limiting the types of service that can be analyzed. However, it may be possible to document change from inpatient to outpatient care over the years if HCUP is combined appropriately with other databases.

Ingenix

Sponsor:
Ingenix Health Intelligence
Corporate Headquarters
2525 Lake Park Blvd.
Salt Lake City, UT 84120

Design: This database contains a subset of claims, utilization, and cost data from 75 large employers.

Time Frame: The available data are for 1997 through 1999.

Sample Size: The dataset includes approximately 1.8 million enrolled employees and their dependents.

Use: The medical claims data provide detailed financial information, as well as dates of service, diagnosis and procedure codes, types of facility, and providers. Drug claims include prescription fill date, patient and plan costs, and, in most cases, national drug codes (NDCs). Claims data contain records for only those who used services.

Benefits: This claims-based dataset captures all health care claims and encounters for employees and their dependents and includes detailed information on both medical and prescription drug costs.

Limitations: The longitudinal data are available for only a subset of firms.

MarketScan

Sponsor:
Medstat
777 E. Eisenhower Parkway
Ann Arbor, MI 48108
(734) 913-3000

Design: The MarketScan dataset is a collection of integrated inpatient and outpatient medical claims data and encounters; prescription drug, enrollment, and eligibility information; and productivity data. Claims are collected from employers who record corresponding employee absenteeism data and disability claims. Age, gender, and regional distribution of patients are available.

Time Frame: Only one year of data, 1999, is presently available for analysis.

Sample Size: This is a proprietary dataset of claims data from 100 health plans serving Fortune 500 employers. It includes data on 800,000 covered lives and approximately 340,000 employees.

Use: This dataset enables the evaluation of productivity and pharmacy data and associated medical claims information.

Benefits: MarketScan is a unique source of information on the indirect costs of a variety of urologic illnesses. It contains productivity and pharmacy data as well, and cases may be followed longitudinally.

Limitations: MarketScan data are not nationally representative. The database covers a working population, which is not necessarily similar to other patient populations. Issues related to the "healthy worker effect" might also be present (i.e., a healthier subset of people in the general population are more likely to work).

Medical Expenditure Panel Survey (MEPS)—Household Component

Co-Sponsors:
Agency for Healthcare Research and Quality (AHRQ) and National Center for Health Statistics (NCHS):

Agency for Healthcare Research and Quality
8757 Georgia Ave.
Silver Spring, MD 20910
(866) 556-4287

National Center for Health Statistics
Centers for Disease Control and Prevention
Division of Data Services
3311 Toledo Road
Hyattsville, MD 20782
(310) 458-4636

Design: MEPS is a nationally representative survey of health care use, expenditures, sources of payment, and insurance coverage for the US civilian noninstitutionalized population. It is designed to yield comprehensive data for estimating the level and distribution of health care use and expenditures, monitoring the dynamics of health care delivery and insurance systems, and assessing health care policy implications. The database continuously collects medical expenditure data at both the person and the household level, using an overlapping panel design. Two calendar years of data are collected from each household in a series of five rounds. These data are then linked with additional information collected from the respondents' medical providers, employers, and insurance providers. The series of data collection activities is repeated each year on a new sample of households, resulting in overlapping panels of survey data in 195 communities across the nation.

Time Frame: Data have been collected five times a year from 1996 to the present.

Sample Size: 10,000 families, or approximately 24,000 individuals.

Use: This national probability survey provides information on the financing and utilization of medical care in the United States. The household component collects information on demographics, health conditions, health status, payments, access to care, satisfaction with care, insurance, income, and employment. These data are collected at the person and the household level over two calendar years and are then linked with additional information collected from the respondents' medical providers, employers, and insurance providers.

Benefits: The database contains longitudinal data for the core survey components. The medical provider component supplements and validates self-reported information in the household component.

Limitations: Because it is a household sample, MEPS may include data on only a few urologic illnesses. In addition, conditions may be underreported if one household member responds for others in the household and is unaware of some illnesses.

National Association of Children's Hospitals and Related Institutions (NACHRI)

Sponsor:
National Association of Children's Hospitals and Related Institutions
401 Wythe Street
Alexandria, VA 22314
(703) 684-1355

Design: This dataset records information on all pediatric inpatient stays at member hospitals.

Time Frame: Data have been collected annually since 1999.

Sample Size: The dataset contains information on approximately 2 million pediatric inpatient discharges. Fifty hospitals located in 30 states participated in 1999, 55 participated in 2000, and 58 participated in 2001.

Use: Data are collected on the age, race, sex, and ICD-9 principal diagnosis of each pediatric inpatient cared for at participating facilities. Additionally, information is collected on length of stay, total charges, and cost-to-charge ratio.
.

Benefits: Because it collects data from children's hospitals, the NACHRI dataset provides a unique opportunity to study the inpatient burden placed on the health care system by relatively uncommon pediatric urologic conditions. The dataset is rigorously edited and cleaned to ensure data quality.

Limitations: Because NACHRI collects data from specialized facilities, information regarding such topics as length of stay, patient demographics, treatment, and costs may not be representative of the national experience.

National Ambulatory Medical Care Survey (NAMCS)

Sponsor:
National Center for Health Statistics
Centers for Disease Control and Prevention
Division of Data Services
3311 Toledo Road
Hyattsville, MD 20782
(310) 458-4636

Design: Data are collected from non-federally-employed physicians engaged in direct patient care (this excludes anesthesiology, radiology, and pathology) during a randomly assigned one-week reporting period. The physicians are selected on the basis of a national probability sample of office-based physicians. During the reporting period, data are gathered on an encounter form that records a systematic random sample of visits per physician. Data collected include patients' symptoms, physicians' diagnoses, and medications either ordered or provided to the patient.

Time Frame: The survey was conducted annually from 1973 through 1981 and once in 1985; it has been conducted annually since 1989.

Sample Size: The sample size for the years of data evaluated in this compendium ranges from 1,200 to 1,700 physicians and 23,000 to 35,000 patient visits annually.

Use: The data provide information about the provision and use of ambulatory medical care in the United States.

Benefits: This database may be considered nationally representative, since it has a multistage probability design and captures the physician subspecialties that may encounter urologic conditions. Also, this database may identify a number of urologic conditions (e.g., UTI, BPH) that might otherwise go unreported because many of them are identified on the basis of office visits alone.

Limitations: There are no identifiers to track patients longitudinally. Also, some rare pediatric conditions may be missed because of the limited number of visits reported. The number of urologists sampled may be small for specific analyses. There are no cost data, and there may be more than one record per person because the data report the number of *patient visits*, not the number of *patients*.

National Health and Nutrition Examination Survey (NHANES)

Sponsor:
National Center for Health Statistics
Centers for Disease Control and Prevention
Division of Data Services
3311 Toledo Road
Hyattsville, MD 20782
(310) 458-4636

Design: NHANES is a continuing series of national sample surveys of households and household members in 50 states.

Time Frame: NHANES-III was conducted from 1988-1994. NHANES is currently a continuing survey, with the latest data release covering 1999-2000.

Sample Size: The sample for NHANES-III includes approximately 33,994 respondents, age 2 months and older.

Use: The survey allows collection of data regarding urologic diseases and symptoms that can be used to generate true national prevalence for these diseases and symptoms during the time period covered in the survey.

Benefits: The data are unique in that they allow for nationally-representative estimates of the prevalence of certain urologic conditions.

Limitations: This survey asks about relatively few urologic conditions. The subjects self-report regarding medical history is subject to error.

National Hospital Ambulatory Medical Care Survey (NHAMCS)

Sponsor:
National Center for Health Statistics
Centers for Disease Control and Prevention
Division of Data Services
3311 Toledo Road
Hyattsville, MD 20782
(310) 458-4636

Design: These data are collected in order to provide a better understanding of the utilization and extent of ambulatory care services in hospital emergency and outpatient departments. Data are collected on a national sample of emergency department and outpatient visits, excluding federal, military, and VA hospitals. The database uses a four- stage probability design: First, a sample of geographic areas is defined. Second, a sample of hospitals is identified within these areas. Third, clinics are selected within these hospitals. And fourth, patients are selected on the basis of their visits to these clinics.
A patient record form is completed by hospital staff during a randomly assigned four-week period.

Time Frame: The data have been collected annually since 1992.

Sample Size: The sample size for the years of data evaluated in this compendium is in the range of 22,000 to 30,000 patient visits annually.

Use: The data describe utilization and provision of ambulatory care services in hospital emergency and outpatient departments (excluding federal, military, and VA hospitals).

Benefits: The survey covers a nationally representative multistage probability sample, which includes a pediatric population and contains data on genitourinary care in ERs. Other reported data include demographic characteristics of patients, expected source(s) of payment, diagnoses, medication, and certain characteristics of the hospital, such as type of ownership.

Limitations: There are no cost data and no identifiers to track patients longitudinally. An individual may have more than one record, since the data are based on number of *patient visits*, not on the number of *patients*. Because the number of visits is small, rare conditions and those that are chronic in nature may be missed.

National Nursing Home Survey (NNHS)

Sponsor:
National Center for Health Statistics
Centers for Disease Control and Prevention
Division of Data Services
3311 Toledo Road
Hyattsville, MD 20782
(310) 458-4636

Design: NNHS is a continuing series of national sample surveys of nursing homes, their residents, and their staff.

Time Frame: These surveys were conducted in 1973–1974, 1977, 1985, 1995, 1997, and 1999. The years of data used for this compendium are 1995 through 1999.

Sample Size: The sample includes approximately 1,500 facilities, where interviews (occasionally via self-administered questionnaires) were conducted with administrators and staff.

Use: The survey provides information from the perspectives of both the providers of service and the recipients. Data collected include information about the size and ownership of the facility, Medicare/Medicaid certification, occupancy rate, number of days of care provided, and expenses. Recipient data collected include demographic characteristics, health status, and services received.

Benefits: The dataset is unique in that information is solicited from both the provider and the recipient of care. It also targets a specific, useful population for study.

Limitations: The surveys do not contain information on the health services provided; they report only whether a patient received service within general categories. The records do not contain a facility number that would allow linkage of records to the facility.

Veterans Affairs Outpatient Clinic Dataset (VA-OPC)

Sponsor:
Austin Automation Center (AAC) Enterprise Business Office
Austin, TX
(http://www.aac.va.gov)
(512) 326-6005

Design: The Department of Veterans Health Administration maintains a centralized data repository that contains computerized utilization data for all outpatient visits and acute care hospital stays, as well as other utilization datasets on nursing home stays, contract services paid for by the VA, etc. These datasets are integral to the National Patient Care Database (NPCD) in the VA.

Time Frame: The computerized outpatient clinic files (OPC) contain data from 1980 to the present. Ambulatory procedures were added in 1990, and outpatient diagnoses (ICD-9-CM) were added in FY1997. Patient treatment files (PTF) contain data from 1970 to the present.

Sample Size: The VA is the largest health care system in the United States, comprising more than 160 hospitals (>45,000 beds), more than 600 community-based outpatient clinics, and more than 100 nursing homes. The VA serves more than 3 million veterans annually. Each dataset within the NPCD contains records for the population of patients seen in all VA health care facilities, representing a comprehensive national record of the delivery of VA health care services to veterans.

Use: The OPC files include demographics, visits, and clinic stops. The PTF contains demographics and admission and discharge data, as well as diagnoses, DRGs, length of stay, transfers, and hospital-based procedures.

Benefits: The datasets represent the population of veteran users of VA health care for whom utilization data were recorded. They provide a rich resource for assessing prevalence of disease among health care users, as well as for evaluating patterns of care. Encrypted SSNs permit file linkage across VA health care facilities and across settings within facilities, providing a relatively complete portrait of health care utilization in VA sites of care.

Limitations: The VA datasets do not provide comprehensive information about health care utilization obtained by veterans *outside* the VA health care system. Also, the diagnosis codes are derived from outpatient visits from physician/patient encounters and, thus, *do not re ect all existing cases among veteran users*. Instead, the diagnosis codes reflect the population for whom care was sought during the year under review.

NOTES

[1] 2000 NAMCS Micro-data file documentation, Data Dissemination Branch, National Center for Health Statistics, 6525 Belcrest Road, Room 1064, Hyattsville, MD, 20782.

[2] CPS Utilities, Unicon Research Corporation, March, 1992-2000.

[3] The VA does not generate a claim or patient bill for eligible veteran users, with the exception of certain co-payments or through medical care cost recovery of selected charges among coinsured veterans. As a result, the insurance categorization in the VA administrative databases may not be as accurate as those in private or other public sector health care organizations or systems for which financing is based entirely on reimbursement of charges. Prevalence estimates for private/HMO insurance may also be underestimates for these veterans, as the VA databases do not capture visits or diagnoses associated with visits to non-VA providers.

[4] These files excluded anyone with health maintenance organization (HMO) experience during any years of our analysis.

[5] Line items with place of service other than physician office, inpatient hospital, ER, ambulatory surgery, outpatient hospital, ambulance, or independent laboratory were excluded from the analysis.

[6] Outpatient claims with facility type listed as skilled nursing facilities (SNF) or home health agencies (HHA) were excluded from analysis.

[7] HIC is an acronym for Health Insurance Claim number. It is an 11-digit code made up of a nine-digit claim account number (CAN) (which is actually a social security number (SSN)) and a two-digit beneficiary identification code (BIC), which uniquely identifies multiple people claiming benefits under the same SSN.

[8] Operative procedures provided at these revenue centers were reviewed by clinical experts and were all considered to be appropriately categorized as ambulatory surgery.

[9] The Emergency Medical Treatment and Active Labor Act, a statute that governs when and how a patient may be (1) refused treatment or (2) transferred from one hospital to another when he or she is in an unstable medical condition.

[10] The HCFA Common Procedure Coding System.

[11] If matches of ER and ambulatory surgery were within one day of each other, then half the costs were assigned to each facility of service. Also, when the office visit line item was matched to a place of service, the non-office-visit line items that matched on HIC, provider, and date were also assigned to that place of service.

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GLOSSARY OF SELECTED TERMS

Race —The concept of race reflects self-identification by people according to the race or races with which they most closely identify. These categories are sociopolitical constructs and should not be interpreted as being scientific or anthropological in nature. Furthermore, the race categories include both racial and national-origin groups. According to the Office of Management and Budget (OMB) standards, race is a considered a separate concept from Hispanic origin (ethnicity).

White — A person having origins in any of the original peoples of Europe, the Middle East, or North Africa. It includes people who indicate their race as "White" or report entries such as Irish, German, Italian, Lebanese, Near Easterner, Arab, or Polish.

Black or African American — A person having origins in any of the Black racial groups of Africa. It includes people who indicate their race as "Black, African Am., or Negro," or provide written entries such as African American, Afro American, Kenyan, Nigerian, or Haitian.

American Indian and Alaska Native (North American Native) — A person having origins in any of the original peoples of North and South America (including Central America) and who maintain tribal affiliation or community attachment.

Asian — A person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent, including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam. It includes "Asian Indian," "Chinese," "Filipino," "Korean," "Japanese," "Vietnamese," and "Other Asian."

Pacific Islander — A person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands. It includes people who indicate their race as "Native Hawaiian," "Guamanian or Chamorro," "Samoan," and "Other Pacific Islander."

Other race — Includes all other responses not included in the "White", "Black or African American", "American Indian and Alaska Native", "Asian" and "Native Hawaiian and Other Pacific Islander" race categories described above. Respondents providing write-in entries such as multiracial, mixed, interracial, Wesort, or a Hispanic/Latino group (for example, Mexican, Puerto Rican, or Cuban) in the "Some other race" category are included here.

Ethnicity — The heritage, nationality group, lineage, or country of birth of the person or the person's parents or ancestors before their arrival in the United States.

Hispanic — Persons of Cuban, Mexican, Puerto Rican, South- or Central-American, or other Spanish culture or origin, regardless of race.

Region — The States are grouped into four regions corresponding to those used by the US Bureau of the Census:

Northeast	Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Pennsylvania
Midwest	Michigan, Ohio, Illinois, Indiana, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas
South	Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, and Texas
West	Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, California, Hawaii, and Alaska

Metropolitan Statistical Area — An MSA consists of a large population nucleus of 50,000 population or greater, together with adjacent communities having a high degrees of social and economic integration with that core. Metropolitan areas comprise at least one county, except in New England, where cities and towns are the basic geographic unit.

Urban Area — Urban areas consist of urbanized areas and other urban entities. An urban area consists of densely settled territory with a population of 50,000 or more inhabitants. Other urban areas have from 2,500 to 49,999 population.

Rural — Territory, population, and housing units not classified as urban.

Source of Payment

Medicare — The health insurance program for the aged and disabled administered by the Centers for Medicare and Medicaid Services (formerly the Health Care Financing Administration).

Medicaid — A jointly funded Federal-State health insurance program providing medical care to those unable to afford it.

Private insurance — A private insurance plan not specified as an HMO/PPO. This includes Blue Cross/Blue Shield plans, medical coverage provided by life insurance companies, casualty insurance companies, health insurance companies, and independent plans such as employer/union-sponsored plans and/or self-funded plans (partial or total).

HMO/PPO — Any Health Maintenance Organization (HMO) or Preferred Provider Organization (PPO) sponsored by consumers, communities, physicians, or hospitals.

Self pay — The majority of the costs for the visit were paid by the patient, spouse, family, or next-of-kin.

Other insurance — Includes any nonprofit source of payment (such as church welfare, United Way, or Shriner's Hospitals for Children).

Poverty Income Ratio — This is a calculated variable based on family income and family size using tables published each year by the Bureau of the Census in a series "Current Population Reports" on poverty in the United States. The primary reporting categories are:

0.00-0.999	(Below poverty)
1.000 and above	(At or above poverty)

or

0.000-1.850	(Low)
1.851-3.500	(Middle)
3.501 and above	(High)

Primary Diagnosis — The condition that is determined during the hospital stay to be the chief reason for causing the hospital admission.

Any Diagnosis — Includes primary diagnosis and additional conditions that coexist at the time of admission, or that develop during the stay, and which have an effect on the treatment or length of stay in the hospital.

Discharge Status: The disposition of a patient at the time of discharge from an inpatient facility.

Nursing Home: In the National Nursing Home Survey, nursing homes are defined as facilities that routinely provide nursing care services and have three or more beds set up for residents. Facilities may be certified by Medicare or Medicaid or not certified but licensed by the state as a nursing home. The facilities may be freestanding or a distinct unit of a larger facility

Intermediate Care Facility: Institutions certified by the Medicaid program to provide health-related services on a regular basis to Medicaid-eligible individuals who do not require hospital or skilled nursing facility care, but do require institutional care above the level of room and board.

Skilled Nursing Facility: An institution (or a distinct part of an institution) that is primarily engaged in providing skilled nursing care and related services for residents who require medical or nursing care, or rehabilitation services for the rehabilitation of injured, disabled, or sick persons, and is not primarily for the care and treatment of mental diseases.

Home Health: A collection of supportive care services focused on providing skilled nursing in the home, along with a range of the following services: personal care services; homemaker and companion services; physical therapy; medical social services; medical equipment and supplies; counseling; 24-hour home care; occupation and vocational therapy; dietary and nutritional services; speech therapy; audiology; and pharmacy care, such as intravenous therapy.