

Chapter 28. Prevention of Delirium in Older Hospitalized Patients

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Background

Delirium, or acute confusional state, is a common complication among hospitalized older patients. Delirium is characterized by a sudden onset and fluctuating course, inattention, altered level of consciousness, disorganized thought and speech, disorientation, and often behavioral disturbance. As with other common geriatric syndromes, the etiology of delirium is multifactorial. Previous research has identified a broad range of predisposing and precipitating factors.¹⁻⁴ These include older age, cognitive or sensory impairments, dehydration, specific medication usage (eg, psychoactive drugs), concurrent medical illness, and sleep deprivation. The multifactorial nature of delirium suggests that intervention strategies targeting multiple known risk factors might be effective in preventing its occurrence in hospitalized older patients. In this chapter, we review multicomponent prevention programs that can be applied to a general hospitalized patient population, not restricted to one admitting diagnosis (in keeping with the crosscutting patient safety focus of the Report; Chapter 1). For example, a study comparing the effect of postoperative analgesia using intravenous versus epidural infusions after bilateral knee replacement surgery was not included.⁵

Practice Description

A number of individual interventions have been used in efforts to prevent delirium. Some could be considered part of general nursing practice, whereas others involve medical assessments by physicians or consultants. General strategies to prevent delirium include use of patient reorientation techniques (such as verbal reassurance, re-introduction of team members, review of the daily hospital routine and patient schedule), environmental modifications (visible clocks and calendars), and scheduled patient mobility. The number and complexity of these interventions can vary, with individual nursing discretion usually determining how and when these interventions are implemented. Patient education,⁶ nursing staff education,⁷ and family involvement⁸ are also useful. Approaches for primary prevention that incorporate physician consultants or geriatric consultative teams⁹⁻¹¹ are reviewed elsewhere in this Report (see Chapters 29 and 30).

Formal prevention programs target defined risk factors by implementing multiple practices according to standardized protocols. For example, a recently reported, multicomponent strategy focused on 6 risk factors and successfully developed intervention protocols to address each of them.¹² Patients with cognitive impairment received daily orientation interventions and 3-times daily cognitive stimulation activities. To target sleep impairment, patients received non-pharmacologic sleeping aids (eg, back massage and relaxation tapes), while hospital staff engaged in noise-reduction strategies such as setting beepers to vibrate and using silent pill crushers. Immobility was addressed with a 3-times daily exercise protocol adapted for use with bed-bound and ambulatory patients. Sensory impairments were addressed by providing devices such as auditory amplifiers, visual aids, and larger size push-button phones. Patients with

evidence of dehydration received standardized repletion interventions. A geriatric nurse specialist and staff assisted by trained volunteers carried out all the interventions.

Prevalence and Severity of the Target Safety Problem

The target safety problem is the primary prevention of delirium, rather than the treatment¹³ of existing delirium. In the United States, delirium affects an estimated 2.3 million hospitalized elders annually, accounting for 17.5 million inpatient days, and leading to more than \$4 billion in Medicare costs (1994 dollars).¹² Studies have found that delirium in hospitalized patients contributes to longer lengths of stay,¹⁴ increased mortality,¹⁵⁻¹⁷ and increased rates of institutional placement.^{18, 19} New cases of delirium occur in approximately 15% to 60% of hospitalized older patients, depending on the number of risk factors present at admission.^{4,15,18,20,21} Moreover, because many cases of delirium go unrecognized during hospitalization and because symptoms may persist for months after discharge,²² these may be conservative estimates. Safety practices to reduce delirium may thus have substantial impact on the health and well-being of older patients in hospitals. These practices may also impact nursing home residents and other institutionalized patients, but our practice review did not identify any studies carried out among these patient populations.

Opportunities for Impact

It is difficult to estimate the extent of existing practices aimed at decreasing delirium. A comprehensive model, the Hospital Elder Life Program,²³ which incorporates the delirium interventions reviewed in one study in this chapter,¹² is presently in the initial dissemination phase at 6 replication sites, with 16 hospitals on a waiting list. Present evidence suggests that few facilities currently have intervention programs designed for the primary prevention of delirium. The opportunity for impact in nursing homes and other long-term care facilities is great, but thus far studies have not targeted these settings.

Study Designs

Cole²⁴ conducted a structured search of the medical literature and identified 10 intervention trials to prevent delirium in hospitalized patients. Of these, we excluded one study of much younger patients (mean age, 49 years)²⁵ and one study that incorporated interventions not applicable to most hospitalized elders (eg, early surgery, prevention and treatment of peri-operative blood pressure falls).²⁶ Three used psychiatric consultations²⁷⁻²⁹ which did not fit our criteria for risk factor intervention (see Chapter 29 for similar studies). Table 28.1 lists the remaining 5 studies^{6, 8, 30-32} and a later study,¹² which is the largest controlled trial to date.

Study Outcomes

All of the studies in Table 28.1 reported delirium or confusion symptoms as an outcome measure. Each study, however, used a different instrument to identify delirium: DSM-III,³³ the Confusion Assessment Method,³⁴ the Short Portable Mental Status Questionnaire,³⁵ or a scoring system based on delirium symptoms.

Evidence for Effectiveness of the Practice

The earliest studies, by Owens⁶ and Chatham,⁸ focused on the effects of patient and family education, respectively. Delirium symptoms modestly improved but achieved statistical significance in only 5 of the 11 symptom categories reported in the latter study. Both studies were limited by small numbers of patients, non-standardized interventions, and minimal data on

baseline co-morbidities of the enrolled patients. The study by Williams and colleagues,³² which targeted a population at high risk for delirium (older patients with hip fracture), also demonstrated a statistically significant reduction in delirium symptoms by targeting environmental nursing interventions and patient education. Two subsequent studies did not show a reduction in delirium. The low incidence of delirium (only 3 cases in 30 intervention patients) in the study by Nagley et al³⁰ created inadequate power to detect a significant effect with only 60 total patients. Although a high percentage of patients experienced delirium in the study by Wanich et al,³¹ 79% of cases were diagnosed at the time of admission (prevalent rather than incident cases) and therefore could not have been prevented by the intervention. Both of these studies may also have suffered from contamination bias. The greatest benefit in delirium prevention, a 40% risk reduction, occurred in the study by Inouye et al,¹² a carefully designed and implemented hospital program targeting 6 well-recognized risk factors for delirium, in which adherence to each intervention protocol was tracked. The intervention reduced the number and severity of patients' risk factors and was successful in preventing patients' first delirium episode.

Potential for Harm

None noted.

Costs of Implementation

The only recent estimate of cost per case of delirium prevented was \$6341 in a delirium prevention trial,¹² which is less than the cost associated with prevention of other hospital complications such as falls. A further analysis of the same patients reveals that the multicomponent strategy is cost-effective for those at intermediate risk of delirium, but not for those at highest risk.³⁶

Comment

The literature for delirium prevention studies is small, and the methodologic quality of many studies is poor. However, one high quality study¹² has demonstrated that multicomponent interventions can prevent incident delirium in hospitalized patients. The interventions have high face validity and are both feasible and transportable across institutions and hospital units, suggesting that implementation in different practice settings would be practical. Implementing a multicomponent intervention on a hospital-wide basis throughout the United States would require significant commitment from hospital staff. Programs such as the Hospital Elder Life Program²³ can be readily integrated into hospital practice and have been successful in preventing both cognitive and functional decline using targeted, practical interventions. Others of these practices could be incorporated by either support staff or trained volunteers, which may save resources and underscore the fact that many common sense interventions do not require a larger professional staff. Future studies should focus on refining the most effective multifactorial programs, determining the optimal combination of interventions, defining appropriate target populations based on delirium risk, demonstrating effectiveness across multiple clinical sites, and disseminating the most cost-effective practices.

Table 28.1. Six studies of delirium prevention*

Study	Study Setting	Interventions	Study Design Outcomes	Results†
Chatham, 1978 ⁸	20 surgical patients in a university affiliated hospital, 1977	<ul style="list-style-type: none"> • Family education • Patient education 	Level 2, Level 1	Delirium symptoms rate: intervention resulted in improvement in 5 of 11 areas—orientation, appropriateness, confusion, delusions, and sleep (p<0.05 for each)
Inouye, 1999 ¹²	852 patients in a university hospital, 1995-1998	Targeted 6 risk factors: <ul style="list-style-type: none"> • Cognitive impairment • Immobility • Visual impairment • Hearing impairment • Dehydration • Sleep deprivation 	Level 2, Level 1	Delirium rate: intervention 9.9%, control 15.0% (matched OR 0.60, 95% CI: 0.39-0.92); Episodes of delirium: intervention 62, control 90 (p=0.03); Total days with delirium: intervention 105, control 161 (p=0.02)
Nagley, 1986 ³⁰	60 patients at a university affiliated hospital	16 interventions, including: <ul style="list-style-type: none"> • Orientation strategies • Providing sensory aides • Ambulation • Hydration measures • Nursing interaction 	Level 2, Level 1	No significant difference in mental status scores between groups (p>0.05)
Owens, 1982 ⁶	64 surgical patients in a university hospital	<ul style="list-style-type: none"> • Patient education 	Level 2, Level 1	Delirium symptoms rate: intervention 59%, control 78% (p>0.05)
Wanich, 1992 ³¹	235 patients in a university hospital, 1986-1987	<ul style="list-style-type: none"> • Nursing education • Caregiver education • Orientation strategies • Mobilization • Environmental modifications • Medication evaluation 	Level 2, Level 1	Delirium rate: intervention 19%, control 22% (p=0.61)
Williams, 1985 ³²	227 orthopedic patients in 4 hospitals	<ul style="list-style-type: none"> • Patient education • Orientation strategies • Providing sensory aides 	Level 2, Level 1	Delirium symptoms rate: intervention 43.9%, control 51.5% (p<0.05)

* CI indicates confidence interval; OR, odds ratio.

† Delirium rate is the percentage of patients with one or more episodes of delirium.

References

1. Elie M, Cole MG, Primeau FJ, Bellavance F. Delirium risk factors in elderly hospitalized patients. *J Gen Intern Med.* 1998;13:204-212.
2. Inouye SK, Viscoli CM, Horwitz RI, Hurst LD, Tinetti ME. A predictive model for delirium in hospitalized elderly medical patients based on admission characteristics. *Ann Intern Med.* 1993;119:474-481.
3. Schor JD, Levkoff SE, Lipsitz LA, Reilly CH, Cleary PD, Rowe JW, et al. Risk factors for delirium in hospitalized elderly. *JAMA.* 1992;267:827-831.
4. Inouye SK, Charpentier PA. Precipitating factors for delirium in hospitalized elderly persons. Predictive model and interrelationship with baseline vulnerability. *JAMA.* 1996;275:852-857.
5. Williams-Russo P, Urquhart BL, Sharrock NE, Charlson ME. Post-operative delirium: predictors and prognosis in elderly orthopedic patients. *J Am Geriatr Soc.* 1992;40:759-767.
6. Owens JF, Hutelmyer CM. The effect of preoperative intervention on delirium in cardiac surgical patients. *Nurs Res.* 1982;31:60-62.
7. Rapp CG, Onega LL, Tripp-Reimer T, Mobily P, Wakefield B, Kundrat M, et al. Unit-based acute confusion resource nurse: an educational program to train staff nurses. *Gerontologist.* 1998;38:628-632.
8. Chatham MA. The effect of family involvement on patients' manifestations of postcardiotomy psychosis. *Heart Lung.* 1978;7:995-999.
9. Hogan DB, Fox RA, Gadley BW, Mann OE. Effect of a geriatric consultation service on management of patients in an acute care hospital. *CMAJ.* 1987;136:713-717.
10. Cole MG, Fenton FR, Englesmann F, Mansouri I. Effectiveness of geriatric psychiatry consultation in an acute care hospital: a randomized clinical trial. *J Am Geriatr Soc.* 1991;39:1183-1188.
11. Marcantonio ER, Flacker JM, Wright RJ, Resnick NM. Reducing delirium after hip fracture: a randomized trial. *J Am Geriatr Soc.* 2001;49:In press.
12. Inouye SK, Bogardus ST, Jr., Charpentier PA, Leo-Summers L, Acampora D, Holford TR, et al. A multicomponent intervention to prevent delirium in hospitalized older patients. *N Engl J Med.* 1999;340:669-676.
13. Meagher DJ. Delirium: optimising management. *BMJ.* 2001; 322:144-149.
14. Pompei P, Foreman M, Rudberg MA, Inouye SK, Braund V, Cassel CK. Delirium in hospitalized older persons: outcomes and predictors. *J Am Geriatr Soc.* 1994;42:809-815.
15. Cameron DJ, Thomas RI, Mulvihill M, Bronheim H. Delirium: a test of the Diagnostic and Statistical Manual III criteria on medical inpatients. *J Am Geriatr Soc.* 1987;35:1007-1010.
16. Weddington WW. The mortality of delirium: an underappreciated problem? *Psychosomatics.* 1982;23:1232-1235.
17. Cole MG, Primeau FJ. Prognosis of delirium in elderly hospital patients. *CMAJ.* 1993;149:41-46.
18. Francis J, Martin D, Kapoor WN. A prospective study of delirium in hospitalized elderly. *JAMA.* 1990;263:1097-1101.
19. Inouye SK, Rushing JT, Foreman MD, Palmer RM, Pompei P. Does delirium contribute to poor hospital outcomes? A three-site epidemiologic study. *J Gen Intern Med.* 1998;13:234-242.

20. Foreman MD. Confusion in the hospitalized elderly: incidence, onset, and associated factors. *Res Nurs Health*. 1989;12:21-29.
21. Rockwood K. Acute confusion in elderly medical patients. *J Am Geriatr Soc*. 1989;37:150-154.
22. Levkoff SE, Evans DA, Liptzin B, Cleary PD, Lipsitz LA, Wetle TT, et al. Delirium. The occurrence and persistence of symptoms among elderly hospitalized patients. *Arch Intern Med*. 1992;152:334-340.
23. Inouye SK, Bogardus ST, Jr., Baker DI, Leo-Summers L, Cooney LM, Jr. The Hospital Elder Life Program: a model of care to prevent cognitive and functional decline in older hospitalized patients. *J Am Geriatr Soc*. 2000;48:1697-1706.
24. Cole MG, Primeau F, McCusker J. Effectiveness of interventions to prevent delirium in hospitalized patients: a systematic review. *CMAJ*. 1996;155:1263-1268.
25. Budd S, Brown W. Effect of a reorientation technique on postcardiotomy delirium. *Nurs Res*. 1974;23:341-348.
26. Gustafson Y, Brannstrom B, Berggren D, Ragnarsson JI, Sigaard J, Bucht G, et al. A geriatric-anesthesiologic program to reduce acute confusional states in elderly patients treated for femoral neck fractures. *J Am Geriatr Soc*. 1991;39:6556-62.
27. Layne OL, Jr., Yudofsky SC. Postoperative psychosis in cardiomy patients. The role of organic and psychiatric factors. *N Engl J Med*. 1971;284:518-520.
28. Schindler BA, Shook J, Schwartz GM. Beneficial effects of psychiatric intervention on recovery after coronary artery bypass graft surgery. *Gen Hosp Psychiatry*. 1989;11:358-364.
29. Lazarus HR, Hagens JH. Prevention of psychosis following open-heart surgery. *Am J Psychiatry*. 1968;124:1190-1195.
30. Nagley SJ. Predicting and preventing confusion in your patients. *J Gerontol Nurs*. 1986;12:27-31.
31. Wanich CK, Sullivan-Marx EM, Gottlieb GL, Johnson JC. Functional status outcomes of a nursing intervention in hospitalized elderly. *Image J Nurs Sch*. 1992;24:201-207.
32. Williams MA, Campbell EB, Raynor WJ, Mlynarczyk SM, Ward SE. Reducing acute confusional states in elderly patients with hip fractures. *Res Nurs Health*. 1985;8:329-337.
33. American Psychiatric Association. *Diagnostic and statistical manual of mental disorders (3rd edition)*. ed. Washington, DC: American Psychiatric Press; 1980.
34. Inouye SK, van Dyck CH, Alessi CA, Balkin S, Siegal AP, Horwitz RI. Clarifying confusion: the confusion assessment method. A new method for detection of delirium. *Ann Intern Med*. 1990;113:941-948.
35. Pfeiffer E. A short portable mental status questionnaire for assessment of organic brain deficit in elderly patients. *J Am Geriatr Soc*. 1979;23:433-438.
36. Rizzo JA, Bogardus ST, Jr., Leo-Summers L, Williams CS, Acampora D, Inouye SK. A multicomponent targeted intervention to prevent delirium in hospitalized older patients: what is the economic value? *Medical Care*. 2001;In press.