

HL7 EHR System Functional Model

Draft Standard for Trial Use

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1.0 Chapter 1: Introduction and Overview

The HL7 Electronic Health Records Special Interest Group (EHR SIG) was established in the spring of 2002. In the spring of 2003 the HL7 group began efforts to develop a standardized functional specification for Electronic Health Records Systems (EHR-S). The EHR SIG is intended primarily to serve as a body which promotes the uptake of Electronic Health Record (EHR) implementation by standardizing the functions that may be present, based on user selection, in an EHR-S.

The Department of Health and Human Services, the Veterans Health Administration, the Health Information Management Systems Society and the Robert Wood Johnson Foundation, in a public-private partnership, approached HL7 to accelerate their existing work to develop a consensus standard to define the functions of an EHR-S. HL7, through its EHR SIG, responded by developing an EHR-S Functional Model to be balloted as a Draft Standard for Trial Use (DSTU). Learning important lessons from its initial ballot period in 2003, the HL7 EHR SIG has now produced a clearer, more simplified list of functions, while delegating specifications on how functions may be used within individual care settings and the priorities of time when functions should be available for use to country-specific realms. This EHR-S Model does not offer country-specific care settings or priority content for use. However, the U.S. realm has submitted reference examples. (For the care setting examples, see the accompanying White Paper.)

1.1 Background

1.1.1 What is HL7?

Established in 1987, Health Level Seven (HL7) is an ANSI accredited, not-for-profit standards-development organization, whose mission is to provide standards for the exchange, integration, sharing, and retrieval of electronic health information; support clinical practice; and support the management, delivery and evaluation of health services. ANSI accreditation, coupled with HL7's own procedures, dictates that any standard published by HL7 and submitted to ANSI for approval, be developed and ratified by a process that adheres to ANSI's procedures for open consensus and meets a balance of interest requirement by attaining near equal participation in the voting process by the various constituencies that are materially affected by the standard (e.g., vendors, providers, government agencies, consultants, non-profit organizations). This balance of interest goal ensures that a particular constituency is neither refused participation nor is it allowed to dominate the development and ratification of a proposed standard. (<http://www.ANSI.org>)

1.1.2 What are Electronic Health Record Systems?

The effective use of information technology is a key focal point for improving healthcare in terms of patient safety, quality outcomes, and economic efficiency. A series of reports from the U.S. Institute of Medicine (IOM) identifies a crisis of "system" failure and calls for "system" transformation enabled by the use of information technology. Such a change is possible by "an infrastructure that permits fully interconnected, universal, secure network of systems that can deliver information for patient care anytime, anywhere." (HHS Goals in Pursuing HL7 EHR Functional Standard" in Memorandum to HIMSS from C. Clancy and W. Raub co-chairs of HHS Council on the Application of Health Information Technology, dated November 12, 2003.) A critical foundational component for resolving these system and infrastructure issues is the Electronic Health Record System (EHR-S).

In developing this DSTU, HL7 relied on three well-accepted definitions: two provided by the U.S. Institute of Medicine and one developed by the European Committee for Standardization/ Comité Européen de Normalisation (CEN). This DSTU leverages these existing EHR-S definitions and does not attempt to create a redundant definition of an EHR-S.

1.1.3 Existing EHR System Definitions

The IOM's 1991 report, *Computerized Patient Record*, defined an EHR System as:

The set of components that form the mechanism by which patient records are created, used, stored, and retrieved. A patient record system is usually located within a health care provider setting. It includes people, data, rules and procedures, processing and storage devices (e.g., paper and pen, hardware and software), and communication and support facilities.

The 2003 IOM Letter Report, *Key Capabilities of an Electronic Health Record System*, defined the EHR System as including:

(1) longitudinal collection of electronic health information for and about persons, where health information is defined as information pertaining to the health of an individual or health care provided to an individual; (2) immediate electronic access to person- and population-level information by authorized, and only authorized, users; (3) provision of knowledge and decision-support that enhance the quality, safety, and efficiency of patient care; and (4) support of efficient processes for health care delivery.

The 2003 ISO/TS 18308 references the IOM 1991 definition above as well as CEN 13606, 2000:

A system for recording, retrieving and manipulating information in electronic health records.

1.1.4 How were the Functions Identified and Developed?

To achieve healthcare community consensus at the outset, the functions are described at a conceptual level, providing a robust foundation for a more detailed work. Functions were included if considered essential in at least one care setting. Written in user-oriented language, the document is intended for a broad readership as reference document and not intended for use. Periodic updating of this document will occur during the DSTU period based on healthcare community requests.

Functional Granularity is a term used to describe the level of abstraction at which a function is represented. Functions that are commonly grouped together in practice or by major systems have been consolidated where appropriate; functions requiring extra or separate language or involving different workflows have been kept separate where appropriate. Decision Support is maintained as a separate section, but mapped to other key sections, to indicate the "smart" function behind an action. All of the functions could be expanded into more granular elements but a balance between a usable document and an unwieldy list of functions has been agreed upon. The goal of determining an appropriate level of functional granularity at this time is to present functions that can be easily selected and used by readers of this DSTU, but that are not so abstract that readers would need to create a large number of additional functions within each function.

Although the determination of functional granularity is a relatively subjective task, systematic evaluation of each function by diverse groups of industry professionals has resulted in a level of granularity appropriate for this EHR-S Model. Every attempt has been made to provide supporting information in the Functional Descriptions to illustrate the more granular aspects of functions that may have been consolidated for usability purposes.

Keeping with the intent of this EHR-S Model to be independent with regard to technology or implementation strategy, no specific technology has been included in the functions, but may be used in the examples to illustrate the functions. Inclusion of specific technologies in the examples does not endorse or support the use of those technologies as implementation strategies.

Drafts of the EHR-S Model and of specific functions have been widely reviewed by healthcare providers, vendors, and other stakeholders. This DSTU reflects input from all these reviewers.

1.1.5 What is the EHR-S DSTU Package?

This EHR-S DSTU package includes both Reference and Normative sections. (See the following table for a description of these terms).

Document Type

Status	Description
Reference	Content of the EHR-S DSTU Package that contains information which clarifies concepts or otherwise provides additional information to aid understanding and comprehension. Reference material is not balloted as part of the draft standard. Readers may comment, identify typographical errors, or provide suggestions for improving the document, but such comments do not materially affect a ballot. Please Note - Reference material is not part of the actual EHR-S DSTU and is not to be voted on.
Normative	Content that is part of the EHR-S DSTU which HL7 committee members and interested industry participants have formally reviewed and balloted following the HL7 procedures for Balloting Normative Documents. This HL7 developed DSTU document has been successfully balloted by the HL7 organization.

(table 1)

The EHR-S DSTU Package includes the following materials:

Document title	Description	Target file name	Status of Content
EHR-S, Draft Standard for Trial Use	Overview and background on the proposed EHR-S Standard and the Functional Outline composed of Direct Care, Supportive, and Information Infrastructure functions and related descriptive elements.	HL7_EHR-S_DSTU.pdf	Normative and Reference. See table 3.
HL7 EHR -S Functional Model: A major development towards consensus on Electronic Health Record System Functionality	A White Paper providing a comprehensive background for the HL7 EHR System Functional Model.	HL7_EHR-S_DSTU_White_Paper.pdf	Reference
HL7 EHR-S, Draft Standard for Trial Use, Sample Profiles	Sample Profiles for four example care settings in the U.S. realm. Not intended for use.	HL7_EHR-S_DSTU_Profiles.pdf	Reference

(table 2)

Some portions of the DSTU document are clearly labeled "Normative". In Chapter 1 the Purpose and Scope and the Overview and Definition of the Model are Normative. In the Functional Outline of chapters 2, 3, and 4 only the Function Name and Function Statement components are Normative in this DSTU. All other sections of this DSTU are reference material.

DSTU Chapter	Section	Status of Content
Chapter 1	Introduction	Reference
Chapter 1	Purpose and Scope	Normative
Chapter 1	Overview and Definition of the Model	Normative
Chapter 1	Anticipated Uses	Reference
Chapters 2, 3 and 4	Function Name	Normative
Chapters 2, 3 and 4	Function Statement	Normative
Chapters 2, 3 and 4	Function Description	Reference
Chapters 2, 3 and 4	Rational	Reference
Chapters 2, 3 and 4	See Also	Reference

(table 3)

1.2 Purpose and Scope (Normative)

The HL7 EHR System Functional Model provides a reference list of functions that may be present in an Electronic Health Record System (EHR-S). The function list is described from a user perspective with the intent to enable consistent expression of system functionality. This EHR-S Model, through the creation of Functional Profiles, enables a standardized description and common understanding of functions sought or available in a given setting (e.g. intensive care, cardiology, office practice in one country or primary care in another country).

A Draft Standard for Trial Use (DSTU) is a standard in draft form that is offered for user-feedback for up to two years. This DSTU will be revised and rebaloted as either an updated DSTU or as a standard in accordance with HL7's Policy and Procedure. (See Appendix B "What is a DSTU?")

1.2.1 EHR-S DSTU Scope

The HL7 EHR System Functional Model defines a standardized model of the functions that may be present in EHR Systems. From the outset, a clear distinction between the EHR as a singular entity and systems that operate on the EHR – i.e., EHR Systems is critical. Section 4.1 describes the basis and foundation for the HL7 definition of an EHR System. Additionally, the EHR-S Model supports research needs by ensuring that the data available to researchers follow the required protocols for privacy, confidentiality, and security. The diversity of research needs precludes the specific listing of functions that are potentially useful for research. Notably, the EHR-S Model does not address whether the EHR-S is a system-of-systems or a single system providing the functions required by the users. This standard makes no distinction regarding implementation - the EHR-S described in a functional profile may be a single system or a system of systems. Further, the functions make no statement about which technology is used, nor about the content of the electronic health record. The specifics of 'how' EHR systems are developed or implemented is not considered to be within the scope of this DSTU now or in the future. This EHR-S Model does not address or endorse implementations or technology, nor does it include the data content of the electronic health record.

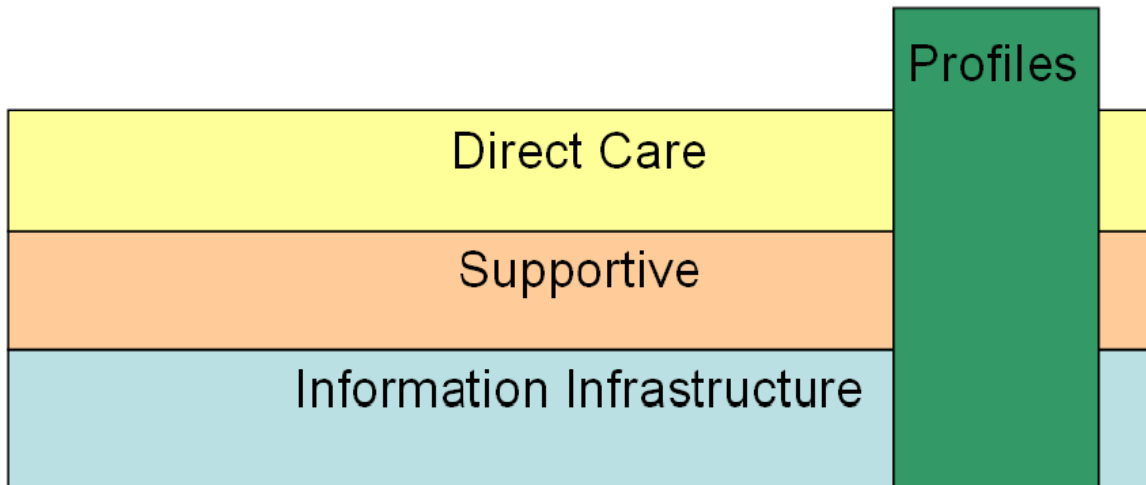
1.2.2 This DSTU is not:

- > A messaging specification.
- > An implementation specification.
- > A conformance specification.
- > An EHR specification.
- > A conformance or conformance testing metric.
- > An exercise in creating a definition for an EHR or EHR-S.

Additionally, the EHR-S Model is not sufficient to provide a longitudinal health record; however, it will contribute to its development. The information exchange enabled by the EHR-S supports the population of clinical documents, event summaries, minimum data sets, claims attachments, in the future, will enable a longitudinal health record.

1.3 Overview and Definition of the Model (Normative)

The EHR-S Functional Model is composed of a functional outline (which is divided into three sections, direct care, supportive and information infrastructure) and functional profiles, which overlay the outlined functions, and assigned priorities for the functions in the profile. While the functional outline should contain all reasonably anticipated EHR-S functions, it is not itself intended as a list of all functions to be found in a specific EHR-S. Functional profiles can be used to constrain the functions to an intended use. This document defines the Functional Outline and describes the general use of profiles and priorities (See 4. Anticipated Uses).



(figure 1)

The EHR-S functional outline of the EHR-S Model is divided into three sections: Direct Care, Supportive and Information Infrastructure functions. Within the three main sections are thirteen subsections (see the graphic below). There are over 125 individual functions in the outline, each including a Function Name and Function Statement (normative) as well as other associated information such as description, rationale for inclusion and citation (reference information). Important to note; the numbering of the functions indicates parent-child relationships (eg. DC.1.1 Health information capture, management, and review, management and review (parent), DC.1.1.1 Identify and maintain a patient record (child). In many cases the parent is fully expressed by the children. In the aggregate, the functional model is intended to include the superset of functions from which a subset can be generated by the user to illustrate what they need within their EHR-S. Only a subset of this inclusive set of functions will apply to any particular EHR-S.

Direct Care	DC1.0	Care Management
	DC2.0	Clinical Decision Support
	DC3.0	Operations Management and Communication
Supportive	S1.0	Clinical Support
	S2.0	Measurement, Analysis, Research, Reporting
	S3.0	Administrative and Financial
Information Infrastructure	I 1.0	EHR Security
	I 2.0	EHR Information and Records Management
	I 3.0	Unique identity, registry, and directory services
	I 4.0	Support for Health Informatics & Terminology Standards
	I 5.0	Interoperability
	I 6.0	Manage business rules
	I 7.0	Workflow

(figure 2)

1.3.1 EHR-S Functional Outline: The Functions and Their Use

The EHRS Functional Outline provides a list (superset) of functions organized into discrete sections and subsections. Functions describe the behavior of a system in user-oriented language so as to be recognizable to the key stakeholders of an EHR-S.

EHR-S functions can be used to:

Facilitate describing end user defined benefits such as patient safety, quality outcomes and cost efficiencies in terms of standard EHR-S functions.

Promote a common understanding of EHR functions upon which developers, vendors, users and other interested parties can plan and evaluate EHR-S functions.

Provide the necessary framework to drive the requirements and applications of next level standards, such as EHR content, coding, information models, constructs and interoperability for information portability between sub-systems of an EHR-S and across EHR-S’.

Establish a standards-based method by which each realm (country) can apply these EHR functions to care settings, uses, and priorities.

Inform those concerned with secondary use and national infrastructure what functions can be expected in an EHR System.

1.3.2 Components of EHR-S Functional Outline

Each function in the HL7 EHR-S Functional Model is identified and described using a set of elements or components as detailed below.

ID	Function Name	Function Statement	Function Description	Rationale	See Also	Citation
	Normative	Normative				

(figure 3)

ID

This is the unique outline identification of a function in the outline. The Direct Care functions are identified by ‘DC’ followed by a number (Example DC.1.1.3.1; DC.1.1.3.2). Supportive functions are identified by an ‘S’ followed by a number (Example S.2.1; S.2.1.1). Information Infrastructure functions are identified by an ‘I’ followed by a number (Example I.1.1; I.1.2). Numbering for all sections begins at n.1.

Function Name - Normative content in chapters 2, 3 and 4.

The name of the Function.

Example: Manage Medication List

Function Statement - Normative content in chapters 2, 3 and 4.

Brief statement of the purpose of this function.

Example: Create and maintain patient-specific medication lists.

Description - Reference content in chapters 2, 3 and 4.

Detailed description of the function, including examples if needed.

Example: Medication lists are managed over time, whether over the course of a visit or stay, or the lifetime of a patient. All pertinent dates, including medication start, modification, and end dates are stored. The entire medication history for any medication is accessible. Medication lists are not limited to medication orders recorded by providers, but may include patient-reported medications.

Rationale - Reference content in chapters 2, 3 and 4.

This element is intended to clarify the rationale for including the function in the EHR-S Functional Model. The rationale must reference one or more of the following:

1. Support delivery of effective healthcare
2. Improve patient safety
3. Facilitate management of chronic conditions
4. Improve efficiency
5. Facilitate self-health management
6. Ensure privacy, confidentiality

See Also - Reference content in chapters 2, 3 and 4.

This element is intended to identify relationships between functions. Future work will involve greater specificity of the relationship between the functions including dependency and precursor/successor associations.

Citation - for reference

This element is used for quoting of an authoritative source for substantiation for the rationale for including this function in the EHR-S Model.

1.3.3 EHR-S Model

Functional profiles are subsets of the Functional Outline which apply to a particular implementation of an EHR-S or express the requirements for a particular EHR-S. Some examples of EHR-S Functional Profiles have been developed by several parties and are included as reference material. A variety of such Functional Profiles will be created to ensure the proper scoping of the functions based on a specific intended context of use (e.g., care setting, function, and priority).

1.4 Anticipated Uses

HL7 is an international community and supports the development of Functional Profiles which are country specific (HL7 realm) specifications within a standard. In the future it is anticipated that there will be realm specific profiles (subsets of functions) that have been found essential now or in the future for specific functional areas (e.g., order entry) or care setting (e.g., a hospital ward). Included in the EHR-S DSTU package are sample functional profiles developed by the EHR Collaborative (<http://www.ehrcollaborative.org>) within the U.S. realm. These example profiles are included as reference documents.

1.4.1 Anticipated Development Approach: Functional Profiles

A “functional profile” is a selected set of functions that are applicable for a particular purpose, user, care setting, domain, etcetera. Functional profiles help to manage the master list of functions. It is not anticipated that the full set of functions will apply to any single EHR-S implementation.

Functional profiles are the expression of usable subsets of functions from this EHR-S Model. In this EHR-S Model the reader will see a long list of Function Names and Function Statements which serve as reasonable representations of functions that may be needed for a clinical environment. The list of functions is not intended to be used in its entirety. For example, the functions outlined in this model apply differently to different care settings. Many of the functions in the model apply to a nursing home setting, but some like DC.1.4.6 (Order blood products and other biologics) would not apply. The list of functions is not considered to be in a usable form until a functional profile or constraint is generated.

The act of creating a functional profile is to support a business case for EHR-S use by selecting an applicable subset of functions from the EHR-S Model list of functions, in effect constraining the model to meet specific requirements. For example, a functional profile may be created by a purchaser, to indicate requirements; by a vendor, to indicate the capability of specific products; or by any person/entity wishing to stipulate a desired subset of functions for a particular purpose, including a care setting within a specific realm. Once an applicable subset of functions has been selected, the person/entity creating the profile gives each function a priority of essential now, essential future or optional. Functions that are not selected can be annotated with Not Applicable to reflect that it was considered and rejected or just left off the final functional profile document. (See HL7 EHR-S White Paper)

1.4.2 Anticipated Stakeholder Use: U.S. Department of Health and Human Services

Below is a statement for the anticipated use of the EHR-S Model by the U.S. Department of Health and Human Services, one of the industry stakeholders that actively supported the HL7 efforts:

The Department of Health and Human Services (HHS) is one of several sponsors of the HL7 effort to define a draft standard for electronic health records (EHRs) system functions. HHS is grateful for the efforts by the HL7 in this arena. We believe that substantial benefits to the healthcare system would ensue if HL7 were able to identify and define as a draft standard for trial use (DSTU) the EHR system functions in an international ballot and achieve a successful voting outcome. HHS understands and appreciates that as a DSTU the EHR model and functions are draft and will continue to evolve.

We understand that healthcare providers, vendors, and others with an interest in EHRs have requested that HHS, other parts of the U.S. government, and other governments around the world indicate how we will promote the adoption of the EHR Functional Model and Standard. As HHS designs and implements programs and policies that promote the use of EHRs, HHS will consider the EHR functions that are successfully balloted by the HL7 along with other sources of information. For example, HHS does not anticipate incorporating all of the functions embedded in the current ballot as we design programs and policies. Rather, HHS will determine, for each program and policy decision related to EHRs, which, if any, of the EHR functions specified in this ballot, related reference material, and other sources of information should be considered as the programs and policies are designed and implemented.

(January 5, 2004 Letter from HHS/CAHIT co-chairs to HL7 EHR SIG Co-Chair, Linda Fischetti.)

2.0 Chapter 2: Direct Care EHR-S Functions

Direct Care EHR-S functions are the subset of EHR-S functions that enable delivery of healthcare and offer clinical decision support.

2.1 Example

For example, when a child presents with symptoms of common cold, a Direct Care EHR-S function will enable the doctor to record that event. Additionally, Clinical decision-support functions within the Direct Care EHR-S section will alert the provider that a vaccination is due and will offer contraindication alerts for the medication given to the child who has symptoms of a cold.

2.2 Actors

The principal users of these functions are expected to be authorized healthcare providers; the patient and/or subject of care will have access to certain functions to view, update or make corrections to their Electronic Health Record. The provider will receive appropriate decision support, as well support from the EHR-S to enable effective electronic communication between providers, and between the provider and the patient/parent/caregiver.

2.3 Functional Outline – Direct Care

Direct Care	DC1.0	Care Management
	DC2.0	Clinical Decision Support
	DC3.0	Operations Management and Communication

ID	Name	Statement	Description	See Also	Rationale	Citations
DC.1	Care Management					
DC.1.1	Health information capture, management, and review		For those functions related to data capture, data may be captured using standardized code sets or nomenclature, depending on the nature of the data, or captured as unstructured data. Care-setting dependent data is entered by a variety of caregivers. Details of who entered data and when it was captured should be tracked. Data may also be captured from devices or other Tele-Health Applications.	S.3.1.4		ISO/TS 18308 - Health Informatics - Requirements for an Electronic Health Record Architecture; ASTM E 1769 Standard Guide for Properties of Electronic Health Records and Record Systems
DC.1.1.1	Identify and maintain a patient record	Identify and maintain a single patient record for each patient.	Key identifying information is stored and linked to the patient record. Static data elements as well as data elements that will change over time are maintained. A lookup function uses this information to uniquely identify the patient.		Supports delivery of effective healthcare, Improves efficiency, Improves patient safety	
DC.1.1.2	Manage patient demographics	Capture and maintain demographic information. Where appropriate, the data should be clinically relevant, reportable and trackable over time.	Contact information including addresses and phone numbers, as well as key demographic information such as date of birth, sex, and other information is stored and maintained for reporting purposes and for the provision of care.	S.1.4.0; S.1.4.1; S.1.4.2; I.1.4.4; I.1.4.5	Supports delivery of effective healthcare, Improves efficiency, Improves patient safety	
DC.1.1.3	Manage summary lists	Create and maintain patient-specific summary lists that are structured and coded where appropriate.	Patient summary lists can be created from patient specific data and displayed and maintained in a summary format. The functions below are important, but do not exhaust the possibilities.	DC.1.1.5; S.1.4.0; S.1.4.1; S.1.4.2; S.2.2 I.1.4.4; I.1.4.5	Supports delivery of effective healthcare, Improves efficiency, Facilitates management of chronic conditions, Improves patient safety	
DC.1.1.3.1	Manage problem list	Create and maintain patient-	A problem list may include, but is		Supports delivery of	

ID	Name	Statement	Description	See Also	Rationale	Citations
		specific problem lists.	not limited to: Chronic conditions, diagnoses, or symptoms, functional limitations, visit or stay-specific conditions, diagnoses, or symptoms. Problem lists are managed over time, whether over the course of a visit or stay or the life of a patient, allowing documentation of historical information and tracking the changing character of problem(s) and their priority. All pertinent dates, include date noted or diagnosed, dates of any changes in problem specification or prioritization, and date of resolution are stored. This might include time stamps, where useful and appropriate. The entire problem history for any problem in the list is viewable.		effective healthcare, Improves efficiency, Facilitates management of chronic conditions	
DC.1.1.3.2	Manage medication list	Create and maintain patient-specific medication lists.	Medication lists are managed over time, whether over the course of a visit or stay, or the lifetime of a patient. All pertinent dates, including medication start, modification, and end dates are stored. The entire medication history for any medication, including alternative supplements and herbal medications, is viewable. Medication lists are not limited to medication orders recorded by providers, but may include, for example, pharmacy dispense/supply records and patient-reported medications.		Supports delivery of effective healthcare, Improves patient safety	
DC.1.1.3.3	Manage allergy and adverse reaction list	Create and maintain patient-specific allergy and adverse reaction lists.	Allergens, including immunizations, and substances are identified and coded (whenever		Supports delivery of effective healthcare, Improves efficiency,	

ID	Name	Statement	Description	See Also	Rationale	Citations
			possible) and the list is managed over time. All pertinent dates, including patient-reported events, are stored and the description of the patient allergy and adverse reaction is modifiable over time. The entire allergy history, including reaction, for any allergen is viewable. The list(s) include drug reactions that are not classifiable as a true allergy and intolerances to dietary or environmental triggers. Notations indicating whether item is patient reported and/or provider verified are supported.		Facilitates management of chronic conditions, Facilitates self-health management, Improves patient safety	
DC.1.1.4	Manage Patient History	Capture, review, and manage medical procedural/surgical, social and family history including the capture of pertinent positive and negative histories, patient-reported or externally available patient clinical history.	The history of the current illness and patient historical data related to previous medical diagnoses, surgeries and other procedures performed on the patient, and relevant health conditions of family members is captured through such methods as patient reporting (for example interview, medical alert band) or electronic or non-electronic historical data. This data may take the form of a positive or a negative such as: "The patient/family member has had..." or "The patient/family member has not had..." When first seen by a health care provider, patients typically bring with them clinical information from past encounters. This and similar information is captured and presented alongside locally captured documentation and notes wherever appropriate.		Supports delivery of effective healthcare, Facilitates management of chronic conditions	
DC.1.1.5	Summarize health record	Present a chronological, filterable, and comprehensive review of a	A key feature of an electronic health record is its ability to		Supports delivery of effective healthcare,	

ID	Name	Statement	Description	See Also	Rationale	Citations
		patient's EHR, which may be summarized, subject to privacy and confidentiality requirements.	present, summarize, filter, and facilitate searching through the large amounts of data collected during the provision of patient care. Much of this data is date or date-range specific and should be presented chronologically. Local confidentiality rules that prohibit certain users from accessing certain patient information must be supported.		Improves efficiency, Facilitates management of chronic conditions, Improves patient safety	
DC.1.1.6	Manage clinical documents and notes	Create, addend, correct, authenticate and close, as needed, transcribed or directly-entered clinical documentation and notes.	Clinical documents and notes may be created in a narrative form, which may be based on a template. The documents may also be structured documents that result in the capture of coded data. Each of these forms of clinical documentation are important and appropriate for different users and situations.		Supports delivery of effective healthcare, Improves efficiency, Facilitates management of chronic conditions, Improves patient safety	
DC.1.1.7	Capture external clinical documents	Incorporate clinical documentation from external sources.	Mechanisms for incorporating external clinical documentation (including identification of source) such as image documents and other clinically relevant data are available. Data incorporated through these mechanisms is presented alongside locally captured documentation and notes wherever appropriate.		Supports delivery of effective healthcare, Improves efficiency, Facilitates management of chronic conditions, Facilitates self-health management, Improves patient safety	
DC.1.1.8	Capture patient-originated data	Capture and explicitly label patient-provided and patient-entered clinical data, and support provider authentication for inclusion in patient history	It is critically important to be able to distinguish patient-provided and patient-entered data from clinically authenticated data. Patients may provide data for entry into the health record or be given a mechanism for entering this data directly. Patient-entered data intended for use by care providers		Supports delivery of effective healthcare, Improves efficiency, Facilitates management of chronic conditions, Facilitates self-health management	

ID	Name	Statement	Description	See Also	Rationale	Citations
			will be available for their use.			
DC.1.1.9	Capture patient and family preferences	Capture patient and family preferences at the point of care.	Patient and family preferences regarding issues such as language, religion, culture, etcetera - may be important to the delivery of care. It is important to capture these at the point of care so that they will be available to the provider.			
DC.1.2	Care plans, guidelines, and protocols			DC.2.2		ISO/TS 18308 Final Draft - Health Informatics - Requirements for an Electronic Health Record Architecture. (care plans); HIMSS Electronic Health Record Definitional Model June 2003 (protocols); ASTM E 1769 Standard Guide for Properties of Electronic Health Records and Record Systems
DC.1.2.1	Present care plans, guidelines, and protocols	Present organizational guidelines for patient care as appropriate to support order entry and clinical documentation.	Care plans, guidelines, and protocols may be site specific, community or industry-wide standards. They may need to be managed across one or more providers. Tracking of implementation or approval dates, modifications and relevancy to specific domains or context is provided.	2.2.1.3	Supports delivery of effective healthcare, Improves efficiency, Facilitates management of chronic conditions, Improves patient safety	
DC.1.2.2	Manage guidelines, protocols and patient-specific care plans.	Provide administrative tools for organizations to build care plans, guidelines and protocols for use during patient care planning and care.	Guidelines or protocols may contain goals or targets for the patient, specific guidance to the providers, suggested orders, and nursing interventions, among other items.	DC.1.2.1	Supports delivery of effective healthcare, Improves efficiency, Facilitates management of chronic conditions, Improves patient safety	
DC.1.2.3	Generate and record patient-specific instructions	Generate and record patient-specific instructions related to pre- and post-procedural and post-	When a patient is scheduled for a test, procedure, or discharge, specific instructions about diet,			

ID	Name	Statement	Description	See Also	Rationale	Citations
		discharge requirements.	clothing, transportation assistance, convalescence, follow-up with physician, etcetera. may be generated and recorded, including the timing relative to the scheduled event.			
DC.1.3	Medication ordering and management					HIMSS Electronic Health Record Definitional Model June 2003
DC.1.3.1	Order medication	Create prescriptions or other medication orders with detail adequate for correct filling and administration. Provide information regarding compliance of medication orders with formularies.	<p>Different medication orders, including discontinue, refill, and renew, require different levels and kinds of detail, as do medication orders placed in different situations. The correct details are recorded for each situation. Administration or patient instructions are available for selection by the ordering clinicians, or the ordering clinician is facilitated in creating such instructions. Appropriate time stamps for all medication related activity are generated. This includes series of orders that are part of a therapeutic regimen, e.g. Renal Dialysis, Oncology.</p> <p>When a clinician places an order for a medication, that order may or may not comply with a formulary specific to the patient's location or insurance coverage, if applicable. Whether the order complies with the formulary should be communicated to the ordering clinician at an appropriate point to allow the ordering clinician to decide whether to continue with the order. Formulary-compliant alternatives to the medication being</p>	DC.3.2.3; DC1.1.3.2	Supports delivery of effective healthcare, Improves efficiency, Facilitates self-health management, Improves patient safety	

ID	Name	Statement	Description	See Also	Rationale	Citations
			ordered may also be presented.			
DC.1.3.2	Manage medication administration	Present to appropriate clinicians the list of medications that are to be administered to a patient, under what circumstances, and capture administration details.	In a setting in which medication orders are to be administered by a clinician rather than the patient, the necessary information is presented including: the list of medication orders that are to be administered; administration instructions, times or other conditions of administration; dose and route, etcetera. Additionally, the clinician is able to record what actually was or was not administered, whether or not these facts conform to the order. Appropriate time stamps for all medication related activity are generated.	DC.1.4.6	Supports delivery of effective healthcare, Improves efficiency, Improves patient safety	
DC.1.4	Orders, referrals, and results management					HIMSS Electronic Health Record Definitional Model June 2003
DC.1.4.1	Place patient care orders	Capture and track orders based on input from specific care providers.	Orders that request actions or items can be captured and tracked. Examples include orders to transfer a patient between units, to ambulate a patient, for medical supplies, durable medical equipment, home IV, and diet or therapy orders. For each orderable item, the appropriate detail, including order identification and instructions, can be captured. Orders should be communicated to the correct recipient for completion if appropriate.	DC.1.3.1	Supports delivery of effective healthcare, Improves efficiency, Improves patient safety	
DC.1.4.2	Order diagnostic tests	Submit diagnostic test orders based on input from specific care providers.	For each orderable item, the appropriate detail and instructions must be available for the ordering care provider to complete. Orders for diagnostic tests should be transmitted to the correct	I.1.2	Supports delivery of effective healthcare, Improves efficiency, Improves patient safety	

ID	Name	Statement	Description	See Also	Rationale	Citations
			destination for completion or generate appropriate requisitions for communication to the relevant resulting agencies.			
DC.1.4.3	Manage order sets	Provide order sets based on provider input or system prompt.	Order sets, which may include medication orders, allow a care provider to choose common orders for a particular circumstance or disease state according to best practice or other criteria. Recommended order sets may be presented based on patient data or other contexts.		Supports delivery of effective healthcare, Improves efficiency, Facilitates management of chronic conditions, Improves patient safety	
DC.1.4.4	Manage referrals	Enable the origination, documentation and tracking of referrals between care providers or healthcare organizations, including clinical and administrative details of the referral.	Documentation and tracking of a referral from one care provider to another is supported, whether the referred to or referring providers are internal or external to the healthcare organization. Guidelines for whether a particular referral for a particular patient is appropriate in a clinical context and with regard to administrative factors such as insurance may be provided to the care provider at the time the referral is created.	DC.1.4.1	Supports delivery of effective healthcare, Improves efficiency, Facilitates management of chronic conditions	
DC.1.4.5	Manage results	Route, manage and present current and historical test results to appropriate clinical personnel for review, with the ability to filter and compare results.	Results of tests are presented in an easily accessible manner and to the appropriate care providers. Flow sheets, graphs, or other tools allow care providers to view or uncover trends in test data over time. In addition to making results viewable, it is often necessary to send results to appropriate care providers using an electronic messaging systems, pagers, or other mechanism. Results may also be routed to patients electronically or in the form of a letter.		Supports delivery of effective healthcare, Improves efficiency, Facilitates management of chronic conditions, Facilitates self-health management, Improves patient safety	

ID	Name	Statement	Description	See Also	Rationale	Citations
			Documentation of notification is accommodated.			
DC.1.4.6	Order blood products and other biologics	Communicate with appropriate sources or registries to order blood products or other biologics.	Interact with a blood bank system or other source to manage orders for blood products or other biologics. Use of such products in the provision of care is captured. Blood bank or other functionality that may come under federal or other regulation (such as by the FDA in the United States) is not required; functional communication with such a system is required.	S.1.1.0	Supports delivery of effective healthcare, Improves efficiency, Improves patient safety	
DC.1.5	Consents, authorizations and directives					American Dental Association Specification No. 1000 for a Standard Clinical Architecture for the Structure and Content of an Electronic Health Record. (consent)
DC.1.5.1	Manage consents and authorizations	Create, maintain, and verify patient treatment decisions in the form of consents and authorizations when required.	Treatment decisions are documented and include the extent of information, verification levels and exposition of treatment options. This documentation helps ensure that decisions made at the discretion of the patient, family, or other responsible party govern the actual care that is delivered or withheld.		Facilitates self-health management, Improves patient safety	
DC.1.5.2	Manage patient advance directives	Capture, maintain and provide access to patient advance directives.	Patient advance directives and provider DNR orders can be captured as well as the date and circumstances under which the directives were received, and the location of any paper records of advance directives as appropriate.		Supports delivery of effective healthcare, Facilitates self-health management, Improves patient safety	

ID	Name	Statement	Description	See Also	Rationale	Citations
DC.2	Clinical Decision Support					
DC.2.1	Manage Health Information to enable Decision Support			D.C. 1.1		
DC.2.1.1	Support for standard assessments	Offer prompts to support the adherence to care plans, guidelines, and protocols at the point of information capture.	When a clinician fills out an assessment, data entered triggers the system to prompt the assessor to consider issues that would help assure a complete/accurate assessment. A simple demographic value or presenting problem (or combination) could provide a template for data gathering that represents best practice in this situation, e.g. Type II diabetic review, fall and 70+, rectal bleeding etcetera. As another example, to appropriately manage the use of restraints, an online alert is presented defining the requirements for a behavioral health restraint when it is selected.		Supports delivery of effective healthcare, improves patient safety and efficiency, and facilitates management of chronic conditions.	
DC.2.1.2	Support for Patient Context-enabled Assessments	Offer prompts based on patient-specific data at the point of information capture.	When a clinician fills out an assessment, data entered is matched against data already in the system to identify potential linkages. For example, the system could scan the medication list and the knowledge base to see if any of the symptoms are side effects of medication already prescribed. Important but rare diagnoses could be brought to the doctor's attention, for instance		Supports delivery of effective healthcare, improves patient safety and efficiency, and facilitates management of chronic conditions	

ID	Name	Statement	Description	See Also	Rationale	Citations
			ectopic pregnancy in a woman of child bearing age who has abdominal pain.			
DC.2.1.3	Support for identification of potential problems and trends	Identify trends that may lead to significant problems, and provide prompts for consideration.	When personal health information is collected directly during a patient visit input by the patient, or acquired from an external source (lab results), it is important to be able to identify potential problems and trends that may be patient-specific, given the individual's personal health profile, or changes warranting further assessment. For example: significant trends (lab results, weight); a decrease in creatinine clearance for a patient on metformin, or an abnormal increase in INR for a patient on warfarin.		Supports delivery of effective healthcare, improves patient safety and efficiency, and facilitates management of chronic conditions.	
DC.2.1.4	Support for patient and family preferences	Support the integration of patient and family preferences into clinical decision support at all appropriate opportunities.	Decision support functions should permit consideration of patient/family preferences and concerns, such as with language, religion, culture, medication choice, invasive testing, and advance directives.	DC.1.1.9	Improves patient safety and facilitates self-health management.	Institute of Medicine (IOM). Committee on Health Care in America. Crossing the quality chasm: A new health system for the 21st century. - National Academy Press: Institute of Medicine. 2001. - Laine C, Davidoff F. Patient-centered medicine. A professional - evolution. JAMA 1996 Jan 10;275(2):152-6.
DC.2.2	Care plans, guidelines and protocols			DC.1.2		
DC.2.2.1	Support for condition based care plans, guidelines, protocols					Payne TH. Computer Decision Support Systems. CHEST 2000; 118:47S-52S. - - Hunt DL, Haynes RB, Hanna SE, Smith K. Effects of computer-based clinical decision support systems on physician performance and patient

ID	Name	Statement	Description	See Also	Rationale	Citations
						outcomes: a systematic review. JAMA 1998;280:1339-1346. -
DC.2.2.1.1	Support for standard care plans, guidelines, protocols	Support the use of appropriate standard care plans, guidelines and/or protocols for the management of specific conditions.	At the time of the clinical encounter, standard care protocols are presented. These may include site-specific considerations.		Supports delivery of effective healthcare and improves efficiency; supports the management of chronic conditions.	
DC.2.2.1.2	Support for context-sensitive care plans, guidelines, protocols	Identify and present the appropriate care plans, guidelines and/or protocols for the management of specific conditions that are patient-specific.	At the time of the clinical encounter (problem identification), recommendations for tests, treatments, medications, immunizations, referrals and evaluations are presented based on evaluation of patient specific data, their health profile and any site-specific considerations. These may be modified on the basis of new clinical data at subsequent encounters.		Supports delivery of effective healthcare and improves efficiency.	
DC.2.2.1.3	Capture variances from standard care plans, guidelines, protocols	Identify variances from patient-specific and standard care plans, guidelines, and protocols.	Variances from care plans, guidelines, or protocols are identified and tracked, with alerts, notifications and reports as clinically appropriate. This may include systematic deviations from protocols or variances on a case by case basis dictated by the patient's particular circumstances.		Supports delivery of effective healthcare and improves efficiency.	
DC.2.2.1.4	Support management of patient groups or populations	Provide support for the management of populations of patients that share diagnoses, problems, demographic characteristics, and etcetera.	Populations or groups of patients that share diagnoses (such as diabetes or hypertension), problems, demographic characteristics, and medication orders are identified. The clinician may be notified of eligibility for a particular test, therapy, or follow-up; or results from audits of compliance of these populations			

ID	Name	Statement	Description	See Also	Rationale	Citations
			with disease management protocols.			
DC.2.2.1.5	Support for research protocols relative to individual patient care.	Provide support for the management of patients enrolled in research protocols and management of patients enrolled in research protocols.	The clinician is presented with protocol-based care for patients enrolled in research studies. See S.3.3.1 for support for enrollment of patients in research protocols.	S.3.3.1		
DC.2.2.1.6	Support self-care	Provide the patient with decision support for self-management of a condition between patient-provider encounters.	Patients with specific conditions need to follow self-management plans that may include schedules for home monitoring, lab tests, and clinical check ups; recommendations about nutrition, physical activity, tobacco use, etcetera; and guidance or reminders about medications.	DC.1.1.7.2; DC.3.2.4	Supports delivery of effective healthcare, improves efficiency, supports the management of chronic conditions; and facilitates self-health management.	Holman H, Lorig K. Patients as partners in managing chronic disease. - Partnership is a prerequisite for effective and efficient health care. BMJ - 2000 Feb 26;320(7234):526-7 - Lorig KR, Sobel DS, Stewart AL, Brown BW Jr, Bandura A, Ritter P, Gonzalez VM, Laurent DD, Holman HR. Evidence suggesting that a chronic disease self-management program can improve health status while reducing hospitalization: a randomized trial. Med Care 1999 Jan;37(1):5-14
DC.2.3	Medication and immunization management			DC 1.3		
DC.2.3.1	Support for medication and immunization ordering					Bates DW et al. Effect of computerized physician order entry and a team intervention on prevention of serious medication errors. JAMA 1998;280:1311-1316. - - Bates DW et al. The impact of computerized physician order entry on medication error prevention. JAMIA 1999;6:313-321. - - Raschke RA et al. A computer alert system to prevent injury from

ID	Name	Statement	Description	See Also	Rationale	Citations
						adverse drug events. JAMA 1998;280:1317-1320. - - Chertow GM et al. Guided Medication dosing for inpatients with renal insufficiency. JAMA 2001;286:2839-2844. - - Evans RS et al. A computer-assisted management program for antibiotics and other anti-infective agents. NEJM 1998; 338:232-238. - - Hunt DL, Haynes RB, Hanna SE, Smith K. Effects of computer-based clinical decision support systems on physician performance and patient outcomes: a systematic review. JAMA 1998;280:1339-1346. - - Mekhjian HS et al. Immediate benefits realized following implementation of physician order entry at an academic medical institution. JAMIA 2002;9:529-539. -
DC.2.3.1.1	Support for drug interaction checking	Identify drug interaction warnings at the point of medication ordering	The clinician is alerted to drug-drug, drug-allergy, and drug-food interactions at levels appropriate to the health care entity. These alerts may be customized to suit the user or group.		Improves patient safety and efficiency and supports delivery of effective healthcare.	
DC.2.3.1.2	Patient specific dosing and warnings	Identify and present appropriate dose recommendations based on patient-specific conditions and characteristics at the time of medication ordering.	The clinician is alerted to drug-condition interactions and patient specific contraindications and warnings e.g. elite athlete, pregnancy, breast-feeding or occupational risks. The preferences of the patient may also be presented e.g. reluctance to use an antibiotic.			

ID	Name	Statement	Description	See Also	Rationale	Citations
			Additional patient parameters, including age, Ht, Wt, BSA, may also be incorporated.			
DC.2.3.1.3	Medication recommendations	Recommend treatment and monitoring on the basis of cost, local formularies or therapeutic guidelines and protocols.	Offer alternative treatments on the basis of best practice (e.g. cost or adherence to guidelines), a generic brand, a different dosage, a different drug, or no drug (watchful waiting). Suggest lab order monitoring as appropriate. Support expedited entry of series of medications that are part of a treatment regimen, i.e. renal dialysis, Oncology, transplant medications, etcetera.		Improves patient safety and efficiency and supports delivery of effective healthcare.	
DC.2.3.2	Support for medication and immunization administration or supply	Alert providers in real-time to potential administration errors such as wrong patient, wrong drug, wrong dose, wrong route and wrong time in support of medication administration or pharmacy dispense/supply management and workflow.	To reduce medication errors at the time of administration of a medication, the patient is positively identified; checks on the drug, the dose, the route and the time are facilitated. Documentation is a by-product of this checking; administration details and additional patient information, such as injection site, vital signs, and pain assessments, are captured. In addition, access to online drug monograph information allows providers to check details about a drug and enhances patient education.		Improves patient safety and efficiency and supports delivery of effective healthcare.	
DC.2.4	Orders, referrals, results and care management					
DC.2.4.1	Support for non-medication ordering	Identify necessary order entry components for non-medication orders that make the order pertinent, relevant and resource-conservative at the time of provider order entry; flag any	Possible order entry components include, but are not limited to: missing results required for the order, suggested corollary orders, notification of duplicate orders, institution-specific order		Improves patient safety and efficiency and promotes the delivery of effective healthcare.	Payne TH. Computer Decision Support Systems. CHEST 2000; 118:47S-52S. - - - Stair TO. Reduction of Redundant Laboratory Orders by Access to Computerized Patient

ID	Name	Statement	Description	See Also	Rationale	Citations
		inappropriate orders based on patient profile.	guidelines, guideline-based orders/order sets, order sets, order reference text, patient diagnosis specific recommendations pertaining to the order. Also, warnings for orders that may be inappropriate or contraindicated for specific patients (e.g. X-rays for pregnant women) are presented.			Records. Computers in Emergency Medicine 1998;16:895-897. - - Sanders DL, Miller RA. The effects on clinician ordering patterns of a computerized decision support system for neuroradiology imaging studies. Proc AMIA Symp 2001;:583-587. - - Hunt DL, Haynes RB, Hanna SE, Smith K. Effects of computer-based clinical decision support systems on physician performance and patient outcomes: a systematic review. JAMA 1998;280:1339-1346. - - Chin HL, Wallace P. Embedding guidelines into direct physician order entry: simple methods, powerful results. Proc AMIA Symp 1999;:221-225.
DC.2.4.2	Support for result interpretation	Evaluate results and notify provider of results within the context of the patient's clinical data.	Possible result interpretations include, but are not limited to: abnormal result evaluation/notification, trending of results (such as discrete lab values), evaluation of pertinent results at the time of provider order entry (such as evaluation of lab results at the time of ordering a radiology exam), evaluation of incoming results against active medication orders.		Improves patient safety, efficiency, and supports the delivery of effective healthcare.	Poom EG, Kuperman GJ, Fiskio J, Bates DW. Real-time notification of laboratory data requested by users through alphanumeric pagers. JAMIA 2002;9:217-222. - - Kuperman GL et al. Improving response to critical laboratory results with automation. JAMIA 1999;6:512-522. - - Bates DW et al. Reducing the frequency of errors in medicine using information technology. JAMIA 2001;8(4):299-308. - -
DC.2.4.3	Support for referrals			DC 1.4		
DC.2.4.3.1	Support for the referral process based	Evaluate referrals within the context of a patient's clinical data.	When a healthcare referral is made, pertinent health information,		Supports delivery of effective healthcare,	

ID	Name	Statement	Description	See Also	Rationale	Citations
	upon the specific patient's clinical data		including pertinent results, demographic and insurance data elements (or lack thereof) are presented to the provider. Protocols for appropriate workup prior to referral may be presented.		improves efficiency, and facilitates management of chronic conditions.	
DC.2.4.3.2	Support for referral recommendations	Evaluate patient data and recommend that a patient be referred based on the specific patient's clinical data.	Entry of specific patient conditions may lead to recommendations for referral e.g. for smoking cessation counseling if the patient is prescribed a medication to support cessation.		Supports delivery of effective healthcare, improves efficiency, and facilitates management of chronic conditions.	
DC.2.4.4	Support for Care Delivery					
DC.2.4.4.1	Support for safe blood administration	Alert provider in real-time to potential blood administration errors.	To reduce blood administration errors at the time of administration of blood products, the patient is positively identified and checks on the blood product, the amount, the route and the time are facilitated. Documentation is a by-product of this checking.		Supports delivery of effective healthcare and improves patient safety and efficiency	
DC.2.4.4.2	Support for accurate specimen collection	Alert providers in real-time to ensure specimen collection is supported.	To ensure the accuracy of specimen collection, when a provider obtains specimens from a patient, the clinician can match each specimen collection identifier and the patient's ID bracelet. The provider is notified in real-time of potential collection errors such as wrong patient, wrong specimen type, wrong means of collection, wrong site, and wrong date and time. Documentation of the collection is a by-product of this checking.	DC 1.4.1; DC 1.4.2	Supports delivery of effective healthcare and improves patient safety and efficiency	
DC.2.5	Support for Health Maintenance: Preventive Care and Wellness					

ID	Name	Statement	Description	See Also	Rationale	Citations
DC.2.5.1	Present alerts for preventive services and wellness	At the point of clinical decision making, identify patient specific suggestions/reminders, screening tests/exams, and other preventive services in support of routine preventive and wellness patient care standards.	At the time of an encounter, the provider or patient is presented with due or overdue activities based on protocols for preventive care and wellness. Examples include but are not limited to, routine immunizations, adult and well baby care, age and sex appropriate screening exams, such as PAP smears.		Supports the delivery of effective healthcare and improves efficiency.	U.S. Preventive Services Task Force. http://www.ahrq.gov/clinic/uspstfix.htm - Reference: Hunt DL, et. al. Effects of Computer-based Clinical Decision Support on Physician Performance and Patient Outcomes. JAMA.1998;280;1339-1346.
DC.2.5.2	Notifications and reminders for preventive services and wellness	Between healthcare encounters, notify the patient and/or appropriate provider of those preventive services, tests, or behavioral actions that are due or overdue.	The provider can generate notifications to patients regarding activities that are due or overdue and these communications can be captured. Examples include but are not limited to time sensitive patient and provider notification of: follow-up appointments, laboratory tests, immunizations or examinations. The notifications can be customized in terms of timing, repetitions and administration reports. E.g. a Pap test reminder might be sent to the patient a 2 months prior to the test being due, repeated at 3 month intervals, and then reported to the administrator or clinician when 9 months overdue.		Supports the delivery of effective healthcare, improves efficiency; and facilitates self-health management.	U.S. Preventive Services Task Force. http://www.ahrq.gov/clinic/uspstfix.htm - Reference: Hunt DL, et. al. Effects of Computer-based Clinical Decision Support on Physician Performance and Patient Outcomes. JAMA.1998;280;1339-1346. -
DC.2.6	Support for population health					
DC.2.6.1	Support for clinical health state monitoring within a population.	Support clinical health state monitoring of aggregate patient data for use in identifying health risks from the environment and/or population.	Standardized surveillance performance measures that are based on known patterns of disease presentation can be identified by aggregating data from multiple input mechanisms. For example, elements include, but are not limited to patient demographics, resource utilization, presenting		Supports the delivery of effective healthcare and improves efficiency.	

ID	Name	Statement	Description	See Also	Rationale	Citations
			<p>symptoms, acute treatment regimens, laboratory and imaging study orders and results and genomic and proteomic data elements. Identification of known patterns of existing diseases involves aggregation and analysis of these data elements by existing relationships. However, the identification of new patterns of disease requires more sophisticated pattern recognition analysis. Early recognition of new patterns requires data points available early in the disease presentation. Demographics, ordering patterns and resource use (e.g., ventilator or intensive care utilization pattern changes) are often available earlier in the presentation of non-predictable diseases. Consumer-generated information is also valuable with respect to surveillance efforts.</p>			
DC.2.6.2	Support for notification and response	Upon notification by an external, authoritative source of a health risk within the cared for population, alert relevant providers regarding specific potentially at-risk patients with the appropriate level of notification.	Upon receipt of notice of a health risk within a cared-for population from public health authorities or other external authoritative sources, identify and notify individual care providers or care managers that a risk has been identified and requires attention including suggestions on the appropriate course of action. This process gives a care provider the ability to influence how patients are notified, if necessary.		Supports the delivery of effective healthcare and improves efficiency.	
DC.2.6.3	Support for monitoring response to notifications	In the event of a health risk alert and subsequent notification related to a specific patient,	Identifies that expected follow-up for a specific patient event (e.g., follow up to error alerts or absence	S.3.4.1	Supports the delivery of effective healthcare and improves patient	

ID	Name	Statement	Description	See Also	Rationale	Citations
	regarding an individual patient's health, including appropriate follow-up notifications	monitor if expected actions have been taken, and execute follow-up notification if they have not.	of an expected lab result) has not occurred and communicate the omission to appropriate care providers in the chain of authority. Of great importance to the notification process is the ability to match a care provider's clinical privileges with the clinical requirements of the notification.		safety and efficiency.	
DC.2.7	Support for knowledge access					
DC.2.7.1	Access clinical guidance	Provide relevant evidence-based information and knowledge to the point of care for use in clinical decisions and care planning.	Examples include but are not limited to: evidence on treatment of conditions and wellness, as well as context-specific links to other knowledge resources. For example, when a condition is diagnosed provider is directed to relevant online evidence for management.		Supports the delivery of effective healthcare, improves patient safety and efficiency, and facilitates management of chronic conditions.	See also S.3.7.1, S.3.7.3
DC.2.7.2	Patient knowledge access	Enable the accessibility of reliable information about wellness, disease management, treatments, and related information that is relevant for a specific patient.	An individual will be able to find reliable information to answer a health question, follow up from a clinical visit, identify treatment options, or other health information needs. The information may be linked directly from entries in the health record, or may be accessed through other means such as key word searching.	DC.3.2.4; S.3.7.2	Facilitates self-health management and supports the delivery of effective healthcare.	U.S. Department of Health and Human Services, Healthy People 2010, Health Communication Focus Area. (USDHHS 2000) http://www.healthypeople.gov/document/HTML/Volume1/11HealthCom.htm - ; Science Panel on Interactive Communication and Health. Wired for Health and Well-Being: the Emergence of Interactive Health Communication. Washington, DC: US Department of Health and Human Services, April 1999. http://www.health.gov/scipich/pubs/finalreport.htm
DC.3	Operations					

ID	Name	Statement	Description	See Also	Rationale	Citations
Management and Communication						
DC.3.1	Clinical workflow tasking	Schedule and manage tasks with appropriate timeliness.	<p>Since the electronic health record will replace the paper chart, tasks that were based on the paper artifact must be effectively managed in the electronic environment. Functions must exist in the EHRS that support electronically any workflow that previously depended on the existence of a physical artifact (such as the paper chart, a phone message slip) in a paper based system. Tasks differ from other more generic communication among participants in the care process because they are a call to action and target completion of a specific workflow in the context of a patient's health record (including a specific component of the record). Tasks also require disposition (final resolution). The initiator may optionally require a response. For example, in a paper based system, physically placing charts in piles for review creates a physical queue of tasks related to those charts. This queue of tasks (for example, a set of patient phone calls to be returned) must be supported electronically so that the list (of patients to be called) is visible to the appropriate user or role for disposition. Tasks are time-limited (or finite). The state transition (e.g. created, performed and resolved) may be managed by the user explicitly or automatically</p>			

ID	Name	Statement	Description	See Also	Rationale	Citations
			<p>based on rules. For example, if a user has a task to signoff on a test result, that task should automatically be marked complete by the EHR when the test result linked to the task is signed in the system. Patients will become more involved in the care process by receiving tasks related to their care. Examples of patient related tasks include acknowledgement of receipt of a test result forwarded from the provider, or a request to schedule an appointment for a pap smear (based on age and frequency criteria) generated automatically by the EHRS on behalf of the provider.</p>			
DC.3.1.1	Clinical task assignment and routing	Assignment, delegation and/or transmission of tasks to the appropriate parties.	<p>Tasks are at all times assigned to at least one user or role for disposition. Whether the task is assignable and to whom the task can be assigned will be determined by the specific needs of practitioners in a care setting. Task-assignment lists help users prioritize and complete assigned tasks. For example, after receiving a phone call from a patient, the triage nurse routes or assigns a task to return the patient's call to the physician who is on call. Task creation and assignment may be automated, where appropriate. An example of a system-triggered task is when lab results are received electronically; a task to review the result is automatically generated and assigned to a clinician. Task assignment ensures that all tasks</p>		Support delivery of effective healthcare; patient safety; improve efficiency	

ID	Name	Statement	Description	See Also	Rationale	Citations
			are disposed of by the appropriate person or role and allows efficient interaction of entities in the care process.			
DC.3.1.2	Clinical task linking	Linkage of tasks to patients and/or a relevant part of the electronic health record.	Clinical tasks are linked to a patient or to a component of a patient's medical record. An example of a well defined task is "Dr. Jones must review Mr. Smith's blood work results." Efficient workflow is facilitated by navigating to the appropriate area of the record to ensure that the appropriate test result for the correct patient is reviewed. Other examples of tasks might involve fulfillment of orders or responding to patient phone calls.		Support delivery of effective healthcare; improve patient safety; improve efficiency	
DC.3.1.3	Clinical task tracking	Track tasks to guarantee that each task is carried out and completed appropriately.	In order to reduce the risk of errors during the care process due to missed tasks, the provider is able to view and track un-disposed tasks, current work lists, the status of each task, unassigned tasks or other tasks where a risk of omission exists. For example, a provider is able to create a report to show test results that have not been reviewed by the ordering provider based on an interval appropriate to the care setting.		Support delivery of effective healthcare; patient safety;	
DC.3.1.3.1	Clinical task timeliness tracking	Track and/or report on timeliness of task completion.	Capability to track and review reports on the timeliness of certain tasks in accordance with relevant law and accreditation standards.		Support delivery of effective healthcare; patient safety	
DC.3.2	Support clinical communication		Healthcare requires secure communications among various participants: patients, doctors, nurses, chronic disease care managers, pharmacies, laboratories,			

ID	Name	Statement	Description	See Also	Rationale	Citations
			<p>payers, consultants, and etcetera. An effective EHRS supports communication across all relevant participants, reduces the overhead and costs of healthcare-related communications, and provides automatic tracking and reporting. The list of communication participants is determined by the care setting and may change over time. Because of concerns about scalability of the specification over time, communication participants for all care settings or across care settings are not enumerated here because it would limit the possibilities available to each care setting and implementation. However, communication between providers and between patients and providers will be supported in all appropriate care settings and across care settings. Implementation of the EHRS enables new and more effective channels of communication, significantly improving efficiency and patient care. The communication functions of the EHRS will eventually change the way participants collaborate and distribute the work of patient care.</p>			
DC.3.2.1	Inter-provider communication	Support secure electronic communication (inbound and outbound) between providers to trigger or respond to pertinent actions in the care process (including referral), document non-electronic communication (such as phone calls,	Communication among providers involved in the care process can range from real time communication (for example, fulfillment of an injection while the patient is in the exam room), to asynchronous communication (for example, consult reports between		Support delivery of effective healthcare; patient safety; management of chronic conditions; improve efficiency;	

ID	Name	Statement	Description	See Also	Rationale	Citations
		correspondence or other encounters) and generate paper message artifacts where appropriate.	physicians). Some forms of inter-practitioner communication will be paper based and the EHRS must be able to produce appropriate documents.			
DC.3.2.2	Pharmacy communication	Provide features to enable secure bidirectional communication of information electronically between practitioners and pharmacies or between practitioner and intended recipient of pharmacy orders.	When a medication is prescribed, routed to the pharmacy or another intended recipient of pharmacy orders. This information is used to avoid transcription errors and facilitate detection of potential adverse reactions. Upon filling the prescription, information is sent back to the practitioner to indicate that the patient received the medication. If there is a question from the pharmacy, that communication can be presented to the provider with their other tasks.		Support delivery of effective healthcare; improve efficiency; management of chronic conditions	
DC.3.2.3	Provider and patient or family communication	Trigger or respond to electronic communication (inbound and outbound) between providers and patients or patient representatives with pertinent actions in the care process.	The clinician is able to communicate with patients and others, capturing the nature and content of electronic communication, or the time and details of other communication. For example: when test results arrive, the clinician may wish to email the patient that test result was normal (details of this communication are captured); a patient may wish to request a refill of medication by emailing the physician; patients with asthma may wish to communicate their peak flow logs/diaries to their provider; or a hospital may wish to communicate with selected patients about a new smoking cessation program.		Support delivery of effective healthcare; management of chronic conditions; improve efficiency; facilitate self health management	
DC.3.2.4	Patient, family and care giver education	Identify and make available electronically or in print any	The provider or patient is presented with a library of educational		Support delivery of effective healthcare;	

ID	Name	Statement	Description	See Also	Rationale	Citations
		educational or support resources for patients, families, and caregivers that are most pertinent for a given health concern, condition, or diagnosis and which are appropriate for the person (s).	materials and where appropriate, given the opportunity to document patient/caregiver comprehension. The materials can be printed or electronically communicated to the patient.		management of chronic conditions; improve efficiency; facilitate self health management	
DC.3.2.5	Communication with medical devices	Support communication and presentation of data captured from medical devices.	Communication with medical devices is supported as appropriate to the care setting. Examples include: vital signs/pulse-oximeter, anesthesia machines, home diagnostic devices for chronic disease management, laboratory machines, bar coded artifacts (medicine, immunizations, demographics, history, and identification).		Support delivery of effective healthcare; Management of chronic conditions Improve efficiency	

3.0 Chapter 3: Supportive EHR-S Functions

Supportive EHR-S functions are the subset of EHR-S functions that assist with the administrative and financial requirements associated with the delivery of healthcare. Supportive EHR-S functions also provide input to systems that perform medical research, promote public health, and seek to improve the quality of healthcare delivered.

3.1 Example

For example, during the encounter, Supportive EHR-S functions will electronically query local immunization registries (to insure that the child is currently registered), and will determine the child's immunization status. After treatment, Supportive EHR-S functions will report any immunization to an immunization registry and will provide any encounter data required by financial and administrative systems.

3.2 Actors

The Support Staff are the principal users of these functions but, under certain circumstances, the Healthcare Providers might be expected to perform certain administrative functions.

3.3 Functional Outline - Supportive

Supportive	S1.0 Clinical Support	
	S2.0 Measurement, Analysis, Research, Reporting	
	S3.0 Administrative and Financial	

ID	Name	Statement	Description	See Also	Rationale	Citations
S.1	Clinical Support					
S.1.1	Registry Notification	Enable the automated transfer of formatted demographic and clinical information to and from local disease specific registries (and other notifiable registries) for patient monitoring and subsequent epidemiological analysis.	The user can export personal health information to disease specific registries, other notifiable registries like immunization registries, and add new registries through the addition of standard data transfer protocols or messages.	I.2.4; I.4.7	1. Support delivery of effective healthcare - 2. Improve patient safety - 3. Facilitate management of chronic conditions	Disease specific registries are exemplified by the long-standing cancer registry system that exists in each state and supported by institution-based tumor registries in many health care institutions. See http://www.cdc.gov/cancer/np cr/index.htm for more information.
S.1.2	Donor management support	Provide capability to capture or receive, and share needed information on potential organ and blood donors and recipients.	The user is able to capture or receive information on potential organ and blood donors and recipients. The user can make this information available to internal and external donor matching agencies.	I.2.4; I.4.7	2. Improve patient safety - 4. Improve efficiency	Organ donor transplant management is a complex interaction of many coordinated bodies that extends beyond the institutions involved in organ harvesting and transplantation. This system is described at http://www.optn.org/about/transplantation/matchingProcess.asp .
S.1.3	Provider directory	Provide a current directory of practitioner, team, department, organization, and etcetera, information in accordance with relevant laws, regulations, and conventions.	Maintain or access current directory of provider information in accordance with relevant laws, regulations, and conventions, including full name, address or physical location, and a 24x7 telecommunications address (e.g. phone or pager access number) for the purposes of the following functions	I.1.3; I.4	1. Support delivery of effective healthcare - 4. Improve efficiency	Unique identification of providers along with appropriate demographics is already being done in healthcare and will form an essential component of the National Provider Identifier in the US under HIPAA (http://aspe.hhs.gov/admsimp/nprm/npinprm.pdf). Role based access to systems is an essential component of any security system. An example of role based access as it applies to the EHR by the

ID	Name	Statement	Description	See Also	Rationale	Citations
						Open Architecture for Secure Internetworking Services (OASIS) may be found at (http://www.cl.cam.ac.uk/~km/MW2001-talk.pdf). OASIS is a not-for-profit global consortium that drives the development, convergence and adoption of e-business standards (http://www.cl.cam.ac.uk/~km/MW2001-talk.pdf). - While current provider location is a convenience item that relates mostly to customer satisfaction it elevates to a level of vital importance when communicating critical test results (http://www.macoalition.org/documents/CTRPractices.pdf)
S.1.3.1	Provider demographics	Provide a current directory of practitioners that, in addition to demographic information, contains data needed to determine levels of access required by the EHR security system.	Provider demographics may include any credentials, certifications, or any other information that may be used to verify that a provider is permitted to perform certain services.	I.1.2		
S.1.3.2	Provider's location within facility	Provide provider location or contact information on a facility's premises.				
S.1.3.3	Provider's on call location	Provide provider location or contact information when on call.				
S.1.3.4	Provider's general location	Provide locations or contact information for the provider in order to direct patients or queries.				
S.1.4	Patient directory	Provide a current directory of patient information in accordance with relevant privacy and other applicable laws, regulations, and	Provide a current directory of patient information in accordance with relevant privacy and other applicable laws, regulations, and	DC.1.1.1; I.1.4	1. Support delivery of effective healthcare - 2. Improve patient safety - 3. Facilitate	Patient location is an essential part of the patient record, which, by IOM definition in their 1991 report forms the

ID	Name	Statement	Description	See Also	Rationale	Citations
		conventions.	conventions, including, when available, full name, address or physical location, alternate contact person, primary phone number, and relevant health status information for the purposes of the following functions.		management of chronic conditions - 4. Improve efficiency - 5. Facilitate self-health management	basis of an EHR (http://books.nap.edu/books/0309055326/html/index.html).
S.1.4.1	Patient demographics	Support interactions with other systems, applications, and modules to enable the maintenance of updated demographic information in accordance with realm-specific recordkeeping requirements.	The minimum demographic data set must include the data required by realm-specific laws governing health care transactions and reporting. This may also include data input of death status information.	S.1.4; S.3.7.3		Patient demographics is an essential part of the patient record, which, by IOM definition in their 1991 report that forms the basis of an EHR (http://books.nap.edu/books/0309055326/html/index.html).
S.1.4.2	Patient's location within a facility	Provide the patient's location information within a facility's premises.	Example: The patient census in a hospital setting			
S.1.4.3	Patient's residence for the provision and administration of services	Provide the patient's residence information solely for purposes related to the provision and administration of services to the patient, patient transport, and as required for public health reporting.				Personal health information disclosure is required for public health purposes, see http://www.cdc.gov/mmwr/preview/mmwrhtml/su5201a1.htm .
S.1.4.4	Optimize patient bed assignment	Support interactions with other systems, applications, and modules to ensure that the patient's bed assignments within the facility optimize care and minimize risks e.g. of exposure to contagious patients.		S.1.7		Information on the recommended isolation of patients with certain infectious diseases may be found at http://www.cdc.gov/ncidod/sars/isolationquarantine.htm with a current list of possible infectious agents at http://www.cdc.gov/ncidod/sars/executiveorder040403.htm . - Information on an instructional role in emergency situations has been developed by JCAHO and maybe found at http://www.jcaho.org/about+u

ID	Name	Statement	Description	See Also	Rationale	Citations
						s/public+policy+initiatives/emergency+preparedness.pdf.
S.1.5	De-identified data request management	Provide patient data in a manner that meets local requirements for de-identification.	When an internal or external party requests patient data and that party requests de-identified data (or is not entitled to identify patient information, either by law or custom), the user can export the data in a fashion that meets local requirements for de-identification. An audit trail of these requests and exports is maintained. For internal clinical audit, a re-identification key may be added to the data.	I.1.8; I.3; I.6.1		Deidentification of data requires removing patient demographic information to the point that the individual patient can not be identified. Actual requirements for deidentification will vary based on location and specific need. In the US regulations for that are viewed as acceptable for complete deidentification can be found at http://privacyruleandresearch.nih.gov/pr_08.asp#8a .
S.1.6	Scheduling	Support interactions with other systems, applications, and modules to provide the necessary data to a scheduling system for optimal efficiency in the scheduling of patient care, for either the patient or a resource/device.	The system user can schedule events as required. Relevant clinical or demographic information can be linked to the task.	DC.3.1; DC.3.2.1; I.2.3; I.4.1; I.7	1. Support delivery of effective healthcare - 2. Improve patient safety - 3. Facilitate management of chronic conditions - 4. Improve efficiency	IOM Rpt, page 10, "Electronic scheduling systems for admissions, procedures and visits not only increase efficiency, but also provide better service to patients (Everett, 2002; Hancock and Walter, 1986; Woods, 2001) - http://www.iom.edu/report.asp?id=14391
S.1.7	Healthcare resource availability	Support interactions with other systems, applications, and modules to enable the distribution of local healthcare resource information in times of local or national emergencies.	In times of identified local or national emergencies and upon request from authorized bodies, provide current status of healthcare resources including, but not limited to, available beds, providers, support personal, ancillary care areas and devices, operating theaters, medical supplies, vaccines, and pharmaceuticals. The intent is for the authorized body to distribute either resources or patient load to maximize efficient	S.1.4.4; I.1.6; I.5.1	1. Support delivery of effective healthcare - 2. Improve patient safety - 4. Improve efficiency	The Public Health response to biological and chemical terrorism: interim planning guidance for state public health officials. http://www.bt.cdc.gov/Documents/Planning/PlanningGuidance.PDF -

ID	Name	Statement	Description	See Also	Rationale	Citations
			healthcare delivery.			
S.2	Measurement, Analysis, Research and Reports					
S.2.1	Measurement, monitoring, and analysis	Support measurement and monitoring of care for relevant purposes.		DC.2.6.1; I.2.4	1. Support Delivery of Effective Healthcare - 2 Improve Patient Safety - 3 Facilitate management of chronic conditions - 4 Improve efficiency	AHIMA Practice Brief: Data Quality Management Model: http://library.ahima.org/xpedio/groups/public/documents/ahima/pub_bok1_000066.html
S.2.1.1	Outcome Measures and Analysis	Support the capture and reporting of information for the analysis of outcomes of care provided to populations, in facilities, by providers, and in communities.		S.3.6.2		
S.2.1.2	Performance and accountability measures	Support the capture and reporting of quality, performance, and accountability measures to which providers/facilities/delivery systems/communities are held accountable including measures related to process, outcomes, and/or costs of care, may be used in 'pay for performance' monitoring and adherence to best practice guidelines.		DC.2.6.3; DC.2.6.2; S.3.6		
S.2.2	Report generation	Provide report generation features for the generation of standard and ad hoc reports.	A user can create standard and ad hoc reports for clinical, administrative, and financial decision-making, and for patient use - including structured data and/or unstructured text from the patient's health record. Reports may be linked with financial and other external data sources (i.e. data external to the entity). Such reports may include patient-level reports, provider/facility/delivery system-	DC.2.6.3; S.3.6; I.2.4	1. Support Delivery of Effective Healthcare - 2 Improve Patient Safety - 3 Facilitate management of chronic conditions - 4 Improve efficiency - 5 Facilitate self-health management	"Claims and encounter data are used to monitor and improve outcomes for numerous preventive services, including prenatal care, childhood immunization, and cancer screenings." p. 8 - Promoting Prevention Through Information Technology: - Assessment of Information Technology in Association of Health Center

ID	Name	Statement	Description	See Also	Rationale	Citations
			<p>level reports, population-level reports, and reports to public health agencies.</p> <p>Examples of patient-level reports include: administratively required patient assessment forms, admission/transfer/discharge reports, operative and procedure reports, consultation reports, and drug profiles.</p> <p>Examples of population-level reports include: reports on the effectiveness of clinical pathways and other evidence-based practices, tracking completeness of clinical documentation, etcetera.</p> <p>Examples of reports to public health agencies include: vital statistics, reportable diseases, discharge summaries, immunization data including adverse outcomes, cancer data, and other such data necessary to maintain the public's health (including suspicion of newly emerging infectious disease and non-natural events).</p>			<p>Affiliated Health Plans http://www.ahcahp.org/publications/Working%20Papers/Final%20Report%20from%202003%20AHCAHP%20IT%20Assessment.pdf -</p>
S.2.2.1	Health record output	Allow users to define the records and/or reports that are considered the formal health record for disclosure purposes, and provide a mechanism for both chronological and specified record element output.	Provide hardcopy and electronic output that can fully chronicle the healthcare process, supports selection of specific sections of the health record, and allows healthcare organizations to define the report and/or documents that will comprise the formal health record for disclosure purposes.	I.2.4; DC.1.15	1. Support Delivery of Effective Healthcare - 3 Facilitate management of chronic conditions - 4 Improve efficiency	

ID	Name	Statement	Description	See Also	Rationale	Citations
S.3	Administrative and Financial					
S.3.1	Encounter/Episode of care management	Manage and document the health care needed and delivered during an encounter/episode of care.	<p>Using data standards and technologies that support interoperability, encounter management promotes patient-centered/oriented care and enables real time, immediate point of service, point of care by facilitating efficient work flow and operations performance to ensure the integrity of:</p> <ul style="list-style-type: none"> (1) the health record, (2) public health, financial and administrative reporting, and (3) the healthcare delivery process. <p>This support is necessary for direct care functionality that relies on providing user interaction and workflows, which are configured according to clinical protocols and business rules based on encounter specific values such as care setting, encounter type (inpatient, outpatient, home health, etcetera), provider type, patient's EHR, health status, demographics, and the initial purpose of the encounter.</p>		<p>1. Support Delivery of Effective Healthcare - 2 Improve Patient Safety - 3 Facilitate management of chronic conditions - 4 Improve efficiency - 5 Facilitate self-health management</p>	<p>AHIMA Practice Brief: Definition of the Health Record for Legal Purposes: http://library.ahima.org/xpedio/groups/public/documents/ahima/pub_bok1_009223.html</p>
S.3.1.1	Specialized views	Present specialized views based on the encounter-specific values, clinical protocols and business rules	The system user is presented with a presentation view and system interaction appropriate to the context with capture of encounter-specific values, clinical protocols and business rules. This "user view" may be configurable by the	DC.2.2.1.2;		<p>Remarks by Tommy G. Thompson, Secretary of HHS, NHII Conference 7/1/03: "Why is it that retailers such as L.L. Bean have been able to personalize my shopping experience and yours -</p>

ID	Name	Statement	Description	See Also	Rationale	Citations
			<p>user or system technicians. As an example, a mobile home health care worker using wireless laptop at the patient's home would be presented with a home health care specific workflow synchronized to the current patient's care plan and tailored to support the interventions appropriate for this patient, including chronic disease management protocols.</p>			<p>automatically providing the correct sizes and suggestions of other items based on what I bought last year - but my doctor and pharmacist cannot quickly refer to a list of my prescriptions or see when I had my last physical?"(http://www.hhs.gov/news/speech/2003/030701.html) Key Capabilities of an Electronic Health Record System, p. 9 (http://www.iom.edu/report.aspx?id=14391) Standards Insight - An Analysis of Health Information - Standards Development Initiatives - July 2003(http://www.himss.org/content/files/StandardsInsight/2003/07-2003.pdf)</p>
S.3.1.2	Encounter specific functionality	Provide assistance in assembling appropriate data, supporting data collection and processing output from a specific encounter.	<p>Workflows, based on the encounter management settings, will assist in determining the appropriate data collection, import, export, extraction, linkages and transformation. As an example, a pediatrician is presented with diagnostic and procedure codes specific to pediatrics. Business rules enable automatic collection of necessary data from the patient's health record and patient registry. As the provider enters data, workflow processes are triggered to populate appropriate transactions and documents. For example, data entry might populate an eligibility verification transaction or query the immunization registry.</p>			<p>The CPR in Eleven Paperless Physicians' Offices; http://www.himss.org/content/files/proceedings/slides/sessions/ses048s.pdf; http://www.himss.org/content/files/proceedings/2000/session/s/ses048.pdf -</p>

ID	Name	Statement	Description	See Also	Rationale	Citations
S.3.1.3	Automatic generation of administrative and financial data from clinical record	Provide patients clinical data to support administrative and financial reporting.	A user can generate a bill based on health record data. Maximizing the extent to which administrative and financial data can be derived or developed from clinical data will lessen provider reporting burdens and the time it takes to complete administrative and financial processes such as claim reimbursement. This may be implemented by mapping of clinical terminologies in use to administrative and financial terminologies.	S.3.2.2		Paperless Success: The Value of E-Medical Records - http://www.himss.org/content/files/proceedings/2001/session/s/ses045.pdf - http://www.himss.org/content/files/proceedings/2001/session/s/ses081.pdf - - "Having clinical data represented with a standardized terminology and in a machine-readable format would reduce the significant data collection burden at the provider level, as well as the associated costs, and would likely increase the accuracy of the data reported." IOM Key Capabilities of an Electronic Health Record System , pg 14 (http://www.iom.edu/report.asp?id=14391) - - "1. Real-time status reports linking performance measures with health outcomes. 2. Rapid adjustments for problem resolution. 3. Community awareness of their local health institutions quality of care." Reference, Improving Health in the Community. IOM, NAS. -
S.3.1.4	Support remote healthcare services	Support remote health care services such as telehealth and remote device monitoring by integrating records and data collected by these means into the patient's EHR for care management, billing and public health reporting purposes.	Enables remote treatment of patients using monitoring devices, and two way communications between provider and patient or provider and provider. - Promotes patient empowerment, self-determination and ability to maintain health status in the	DC.3.2.1; DC.3.2.3; DC.3.2.5; DC.1.1.7.2; DC.1.1		Recent examples of: device monitoring (http://www.hi-europe.info/files/2003/9974.htm); remote monitoring(http://www.device-link.com/mddi/archive/03/06/012.html); and telehealth (http://www.mcg.edu/Telemed

ID	Name	Statement	Description	See Also	Rationale	Citations
			community. Promotes personal health, wellness and preventive care. For example, a diabetic pregnant Mom can self-monitor her condition from her home and use web TV to report to her provider. The same TV-internet connectivity allows her to get dietary and other health promoting information to assist her with managing her high-risk pregnancy.			icine/Index.html) - -
S.3.2	Information access for supplemental use	Support extraction, transformation and linkage of information from structured data and unstructured text in the patient's health record for care management, financial, administrative, and public health purposes.	Using data standards and technologies that support interoperability, information access functionalities serve primary and secondary record use and reporting with continuous record availability and access that ensure the integrity of (1) the health record, (2) public health, financial and administrative reporting, and (3) the healthcare delivery process.		1. Support delivery of effective healthcare - 2. Improve patient safety - 3. Facilitate management of chronic conditions - 4. Improve efficiency	AHIMA Practice Brief: Definition of the Health Record for Legal Purposes: http://library.ahima.org/xpedio/groups/public/documents/ahima/pub_bok1_009223.html - - IOM Key Capabilities of an Electronic Health Record System, p.14 - http://www.iom.edu/report.asp?id=14391
S.3.2.1	Rules-driven clinical coding assistance	Make available all pertinent patient information needed to support coding of diagnoses, procedures and outcomes.	The user is assisted in coding information for clinical reporting reasons. For example, a professional coder may have to code the principal diagnosis in the current, applicable ICD as a basis for hospital funding. All diagnoses and procedures during the episode may be presented to the coder, as well as the applicable ICD hierarchy containing these codes.	I.7		Remarks by Tommy G. Thompson, Secretary of HHS, NHII Conference 7/1/03: We need a health information system that automatically gives health professionals access to the patient-specific medical knowledge required for diagnosis and treatment - the latest research results from medical journals, the most up-to-date guidelines, the appropriate public health notifications. Our doctors then will not have to depend on their great memories any more. - http://www.hhs.gov/news/spee

ID	Name	Statement	Description	See Also	Rationale	Citations
S.3.2.2	Rules-driven financial and administrative coding assistance	Provide financial and administrative coding assistance based on the structured data and unstructured text available in the encounter documentation.	The user is assisted in coding information for billing or administrative reasons. For example, the HIPAA 837 Professional claim requires the date of the last menstrual cycle for claims involving pregnancy. To support the generation of this transaction, the clinician would need to be prompted to enter this date when the patient is first determined to be pregnant, then making this information available for the billing process.	I.7; S.3.1.3		ch/2003/030701.html - NHII03 Standards and Vocabulary Groups A&B: http://aspe.hhs.gov/sp/nhii/Conference03/StandardsVocabA.ppt , http://aspe.hhs.gov/sp/nhii/Conference03/StandardsVocabB.PPT
S.3.2.3	Integrate cost/financial information	Support interactions with other systems, applications, and modules to enable the use of cost management information required to guide users and workflows	The provider is alerted or presented with the most cost-effective services, referrals, devices and etcetera, to recommend to the patient. This may be tailored to the patient's health insurance/plan coverage rules. Medications may be presented in order of cost, or the cost of specific interventions may be presented at the time of ordering.			Medical Informatics for Better and Safer Health Care. http://www.ahrq.gov/data/informatics/informatria.pdf
S.3.3	Administrative transaction processing	Support the creation (including using external data sources, if necessary), electronic interchange, and processing of transactions listed below that may be necessary for encounter management during an episode of care	Support the creation (including using external data sources, if necessary), electronic interchange, and processing of transactions listed below that may be necessary for encounter management during an episode of care. > The EHR system shall capture the patient health-related information needed for administrative and financial purposes including reimbursement.	DC.1.3	1. Support Delivery of Effective Healthcare - - 4. Improve efficiency -	IOM Key Capabilities of an Electronic Health Record System: "Use of communication and content standards is equally important in the billing and claims management area - close coupling of authorization and prior approvals can, in some cases, eliminate delays and confusion. Additionally, immediate validation of insurance eligibility will add value for both providers and

ID	Name	Statement	Description	See Also	Rationale	Citations
			<p>>Captures the episode and encounter information to pass to administrative or financial processes (e.g. triggers transmissions of charge transactions as by-product of on-line interaction including order entry, order statusing, result entry, documentation entry, medication administration charting.)</p> <p>> Automatically retrieves information needed to verify coverage and medical necessity.</p> <p>> As a byproduct of care delivery and documentation: captures and presents all patient information needed to support coding. Ideally performs coding based on documentation.</p> <p>> Clinically automated revenue cycle - examples of reduced denials and error rates in claims.</p> <p>> Clinical information needed for billing is available on the date of service.</p> <p>>Physician and clinical teams do not perform additional data entry / tasks exclusively to support administrative or financial processes.</p>			<p>patients through improved access to services, more timely payments and less paperwork. "http://www.iom.edu/report.asp?id=14391 - HIMSS Electronic Health Record Definitional Model - Version 1.0 - - AHIMA Practice Brief: Definition of the Health Record for Legal Purposes: http://library.ahima.org/xpedio/groups/public/documents/ahima/pub_bok1_009223.html - - AHIMA Practice Brief: Health Informatics Standards and Information Transfer: Exploring the HIM Role: http://library.ahima.org/xpedio/groups/public/documents/ahima/pub_bok1_000024.html - - AHIMA Practice Brief: Defining the Designated Record Set: http://library.ahima.org/xpedio/groups/public/documents/ahima/pub_bok1_017122.html -</p>
S.3.3.1	Enrollment of patients	Support interactions with other systems, applications, and modules to enable enrollment of uninsured patients into subsidized and unsubsidized health plans, and	Expedites determination of health insurance coverage, thereby increasing patient access to care. The provider may be alerted that uninsured patients may be eligible	DC.2.2.1.5		Enrolling and Retaining Low Income families http://cms.hhs.gov/schip/outreach/progress.pdf - To a Streamlined Approach to -

ID	Name	Statement	Description	See Also	Rationale	Citations
		enrollment of patients who are eligible on the basis of health and/of financial status in social service and other programs, including clinical trials.	for subsidized health insurance or other health programs because they meet eligibility criteria based on demographics and/or health status. For example: a provider is notified that the uninsured parents of a child enrolled in S-CHIP may now be eligible for a new subsidized health insurance program; a provider of a pregnant patient who has recently immigrated is presented with information about eligibility for subsidy. Links may be provided to online enrollment forms. When enrollment is determined, the health coverage information needed for processing administrative and financial documentation, reports or transactions is captured.			Public Health Insurance Enrollment - http://www.healthapp.org/ -
S.3.3.2	Eligibility verification and determination of coverage	Support interactions with other systems, applications, and modules to enable eligibility verification for health insurance and special programs, including verification of benefits and pre-determination of coverage.	Automatically retrieves information needed to support verification of coverage at the appropriate juncture in the encounter workflow. Improves patient access to covered care and reduces claim denials. When eligibility is verified, the EHRS would capture eligibility information needed for processing administrative and financial documentation, reports or transactions - updating or flagging any inconsistent data. In addition to health insurance eligibility, this function would support verification of registration in programs and registries, such as chronic care case management and immunization registries. An EHRS would likely verify health insurance eligibility prior to the encounter, but would			Immunization registries are having continual success in increasing vaccination rates of children (http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5001a2.htm). - - Electronic determination of insurance coverage is a required HIPAA transaction in the US. See the 270/271 Implementation Guide available at http://www.wpc-edi.com/hipaa/HIPAA_40.asp . - -

ID	Name	Statement	Description	See Also	Rationale	Citations
			verify registration in case management or immunization registries during the encounter.			
S.3.3.3	Service authorizations	Support interactions with other systems, applications, and modules to enable the creation of requests, responses and appeals related to service authorization, including prior authorizations, referrals, and pre-certification.	Automatically retrieves information needed to support verification of medical necessity and prior authorization of services at the appropriate juncture in the encounter workflow. Improves timeliness of patient care and reduces claim denials.			Plans reported that their electronic connections to various types of providers enable numerous functions to be completed over the Internet, including claims submission, online eligibility verification, and referral approvals. P.9 - Promoting Prevention Through Information Technology: Assessment of Information Technology in Association of Health Center Affiliated Health Plans http://www.ahcahp.org/publications/Working%20Papers/Final%20Report%20from%202003%20AHCAHP%20IT%20Assessment.pdf
S.3.3.4	Support of service requests and claims	Support interactions with other systems, applications, and modules to support the creation of health care attachments for submitting additional clinical information in support of service requests and claims.	Automatically retrieves structured data, including lab, imaging and device monitoring data, and unstructured text based on rules or requests for additional clinical information in support of service requests or claims at the appropriate juncture in the encounter workflow			Electronic transmission of clinical data for claims is a required HIPAA transaction in the US that is under development. See http://www.hl7.org/library/committees/ca/hipaa%20and%20claims%20attachments%20white%20paper%2020030920.pdf for details.
S.3.3.5	Claims and encounter reports for reimbursement	Support interactions with other systems, applications, and modules to enable the creation of claims and encounter reports for reimbursement	Automatically retrieves information needed to support claims and encounter reporting at the appropriate juncture in the encounter workflow.			Electronic submission of claims data is a required HIPAA transaction in the US. See the 837 Implementation Guide available at http://www.wpc-edi.com/hipaa/HIPAA_40.asp .

ID	Name	Statement	Description	See Also	Rationale	Citations
S.3.3.6	Health service reports at the conclusion of an episode of care.	Support the creation of health service reports at the conclusion of an episode of care. Support the creation of health service reports to authorized health entities, for example public health, such as notifiable condition reports, immunization, cancer registry and discharge data that a provider may be required to generate at the conclusion of an episode of care.	Effective use of this function means that clinicians do not perform additional data entry to support health management programs and reporting.	S.2.2		IOM Key Capabilities of an Electronic Health Record System p. 14 http://www.iom.edu/report.asp?id=14391 - HIMSS Electronic Health Record Definitional Model - Version 1.0
S.3.4	Manage Practitioner/Patient relationships	Identify relationships among providers treating a single patient, and provide the ability to manage patient lists assigned to a particular provider.	<p>This function addresses the ability to access and update current information about the relationships between caregivers and the subjects of care. This information should be able to flow seamlessly between the different components of the EHRS, and between the EHRS and other systems. Business rules may be reflected in the presentation of, and the access to this information. The relationship among providers treating a single patient will include any necessary chain of authority/responsibility.</p> <p>Example: In a care setting with multiple providers, where the patient can only see certain kinds of providers (or an individual provider); allow the selection of only the appropriate providers.</p> <p>Example: The user is presented with a list of people assigned to a given practitioner and may alter the assignment as required - to a group, to another individual or by sharing</p>	DC.2.6.3; S.2.2	1. Support delivery of effective healthcare - 3. Facilitate management of chronic conditions - 4. Improve efficiency	IOM Rpt, page 9, "Effective communication - among health care team members and with patients - is critical to the provision of quality health care (Bates and Gawande, 2003; Wanlass et. Al. 1992) - http://www.iom.edu/report.asp?id=14391

ID	Name	Statement	Description	See Also	Rationale	Citations
			the assignment.			
S.3.5	Subject to Subject relationship	Capture relationships between patients and others to facilitate appropriate access to their health record on this basis (e.g. parent of a child) if appropriate.	A user may assign the relationship of parent to a person who is their offspring. This relationship may facilitate access to their health record as parent of a young child.	S.1.4.1; I.1.3; I.1.5; I.2.2	1. Support Delivery of Effective Healthcare - 3 Facilitate management of chronic conditions	An EHR used at a professional site should support personal health information (http://www.connectingforhealth.org/resources/phwg_final_report.pdf). Why Keeping Family Health Records is a Good Idea http://www.healthminder.com/articles/benefits.htm
S.3.5.1	Related by genealogy	Provide information of Related by genealogy (blood relatives)				
S.3.5.2	Related by insurance	Support interactions with other systems, applications, and modules to provide information of Related by insurance (domestic partner, spouse, and guarantor).				
S.3.5.3	Related by living situation	Provide information of Related by living situation (in same household)				
S.3.5.4	Related by other means	Provide information of Related by other means (e.g. epidemiologic exposure or other person authorized to see records, Living Will cases)				Contact tracing is an essential and required feature of public health and has usefulness outside of public health when evaluating non-reportable infectious disease or genetically related conditions. (http://biotech.law.lsu.edu/Books/lbb/x578.htm)
S.3.6	Acuity and Severity	Provide the data necessary for the capability to support and manage patient acuity/severity of illness/risk adjustment		S.2.1.2	1. Support Delivery of Effective Healthcare - 2 Improve Patient Safety - - 4 Improve efficiency	An Integrated Analysis of Staffing and Effects on Patient Outcomes http://www.nursingworld.org/OJIN/KEYNOTES/speech_3.htm
S.3.7	Maintenance of supportive functions	Update EHR supportive content on an automated basis.			1. Support Delivery of Effective Healthcare - 2. Improve Patient	

ID	Name	Statement	Description	See Also	Rationale	Citations
					Safety - 3. Facilitate management of chronic conditions - 4. Improve efficiency - 5. Facilitate self-health management	
S.3.7.1	Clinical decision support system guidelines updates	Receive and validate formatted inbound communications to facilitate updating of clinical decision support system guidelines and associated reference material		DC.1.2.1; DC.2.6.3; DC.2.7.1		Nearly all plans (92 percent) reported having one or more IT databases that reference clinical criteria, guidelines or protocols. While plans reported a variety of methods used to communicate clinical criteria, guidelines and protocols to providers, e-mail and electronic newsletters are seldom used and only one of the most widely used methods is related to IT. p 3 - Promoting Prevention Through Information Technology: Assessment of Information Technology in Association of Health Center Affiliated Health Plans http://www.ahcahp.org/publications/Working%20Papers/Final%20Report%20from%202003%20AHCAHP%20IT%20Assessment.pdf
S.3.7.2	Account for patient education material updates	Receive and validate formatted inbound communications to facilitate updating of patient education material		DC.3.2.4		Patient Provider Communication Tools http://www.chcf.org/documents/ihealth/PatientProviderCommunicationTools.pdf Informing Patients A Guide for Providing Patient Health Information - http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=6

ID	Name	Statement	Description	See Also	Rationale	Citations
						1336 - - Promoting Prevention Through Information Technology: Assessment of Information Technology in Association of Health Center Affiliated Health Plans - http://www.ahcahp.org/publications/Working%20Papers/Final%20Report%20from%202003%20AHCAHP%20IT%20Assessment.pdf
S.3.7.3	Patient reminder information updates	Receive and validate formatted inbound communications to facilitate updating of patient reminder information from external sources such as Cancer or Immunization Registries		I.5.2; S.1.4.1		Plans reported using IT systems to support numerous activities and processes, such as utilization management, disease management and targeted mailings to members. P. 3 Promoting Prevention Through Information Technology: Assessment of Information Technology in Association of Health Center Affiliated Health Plans http://www.ahcahp.org/publications/Working%20Papers/Final%20Report%20from%202003%20AHCAHP%20IT%20Assessment.pdf -
S.3.7.4	Public health related updates	Receive and validate formatted inbound communications to facilitate updating of public health reporting guidelines		I.5.2		Public health response information changes continually and the ability to access the latest data by EHR users is essential (http://www.cdc.gov/phn/components/PHIN%20Brochure%20HAN%20.ppt). -

4.0 Chapter 4: Information Infrastructure EHR-S Functions

Information Infrastructure EHR-S functions are the subset of EHR-S functions that:

- a. Provide a framework for the proper operation of the Direct Care and Supportive EHR-S functions, and
- b. Offer EHR-S technical capabilities that are essential, yet transparent, to the user. (NOTE: These Information Infrastructure functions make an implicit assumption that a base technical environment exists. These functions may be mapped to existing standards, but are not intended to imply or endorse the implementation of any specific technical standard, nor imply a need for new technical standards.)

4.1 Example

For example, Direct Care and Supportive EHR-S functions must operate in a secure environment. Therefore, Information Infrastructure functions will provide a secure electronic environment for the immunization registration query mentioned above and will report the child's immunization event in a secure manner. Information Infrastructure functions will also transparently provide other essential services, such as the archival and backup of the child's record and an audit trail of all accesses to the child's record.

4.2 Actors

These functions are expected to be performed transparently by EHR-S applications on behalf of EHR-S end-users. The System Administrator is expected to be involved in all operations related to configuring and managing the EHR-S operation.

4.3 Functional Outline – Information Infrastructure

Information Infrastructure	I 1.0	EHR Security
	I 2.0	EHR Information and Records Management
	I 3.0	Unique identity, registry, and directory services
	I 4.0	Support for Health Informatics & Terminology Standards
	I 5.0	Interoperability
	I 6.0	Manage business rules
	I 7.0	Workflow

ID	Name	Statement	Description	See Also	Rationale	Citations
I.1	Security	Secure the access to an EHR-S and EHR information. Manage the sets of access control permissions granted within an EHR-S. Prevent unauthorized use of data, data loss, tampering and destruction.	To enforce security, all EHR-S applications must adhere to the rules established to control access and protect the privacy of EHR information. Security measures assist in preventing unauthorized use of data and protect against loss, tampering and destruction.			ISO 9735-7:2002 -- Electronic data interchange for administration, commerce and transport - (EDIFACT) -- Application level syntax rules (Syntax version number: 4, - Syntax release number: 1) -- Part 7: Security rules for batch EDI - (confidentiality)
I.1.1	Entity Authentication	Authenticate EHR-S users and/or entities before allowing access to an EHR-S.	Both users and application are subject to authentication. The EHR-S must provide mechanisms for users and applications to be authenticated. Users will have to be authenticated when they attempt to use the application, the applications must authenticate themselves before accessing EHR information managed by other applications or remote EHR-S'. In order for authentication to be established a Chain of Trust agreement is assumed to be in place. Examples of entity authentication include: > Username/ password; > Digital certificate; > Secure token; > Biometrics			
I.1.2	Entity Authorization.	Manage the sets of access-control permissions granted to entities that use an EHR-S (EHR-S Users). Enable EHR-S security administrators to grant authorizations to users, for roles, and within contexts. A combination of the authorization levels may be applied to control access to EHR-S functions or data within an EHR-S, including at the application or the operating	Entities that use an EHR-S (EHR-S Users) are authorized to use the components of an EHR-S according to identity, role, work-assignment, present condition and/or location in accordance with an entity's scope of practice within a legal jurisdiction. > User based authorization refers to the permissions granted or denied based on the identity of an	I.1.3; S.1.3.1		ISO 18307

ID	Name	Statement	Description	See Also	Rationale	Citations
		system level.	<p>individual. An example of User based authorization is a patient defined denial of access to all or part of a record to a particular party for reasons such as privacy. Another user based authorization is for a telemonitor device or robotic access to an EHR-S for prescribed directions and other input.</p> <p>> Role based authorization refers to the responsibility or function performed in a particular operation or process. Example roles include: an application or device (telemonitor or robotic); or a nurse, dietician, administrator, legal guardian, and auditor.</p> <p>> Context-based Authorization is defined by ISO as security-relevant properties of the context in which an access request occurs, explicitly time, location, route of access, and quality of authentication. For example, an EHR-S might only allow supervising providers' context authorization to attest to entries proposed by residents under their supervision.</p> <p>In addition to the standard, context authorization for an EHR-S is extended to satisfy special circumstances such as, assignment, consents, or other healthcare-related factors. A context-based example might be a right granted for a limited period to view those,</p>			

ID	Name	Statement	Description	See Also	Rationale	Citations
			and only those, EHR records connected to a specific topic of investigation.			
I.1.3	Entity Access Control	Verify and enforce access control to all EHR-S components, EHR information and functions for end-users, applications, sites, etc., to prevent unauthorized use of a resource, including the prevention or use of a resource in an unauthorized manner.	This is a fundamental function of an EHR-S. To ensure access is controlled, an EHR-S must perform an identity lookup of users or application for any operation that requires it (authentication, authorization, secure routing, querying, etc.) and enforce the system and information access rules that have been defined.			
I.1.3.1	Patient Access Management	Enable a healthcare professional to manage a patient's access to the patient's personal health information. Patient access-management includes allowing a patient access to the patient's information and restricting access by the patient or guardian to information that is potentially harmful to the patient.	A healthcare professional will be able to manage a patient's ability to view his/her EHR, and to alert other providers accessing the EHR about any constraints on patient access placed by this provider. Typically, a patient has the right to view his/her EHR. However, a healthcare provider may sometimes need to prevent a patient (or guardian) from viewing parts of the record. For example, a patient receiving psychiatric care might harm himself (or others) if he reads the doctor's evaluation of his condition. Furthermore, reading the doctor's therapy plan might actually cause the plan to fail.			
I.1.4	Non-repudiation	Limit an EHR-S user's ability to deny (repudiate) an electronic data exchange originated, received or authorized by that user.	Non-repudiation ensures that an entered or a transferred message has been entered, sent, or received by the parties claiming to have entered, sent or received the message. Non-repudiation is a way to guarantee that the sender of a message cannot later deny having sent the message and that the			

ID	Name	Statement	Description	See Also	Rationale	Citations
			<p>recipient cannot deny having received the message. Non-repudiation may be achieved through the use of:</p> <ul style="list-style-type: none"> > Digital signature, which serves as a unique identifier for an individual (much like a written signature). > Confirmation service, which utilizes a message transfer agent to create a digital receipt (providing confirmation that a message was sent and/or received) and > Timestamp, which proves that a document existed at a certain date and time 			
I.1.5	Secure Data Exchange	Secure all modes of EHR data exchange.	Whenever an exchange of EHR information occurs, it requires appropriate security and privacy considerations, including data obfuscation as well as both destination and source authentication when necessary. For example, it may be necessary to encrypt data sent to remote or external destinations. This function requires that there is an overall coordination regarding what information is exchanged between EHR-S entities and how that exchange is expected to occur. The policies applied at different locations must be consistent or compatible with each other in order to ensure that the information is protected when it crosses entity boundaries within an EHRS or external to an EHRS.	I.1.1		

ID	Name	Statement	Description	See Also	Rationale	Citations
I.1.6	Secure Data Routing	Route electronically exchanged EHR data only to/from known, registered, and authenticated destinations/sources (according to applicable healthcare-specific rules and relevant standards).	An EHR-S needs to ensure that it is exchanging EHR information with the entities (applications, institutions, directories) it expects. This function depends on entity authorization and authentication to be available in the system. For example, a physician practice management application in an EHR-S might send claim attachment information to an external entity. To accomplish this, the application must use a secure routing method, which ensures that both the sender and receiving sides are authorized to engage in the information exchange.	I.1.1; I.1.2		
I.1.7	Information Attestation	Manage electronic attestation of information including the retention of the signature of attestation (or certificate of authenticity) associated with incoming or outgoing information.	The purpose of attestation is to show authorship and assign responsibility for an act, event, condition, opinion, or diagnosis. Every entry in the health record must be identified with the author and should not be made or signed by someone other than the author. (Note: A transcriptionist may transcribe an author's notes and a senior clinician may attest to the accuracy of another's statement of events.) Attestation is required for (paper or electronic) entries such as narrative or progress notes, assessments, flow sheets, and orders. Digital signatures may be used to implement document attestation. For an incoming document, the record of attestation is retained if included. Attestation functionality must meet applicable legal, regulatory and other			

ID	Name	Statement	Description	See Also	Rationale	Citations
			applicable standards or requirements.			
I.1.8	Enforcement of Confidentiality	Enforce the applicable jurisdiction's patient privacy rules as they apply to various parts of an EHR-S through the implementation of security mechanisms.	A patient's privacy may be adversely affected when EHRs are not held in confidence. Privacy rule enforcement decreases unauthorized access and promotes the level of EHR confidentiality.	I.6		
I.2	Health record information and management	Manage EHR information across EHR-S applications by ensuring that clinical information entered by providers is a valid representation of clinical notes; and is accurate and complete according to clinical rules and tracking amendments to clinical document. Ensure that information entered by or on behalf of the patient is accurately represented.	Since EHR information will typically be available on a variety of EHR-S applications, an EHR-S must provide the ability to access, manage and verify accuracy and completeness of EHR information, and provide the ability to audit the use of and access to EHR information.			
I.2.1	Data Retention, Availability and Destruction	Retain, ensure availability, and destroy health record information according to organizational standards. This includes: > Retaining all EHR-S data and clinical documents for the time period designated by policy or legal requirement; >Retaining inbound documents as originally received (unaltered); >Ensuring availability of information for the legally prescribed period of time; and >Providing the ability to destroy EHR data/records in a systematic way according to policy and after the legally prescribed retention period.	Discrete and structured EHR-S data, records and reports must be: > Made available to users in a timely fashion; > Stored and retrieved in a semantically intelligent and useful manner (for example, chronologically, retrospectively per a given disease or event, or in accordance with business requirements, local policies, or legal requirements); > Retained for a legally-proscribed period of time; and >Destroyed in a systematic manner	I.1.7		

ID	Name	Statement	Description	See Also	Rationale	Citations
			<p>in relation to the applicable retention period.</p> <p>An EHR-S must also allow an organization to identify data/records to be destroyed, and to review and approve destruction before it occurs.</p>			
I.2.2	Audit trail	<p>Provide audit trail capabilities for resource access and usage indicating the author, the modification (where pertinent), and the date and time at which a record was created, modified, viewed, extracted, or deleted. Audit trails extend to information exchange and to audit of consent status management (to support DC.1.5.1) and to entity authentication attempts. Audit functionality includes the ability to generate audit reports and to interactively view change history for individual health records or for an EHR-S.</p>	<p>Audit functionality extends to security audits, data audits, audits of data exchange, and the ability to generate audit reports. Audit trail settings should be configurable to meet the needs of local policies. Examples of audited areas include:</p> <ul style="list-style-type: none"> > Security audit, which logs access attempts and resource usage including user login, file access, other various activities, and whether any actual or attempted security violations occurred; > Data audit, which records who, when, and by which system an EHR record was created, updated, translated, viewed, extracted, or (if local policy permits) deleted. Audit-data may refer to system setup data or to clinical and patient management data; and > Information exchange audit, record data exchanged between EHR-S applications (for example, sending application; the nature, history, and content of the information exchanged); and information about data 			

ID	Name	Statement	Description	See Also	Rationale	Citations
			<p>transformations (for example, vocabulary translations, reception event details, etc.).</p> <ul style="list-style-type: none"> > Audit reports should be flexible and address various users' needs. For example, a legal authority may want to know how many patients a given healthcare provider treated while the provider's license was suspended. Similarly, in some cases a report detailing all those who modified or viewed a certain patient record may be needed. > Security audit trails and data audit trails are used to verify enforcement of business, data integrity, security, and access-control rules. <p>There is a requirement for system audit trails for the following events:</p> <ul style="list-style-type: none"> > Loading new versions of, or changes to, the clinical system; > Loading new versions of codes and knowledge bases; > Changing the date and time where the clinical system allows this to be done; > Taking and restoring of backup; <p>Archiving any data;</p> <ul style="list-style-type: none"> > Re-activating of an archived 			

ID	Name	Statement	Description	See Also	Rationale	Citations
			<p>patient record;</p> <p>>Entry to and exiting from the clinical system;</p> <p>> Remote access connections including those for system support and maintenance activities</p>			
I.2.3	Synchronization	<p>Maintain synchronization involving:</p> <p>>Interaction with entity directories;</p> <p>>Linkage of received data with existing entity records;</p> <p>>Location of each health record component; and</p> <p>>Communication of changes between key systems.</p>	<p>An EHR-S may consist of a set of components or applications; each application manages a subset of the health information. Therefore it is important that, through various interoperability mechanisms, an EHR-S maintains all the relevant information regarding the health record in synchrony. For example, if a physician orders an MRI, a set of diagnostic images and a radiology report will be created. The patient demographics, the order for MRI, the diagnostic images associated with the order, and the report associated with the study must all be synchronized in order for the clinicians to view the complete record.</p>			
I.2.4	Extraction of health record information	<p>Manage data extraction in accordance with analysis and reporting requirements. The extracted data may require use of more than one application and it may be pre-processed (for example, by being de-identified) before transmission. Data extractions may be used to exchange data and provide reports for primary and ancillary purposes.</p>	<p>An EHR-S enables an authorized user, such as a clinician, to access and aggregate the distributed information, which corresponds to the health record or records that are needed for viewing, reporting, disclosure, etc. An EHR-S must support data extraction operations across the complete data set that constitutes the health record of an individual and provide an output that fully chronicles the healthcare process. Data extractions are used</p>	S.2.2		

ID	Name	Statement	Description	See Also	Rationale	Citations
			as input to continuity of care records. In addition, data extractions can be used for administrative, financial, research, quality analysis, and public health purposes.			
I.3	Unique identity, registry, and directory services	Enable secure use of registry services and directories to uniquely identify and supply links for retrieval and to identify the location of subjects of care: patients and providers for health care purposes; payers, health plans, sponsors, employers and public health agencies for administrative and financial purposes; and health care resources and devices for resource management purposes.	Unique identity, registry, and directory service functions are critical to successfully managing the security, interoperability, and the consistency of the health record data across an EHR-S.			
I.3.1	Distributed registry access	Enable system communication with registry services through standardized interfaces and extend to services provided externally to an EHR-S.	An EHR-S relies on a set of infrastructure services, directories, and registries, which may be organized hierarchically or federated, that support communication between EHR-S'. For example, a patient treated by a primary care physician for a chronic condition may become ill while out of town. The new provider's EHR-S interrogates a local, regional, or national registry to find the patient's previous records. From the primary care record, a remote EHR-S retrieves relevant information in conformance with applicable patient privacy and confidentiality rules. An example of local registry usage is an EHR-S application			

ID	Name	Statement	Description	See Also	Rationale	Citations
			sending a query message to the Hospital Information System to retrieve a patient's demographic data.			
I.4	Health Informatics and Terminology Standards	Ensure consistent terminologies, data correctness, and interoperability in accordance with realm specific requirements by complying with standards for health care transactions, vocabularies, code sets, as well as artifacts such as: templates, system interfaces, decision support syntax and algorithms, and clinical document architecture. Support reference to standard and local terminologies and their versions in a manner that ensures comparable and consistent use of vocabulary, such as the Common Terminology Services specification.	Examples that an EHR-S needs to support are a consistent set of terminologies such as: LOINC, SNOMED, applicable ICD, CPT and messaging standards such as X12 and HL7. Vocabularies may be provided through a terminology service internal or external to an EHR-S.			
I.4.1	Maintenance and versioning of health informatics and terminology standards.	Enable version control according to customized policies to ensure maintenance of utilized standards.	Version control allows for multiple sets or versions of the same terminology to exist and be distinctly recognized over time. Terminology versioning supports retrospective analysis and research as well as interoperability with systems that comply with different releases of the standard. Similar functionality must exist for messaging and other informatics based standards. It should be possible to retire deprecated versions when applicable business cycles are completed while maintaining obsolescent code sets for possible claims adjustment			

ID	Name	Statement	Description	See Also	Rationale	Citations
I.4.2	Mapping local terminology, codes, and formats	Map or translate local terminology, codes and formats to standard terminology, codes, and formats to comply with health informatics standards.	<p>throughout the claim's lifecycle.</p> <p>An EHR-S, which uses local terminology, must be capable of mapping and/or converting the local terminology into a standard terminology. For example, a local term or code for "Ionized Calcium" must be mapped to an equivalent, standardized (LOINC) term or code when archiving or exchanging artifacts.</p>			
I.5	Standards-based Interoperability	Provide automated health delivery processes and seamless exchange of key clinical and administrative information through standards-based solutions.	Interoperability standards enable an EHR-S to operate as a set of applications.			
I.5.1	Interchange Standards	Support the ability to operate seamlessly with complementary systems by adherence to key interoperability standards. Systems may refer to other EHR-S', applications within an EHR-S, or other authorized entities that interact with an EHR-S.	<p>An EHR-S must adhere to standards for connectivity, information structures, and semantics ("interoperability standards"). An EHR-S, which may exist locally or remotely, must support seamless operations between complementary systems.</p> <p>An EHR-S must support realm specific interoperability standards such as: HL7 Messages, Clinical Document Architecture (CDA), X12N healthcare transactions, and Digital Imaging and Communication in Medicine (DICOM).</p> <p>An EHR-S must be capable of common semantic representations to support information exchange.</p> <p>An EHR-S may use different</p>	I.4.2		

ID	Name	Statement	Description	See Also	Rationale	Citations
			<p>standardized or local vocabularies in accordance with realm specific requirements. In order to reconcile the semantic differences across vocabularies, an EHR-S must adhere to standard vocabulary or leverage vocabulary lookup and mapping capabilities that are included in the Health Informatics and Terminology Standards.</p> <p>An EHR-S must support multiple interaction modes to respond to differing levels of immediacy and types of exchange. For example, messaging is effective for many near-real time, asynchronous data exchange scenarios but may not be appropriate if the end-user is requesting an immediate response from a remote application.</p> <p>In addition, in the case where store-and-forward, message-oriented interoperability is used; the applications may need to support the appropriate interaction mode. For example: Unsolicited Event Notifications, Query/Response, Query for display, Unsolicited summary, structured/discrete, and unstructured clinical documents.</p>			
I.5.2	Standards-based Application Integration	Provide integration with complementary systems and infrastructure services (directory, vocabulary, etc.) using standard-based application programming interfaces (for example, CCOW).	Similar to standard-based messaging, standard-based application integration requires that an EHR-S use standardized programming interfaces, where applicable. For example, CCOW may be used for visual integration			

ID	Name	Statement	Description	See Also	Rationale	Citations
I.5.3	Interchange Agreements	Support interaction with entity directories to determine the recipients' address profile and data exchange requirements, and use these rules of interaction when exchanging information with partners.	<p>and WfMC for workflow integration.</p> <p>An EHR-S uses the entity registries to determine the security, addressing, and reliability requirements between partners. An EHR-S uses this information to define how data will be exchanged between the sender and the receiver.</p>	I.3		
I.6	Business Rules Management	Manage the ability to create, update, delete, and version business rules including institutional preferences. Apply business rules from necessary points within an EHR-S to control system behavior. An EHR-S audits changes made to business rules, as well as compliance to and overrides of applied business rules.	<p>An EHR-S business rule implementation functions include: decision support, diagnostic support, workflow control, access privileges, as well as system and user defaults and preferences.</p> <p>An EHR-S supports the ability of providers and institutions to customize decision support components such as triggers, rules, or algorithms, as well as the wording of alerts and advice to meet realm specific requirements and preferences.</p> <p>Examples of applied business rules include:</p> <ul style="list-style-type: none"> > Suggesting diagnosis based on the combination of symptoms (flu-like symptoms combined with widened mediastinum suggesting anthrax); > Classifying a pregnant patient as high risk due to factors such as age, health status, and prior pregnancy outcomes; 	DC.2.2; S.3.1; S.3.7		

	Name	Statement	Description	See Also	Rationale	Citations
			<ul style="list-style-type: none"> > Sending an update to an immunization registry when a vaccination is administered; > Limiting access to mental health information to a patient's psychiatrist/psychologist; > Establishing system level defaults such as for vocabulary data sets to be implemented.; and > Establishing user level preferences such as allowing the use of health information for research purposes. 			
I.7	Workflow Management	Support workflow management functions including both the management and set up of work queues, personnel, and system interfaces as well as the implementation functions that use workflow-related business rules to direct the flow of work assignments.	<p>Workflow management functions that an EHR-S supports include:</p> <ul style="list-style-type: none"> > Distribution of information to and from internal and external parties; > Support for task-management as well as parallel and serial task distribution; > Support for notification and task routing based on system triggers; and > Support for task assignments, escalations and redirection in accordance with business rules. <p>Workflow definitions and management may be implemented by a designated application or distributed across an EHR-S.</p>			

Appendix A: What is a DSTU?

Definition from HL7 Policy and Procedure Manual:

POL 14.00.01 Draft Standard for Trial Use In order to provide timely compliance with regulatory or other governmental mandate and/or timely response to industry or market demand, the Board of Directors is empowered to adopt and publish a Draft Standard for Trial Use (DSTU). The issuance of a DSTU shall be an extraordinary event and shall only proceed with the understanding that the draft standard will, following a suitable period for evaluation and comment, be expeditiously incorporated into a fully balloted and accredited version of the standard. Where the evaluation and comment period results in a need for substantive changes to the draft standard, the relevant accredited version of the standard may embody such changes or a revised DSTU may be published for further evaluation. In either case, given the need for substantive changes, the accredited version of the standard or the subsequent revised DSTU is not bound to maintain compatibility with the initial DSTU. Under such circumstances it is the obligation of the author(s), given that the intent of a draft standard is to improve the viability of the accredited standard, to select enhancement over compatibility. Conversely, recognizing the commitment and investment involved in implementing a DSTU for evaluation and comment, a DSTU implementation shall be accepted as viable for up to two years after its publication or for up to six months after the publication of a subsequent revised DSTU or the first accredited version of the standard that embodies the draft standard, whichever is longer.

Appendix B: Scenarios on reader review of the EHR-S DSTU package

Readers may wish to focus on the specific section of the EHR-S DSTU package that is most relevant for their every day work. For example, a clinician might read the Direct Care and Supportive sections very closely, while technical people might focus especially on the Information Infrastructure section. Within an organization, it might be helpful to delegate responsibility for scrutinizing the different sections among staff with different responsibilities and expertise. Three vignettes are included here to help readers in different positions or organizations envision how they would study, comment on, and ultimately utilize the DSTU Functional Outline.

Scenario 1 - GROUP PRACTICE.

Dr. Smith is part of a 50-person group practice. The practice currently has a clinical information system that provides billing, scheduling, and other administrative support. For several reasons, it will need to be upgraded or replaced within 2 years. It does not include electronic health records. Dr. Smith wants the practice to review the EHR-S Model to be sure it would be helpful to them as they make their IT decisions. Dr. Smith and interested colleagues review the Ambulatory Care documents in the reference section to see how the example use setting and scenario illustrate the EHR functions related to their practice; they look at the example Ambulatory Care prioritization of the individual functions that a group of experts working with HL7 have suggested. With a good understanding of what the EHR functions would mean for their practice, Dr. Smith and several other providers then focus on the Direct Care and Supportive sections, while the technical support staff look at the Information Infrastructure section. They meet to discuss their conclusions. Overall, they are very favorable to the list of functions. They identify a few terminology issues and suggestions for revising them, as input to the DSTU comment process. They plan to use the list of functions in discussions with vendors about their next IT system, recognizing that some functions may not yet be available.

Scenario 2 - HOSPITAL.

Mr. Jones is the Chief Informatics Officer in a large hospital organization. Their IT system was installed two years ago and includes patient tracking and ordering components; it was upgraded for HIPAA compliance. It does not include clinical decision support, performance monitoring, or public health reporting. Mr. Jones asks the Chief Medical Officer to organize a review of the HL7 EHR-S Model while his team also reviews it. They both begin by looking at the Acute Care profile documents in the reference section to see how a group of experts working with HL7 have suggested the EHR-S might be used within a hospital. The example scenario and example prioritization of the individual functions is helpful. The CMO and several doctors and senior nurses review the Direct Care and Supportive sections of the EHR-S Model; the CIO and his team focus on the Information Infrastructure section but also look at the Direct Care and Supportive sections. A small team of providers and IT staff meet to discuss their conclusions. They elect to suggest some specific revisions, as part of the DSTU comment process, to some functions, to some

sections of the Informative text, and to the Acute Care reference materials. They plan to use the list of functions in discussions with vendors about adding decision support, performance monitoring, and public health reporting to their existing system, recognizing that their budget will only allow very limited expansion in the near term.

Scenario 3 - IT VENDOR.

Ms. Green is the head of the clinical systems division of a large health IT company. Their product line includes both dedicated EHR systems and integrated systems that include an EHR. Their EHR and integrated systems have some decision support for medication ordering, but no performance monitoring/reporting functions. While most of their clients are larger provider organizations and hospitals, they are planning to expand into the small practice and home health markets with a simple, less expensive clinical system. In anticipation of HHS's implementation of the Medicare Reform law, which provides financial incentives for providers who use IT to track patients, the company wants to add a range of functionality to its products that would meet or exceed the Medicare requirements. Ms. Green asks her staff to review the entire HL7 EHR-S Model package, beginning with the care setting examples in the reference section. Based on the examples in the care setting section, they determine that they could add a relatively small number of functions to various products to be able to offer superior products for current and future clients. They review the list of functions in the EHR-S model and find that a specific supportive function they already provide is not included. They anticipate discussing the inclusion of this function with HL7 during the DSTU period. They see value in the EHR-S Model for their discussions with their clients about upgrades or new purchases.