Annals of Internal Medicine | Supplement

In-Facility Delirium Prevention Programs as a Patient Safety Strategy

A Systematic Review

James T. Reston, PhD, MPH, and Karen M. Schoelles, MD, SM

Delirium, an acute decline in attention and cognition, occurs among hospitalized patients at rates estimated to range from 14% to 56% and increases the risk for morbidity and mortality. The purpose of this systematic review was to evaluate the effectiveness and safety of in-facility multicomponent delirium prevention programs. A search of 6 databases (including MEDLINE, EMBASE, and CINAHL) was conducted through September 2012. Randomized, controlled trials; controlled clinical trials; interrupted time series; and controlled before–after studies with a prospective postintervention portion were eligible for inclusion. The evidence from 19 studies that met the inclusion criteria suggests that most multicomponent interventions are effective in preventing onset of delirium in at-risk patients in a hospital setting. Evidence was insufficient to determine the benefit of such programs in other care settings. Future comparative effectiveness studies with standardized protocols are needed to identify which components in multicomponent interventions are most effective for delirium prevention.

Ann Intern Med. 2013;158:375-380. www.annals.org

For author affiliations, see end of text.

The Problem

Delirium (also known as acute confusional state) is an acute decline in attention and cognition that constitutes a serious problem for older hospitalized patients and long-term care residents. Estimated hospital occurrence rates range from 14% to 56% and vary depending on the reason for hospitalization (for example, urgent surgery, intensive care, or general medical admission) and the patient's risk for the condition (1).

Delirium is associated with an increased risk for death, postoperative complications, longer hospital and intensive care unit stays, and functional decline (1, 2), and it presents a substantial burden in terms of short- and long-term health care costs. A study of 841 patients (aged ≥70 years) admitted to non–intensive care general medical units over a 3-year period at Yale-New Haven Hospital found that daily costs were more than 2.5 times higher for patients with delirium than for those without it. The total cost estimates associated with delirium ranged from $16 303 to $64 421 per patient, which the authors extrapolated to national costs ranging from $38 billion to $152 billion each year (1). Because these estimates were based on data from 1995 to 1998, the costs would be even higher today. Accordingly, prevention of delirium is extremely important for improving patient outcomes and decreasing health care costs.

Evidence from risk-factor studies suggests that delirium has a multifactorial cause (more information on these studies appears in the full report, available at the Agency for Healthcare Research and Quality [AHRQ] Web site [www.ahrq.gov]). No 2 studies evaluated the same set of factors or found the same combination of significant factors associated with delirium. Age was the most commonly evaluated factor—58.8% of studies that evaluated age found it to be significantly associated with occurrence of delirium. Some studies may have lacked adequate power to find statistical significance, although this was clearly not the case in all studies that did not have a significant finding. Among studies that evaluated cognitive impairment or dementia, 84.6% found a significant association between this factor and incidence of delirium. Depression was found to have a significant association with delirium occurrence in only 40% of the studies that evaluated it as a potential risk factor.

Other patient-specific risk factors that showed a significant association with delirium in more than 1 study include male sex, multiple medications, comorbid conditions (for example, diabetes), pneumonia, various anesthetics, neuropsychiatric drugs (for example, benzodiazepines), anticholinergics, blood transfusions, abnormal serum chemistry (for example, blood urea nitrogen levels or creatinine levels), apolipoprotein E4, atrial fibrillation, heavy alcohol intake, volume depletion (dehydration), hypoxia, complications, restraints (rendering patients immobile), and visual impairment. Several studies evaluated patients having specific surgical procedures (for example, hip repair or replacement or cardiac surgery); some of these studies focused on surgery-specific risk factors (for example, blood transfusions or intraoperative anesthesia) and evaluated few nonsurgical factors.

Given the multifactorial nature of delirium, a patient safety strategy designed to assess and remediate multiple factors is considered likely to be effective for delirium prevention. The purpose of this systematic review was to assess the benefits and harms of multicomponent interventions, including system-level changes, that are designed to prevent delirium in hospitals, palliative care centers, and long-term care facilities.

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Key Summary Points

Because delirium has multiple risk factors, multicomponent interventions targeting several risk factors represent promising patient safety strategies for delirium prevention.

Most of the evidence suggests that most multicomponent interventions are effective in preventing onset of delirium in at-risk patients in a hospital setting. These interventions do not seem to have significant associated harms.

The evidence is insufficient to identify which multicomponent interventions are most beneficial, and the studies do not address the question of which components within a program provide the most benefit for delirium prevention.

The evidence is insufficient to determine the benefit of delirium prevention programs in palliative care or long-term care settings.

Patient Safety Strategies

Several delirium prevention programs consist of multifactorial intervention bundles. In general, the components of the bundle vary across each published evaluation, and the same bundle is rarely evaluated in more than 1 application. Therefore, the best that can be done is to describe the components most commonly included in bundles that have been found to reduce incident delirium. The most common components of successful bundles are shown in the **Table**.

Additional components have been reported in successful multifactorial bundles. An intervention used for patients with hip fracture in a Swedish university hospital included increased physiologic monitoring, avoidance of delays in transfer through different areas of the hospital, daily delirium screening, and avoidance of polypharmacy (as well as several components from the **Table**, including extra nutrition, intravenous fluid supplementation, pain management, and perioperative or anesthetic period protocols) (3). A multifactorial intervention used for patients with hip fracture at another Swedish university hospital included treatment of sleep apnea, prevention and treatment of decubitus ulcers, and measurement of blood pressure along with components from the **Table**, although it is not clear that all of these components were specifically designed to prevent delirium (4).

The Hospital Elder Life Program (HELP), or modified versions thereof, has been evaluated in 3 studies (5–7). This program typically consists of 6 components: orientation, therapeutic activities, vision and hearing protocols, sleep enhancement, and early mobilization. Two studies (1 in the United States and 1 in Australia) used proactive geriatric consultation with targeted recommendations (several from the **Table**) based on a structured protocol (8, 9).

Review Processes

We conducted a systematic review of 6 databases (including MEDLINE, EMBASE, and CINAHL) for 1999 to September 2012. A total of 673 titles were identified, of which 309 were reviewed in detail. The **Supplement** (available at www.annals.org) provides a complete description of the search strategies, an article flow diagram, and evidence tables. Randomized, controlled trials; controlled clinical trials; interrupted time series; and controlled before–after studies with a prospective postintervention portion were eligible for inclusion to address effectiveness and harms. Studies were required to have at least 20 patients per intervention group. Methods for assessing risk of bias and strength of evidence are described in the full report on the AHRQ Web site.

Of 309 studies retrieved from our literature searches and reviewed in detail, we identified 35 that addressed single or multicomponent interventions. Of these, 19 evaluated the efficacy of multicomponent interventions and are the subject of this review (see **Table 2** of the **Supplement**). Most of these studies reported the incidence of delirium after the intervention compared with a control group of usual care patients treated concurrently or during a period immediately before adoption of the new intervention. Because few studies used the same intervention, comparison group, study design, or patient population, meta-analyses were not done.

This review was supported by the AHRQ, which had no role in the selection or review of the evidence or in the decision to submit the manuscript for publication.

Benefits and Harms

Benefits

Hospital Inpatient Care

Two studies used HELP, and a third used a modification of HELP. One was a controlled before–after study with a concurrent control group consisting of patients from usual care units (7, 10); this study had a moderate risk of bias. The remaining 2 studies were before–after studies where the usual care group consisted of patients treated before implementation of HELP (historical control) (5, 6); these studies had a high risk of bias. All 3 studies found a substantial reduction in incident delirium after implementation of HELP compared with usual care. Although the findings of the studies were consistent, the average risk of bias was high, mainly because of lack of randomization and blinding.

Two studies used proactive geriatric consultation with targeted recommendations based on a structured protocol for patients with hip fracture. One was a single-blind, randomized, controlled trial with a usual care control group (8), and the other was a before–after study with a historical usual care control group (9). Both studies reported a reduction of incident delirium for the geriatric consultation group compared with the usual care group; however, the

findings from the randomized, controlled trial were no longer statistically significant after adjustment for baseline imbalances. The risk of bias for the studies was high and moderate, respectively. A nonrandomized, controlled study used an inpatient geriatric consultation team that made targeted recommendations (although a list of potential recommendations was not reported) to prevent delirium in patients with hip fracture. Although delirium incidence was lower in the intervention group, the difference in incidence rates did not reach statistical significance (28% vs. 44%; $P = 0.067$). This study had a high risk of bias due to lack of randomization and a low adherence rate to inpatient geriatric consultation team recommendations (one third of recommendations was not implemented) (11).

Of the remaining multicomponent studies (3, 4, 12–20), all but 1 reported a statistically significant reduction in delirium by at least 1 measure in the intervention group versus the control group. The exception was a study of a system-wide quality improvement project (17). A study of nurse-facilitated family participation reported substantially fewer patients with a diagnosis of delirium (defined as a score ≥4 on the Intensive Care Delirium Screening Checklist) in the intervention group but also no statistically significant between-group difference in mean scores; this study placed more emphasis on the latter measure (18). Overall, the findings are consistent with those from studies of the HELP intervention, although the risk of bias was high—again, because of lack of randomization and blinding.

Palliative Care

One multicenter controlled trial assessed a multicomponent intervention intended to prevent delirium in patients with terminal cancer (21). In this population, delirium stems from such risk factors as metastatic brain lesions, high opioid intake, and metabolic disturbances; these are not the typical risk factors found in the general geriatric population, which include older age, cognitive impairment, visual impairment, and multiple medications. Two centers (with 674 patients) implemented the intervention, and the remaining 5 centers (with 842 patients) performed usual care. The intervention involved training nurses to orient the patient each day, recognize risk factors for delirium, and send this information to physicians so that preventive actions could be taken (for example, changing medication). The closest family member was also educated by nurses on delirium and its symptoms, as well as American College of Physicians recommendations for avoiding symptoms of confusion in this patient population. Delirium symptoms were assessed by nurses using the Confusion Rating Scale. During the 3-year study, 49% of patients in the intervention group and 44% in the usual care group developed delirium; after adjustment for confounding factors, there was no significant between-group difference in incident delirium (odds ratio, 0.94; $P =$ 0.66). The risk of bias was high because of lack of randomization; inadequate blinding; and failure to obtain a systematic, formal diagnosis of delirium.

Table. **The Most Common Components of Successful Delirium Prevention Programs**

Anesthesia protocols
Assessment of bowel/bladder functions
Early mobilization
Extra nutrition
Geriatric consultation
Hydration
Medication review
Pain management
Prevention and treatment of medical complications
Sleep enhancement
Staff education
Supplemental oxygen
Therapeutic cognitive activities/orientation
Vision and hearing protocols

Long-Term Care

The single study done in a nursing home setting reported that homes randomly assigned to use pharmacist-led Geriatric Risk Assessment MedGuide reports and automated medication monitoring plans had a significant reduction in delirium onset among newly admitted residents compared with those randomly assigned to usual care (22). However, it is unclear how much of this is due to delirium prevention or resolution of new-onset delirium. Complications did not differ significantly between the groups.

Harms

Most trials of multicomponent delirium prevention programs have not reported any harms. However, it is not clear whether the possibility of harms was explicitly assessed in all of these trials. One study based on a structured quality improvement model reported 4 unexpected minor events (rectal or feeding tube displacement or removal that did not lead to any true complications) but no major complications (and no statistically significant difference compared with usual care, although the study lacked the statistical power to detect meaningful differences) (12). One other study reported no statistically significant differences in total complication rates between intervention (50.4%) and usual care (53%) groups; this study was adequately powered to detect a meaningful difference in complication rates (3).

Implementation Considerations and Costs

Structural Organizational Characteristics

Multicomponent delirium prevention programs have been successfully implemented in acute care hospitals (17 studies), palliative care centers (1 study), and nursing homes (1 study). Five of the acute care hospital studies

were conducted in the United States; 3 in the United Kingdom; 3 in Sweden; and 1 each in Australia, Spain, Italy, Belgium, Chile, and Taiwan. Twelve studies were from academically affiliated urban hospitals, 2 were conducted in urban hospitals that were not described as teaching hospitals, 2 were set in community hospitals (in 1 study, the participating community hospitals were part of a larger health system), and the remaining study was set in a naval hospital. No studies have been reported from rural hospitals. The single study of palliative care was conducted in Canada, and the study set in nursing homes was done in the United States.

Existing Infrastructure

Only 1 study reported minimal information on patient safety culture at the organizational level. The authors stated merely that "SHS [Summa Health System] maintains a strong commitment to patient safety and quality" (17).

External Factors

External factors or motivators were not mentioned in any delirium study.

Implementation

All multicomponent intervention studies provided at least minimal information about teamwork or leadership at the level of the unit where the intervention was implemented. Thirteen of 19 studies specifically identified the study leaders, and 17 of 19 studies identified the team members by job status (for example, nurses and geriatricians) or at least stated that all staff in the intervention ward or unit was part of the team. All of these studies reported multidisciplinary teamwork that included clinical experts, nurses, and other staff (for example, physical therapists or volunteers). One study reported minimal information on teamwork or leadership at the hospital level (17).

Eight studies described multiprofessional implementation, 1 had the intervention performed by the ward staff, 1 involved ward staff plus physical therapists (during home visits), 1 involved ward staff plus ambulance workers, 1 involved unit staff plus volunteers, 2 involved the nursing staff only, 1 involved nursing staff plus consultant pharmacists, 2 involved nurses assisting family members with the intervention, and 1 involved elder life specialists plus volunteers.

Fifteen studies reported on staff education and training if this was part of the intervention, and 9 studies reported the persons responsible for implementation. Most of these studies reported that all staff involved in the implementation had some type of education or training. Thirteen studies reported the type of training, and only 4 reported the length of training.

Four studies reported a change in the implementation process due to local tailoring or an iterative process. Only 1 study reported that internal incentives were used to promote implementation (5). Allen and colleagues published the only study that provided a table summarizing an actual implementation instrument (a scorecard used to track process and outcome variables) (17).

Eighteen studies outlined the intended intervention and the general sequence in which the components were implemented; only 13 studies included enough detail to determine the roles of the various team members. Most studies generally described how the intervention was supposed to be implemented and did not describe any modifications or failures of adherence that might have occurred during the actual implementation. Only 2 studies actually measured adherence to targeted recommendations (8, 11), respectively reporting adherence rates of 77% and approximately 67% for implementation of geriatric consultant recommendations for patients after hip fracture. Fifteen studies reported patient characteristics.

Although implementation of multicomponent delirium prevention programs has not been well-described in most studies, a few themes seem sufficiently consistent to report here. First, engagement of front-line clinical staff in the design of the intervention helps ensure that it will mesh with existing clinical procedures. Second, a multidisciplinary team comprising clinical experts, nurses, and additional staff is helpful for implementation of a complex intervention. Finally, education and training of clinical staff are necessary to help ensure that compliance does not wane over time.

Context

Two studies reported on the effect of context on outcomes. One study of an educational package for medical and nursing staff reported that it was effective at preventing delirium in hospitalized men but not women (12, 23). A study of proactive geriatric consultation with target recommendations based on a structured protocol for patients with hip fracture reported a "trend" toward more effectiveness among patients without prefracture dementia or impairment in activities of daily living, but the differences were not statistically significant (8).

One study assessed the somewhat related concept of patient adherence and its effect on outcomes of a multifactorial intervention (HELP). Based on a composite adherence score for the 3 components assigned to all patients (orientation, mobility, and therapeutic activities), increased adherence scores were associated with a reduction in delirium incidence rates (odds ratio, 0.69 [95% CI, 0.56 to 0.87]) (7).

Costs

Two studies in the evidence base reported information on costs or cost savings associated with multicomponent delirium prevention programs. Rizzo and colleagues (24) calculated the total intervention costs of HELP over a

3-year period (1995–1998) at Yale-New Haven Hospital as $257 385 (personnel plus equipment). In a cost-effectiveness analysis, they found that the intervention was cost-effective for patients at intermediate risk for delirium but not for patients at high risk (lack of effectiveness and higher overall costs). However, these findings may be due to inadequate power based on their relatively small sample size of higher-risk patients, leading to uncertainty in the results for this subgroup (24). Rubin and colleagues (5) calculated that implementation of HELP at their hospital led to estimated cost savings of more than $2 million per year from prevention of delirium cases. In addition, more than $2.2 million per year of estimated revenue was generated by shorter hospital stays for patients without delirium.

Discussion

Moderate-strength evidence suggests that most multicomponent interventions are effective in preventing onset of delirium in at-risk patients in a hospital setting. These interventions have not been reported to have important associated harms, although most studies did not explicitly assess this possibility. In general, successful delirium prevention programs involved a multidisciplinary team of clinical experts, nurses, and other staff (for example, physical therapists or volunteers) and included protocols for early mobilization of patients, volume repletion (for hydration and electrolyte balance), and addressing visual or hearing deficits; a few programs included elimination of unnecessary medications. Other components reported in more than 1 study included staff education, geriatric consultation, therapeutic cognitive activities or orientation, extra nutrition, sleep enhancement, pain management, anesthesia protocols, supplemental oxygen, assessment of bowel or bladder functions, and prevention and treatment of medical complications.

This review has several limitations, the most notable of which is that most of the included studies were rated as having a high risk of bias due to lack of randomization and blinding, as well as other shortcomings. Although a few studies were rated as having a moderate risk of bias, none of the studies was considered to be at low risk of bias. In addition, although the findings of benefit were consistent across most studies, the heterogeneity of multicomponent interventions and the low number of studies evaluating each specific intervention preclude identifying a particular program as being the most beneficial, and these studies do not address the question of which particular program components are most beneficial. Finally, the evidence was insufficient to determine the benefit of delirium prevention programs in palliative care or long-term care settings.

Future comparative effectiveness studies with standardized protocols are needed, particularly to identify which components in multicomponent interventions are most effective for delirium prevention. Identification of the most effective bundle of components might encourage hospitals to adopt a more standardized approach to delirium prevention.

From ECRI Institute, Plymouth Meeting, Pennsylvania.

Note: The AHRQ reviewed contract deliverables to ensure adherence to contract requirements and quality, and a copyright release was obtained from the AHRQ before submission of the manuscript.

Disclaimer: All statements expressed in this work are those of the authors and should not in any way be construed as official opinions or positions of ECRI Institute, the AHRQ, or the U.S. Department of Health and Human Services.

Acknowledgment: The authors thank Allison Gross, MS, MLS, for performing literature searches and Katherine Donahue and Lydia Dharia for editing and formatting the manuscript.

Financial Support: From AHRQ, U.S. Department of Health and Human Services (contract HHSA-290-2007-10062I).

Potential Conflicts of Interest: Dr. Reston: *Grant (money to institution):* AHRQ, U.S. Department of Health and Human Services. Dr. Schoelles: *Support for travel to meetings for the study or other purposes (money to institution):* Rand Corporation. *Other (money to institution):* Rand Corporation. Disclosures can also be viewed at www.acponline.org/authors/icmje/ConflictOfInterestForms.do?msNum=M12-2566.

Requests for Single Reprints: James T. Reston, PhD, MPH, ECRI Institute, 5200 Butler Pike, Plymouth Meeting, PA 19462-1298; e-mail, jreston@ecri.org.

Current author addresses and author contributions are available at www.annals.org.

References

1. **Leslie DL, Marcantonio ER, Zhang Y, Leo-Summers L, Inouye SK.** One-year health care costs associated with delirium in the elderly population. Arch Intern Med. 2008;168:27-32. [PMID: 18195192]

2. **Rudolph JL, Marcantonio ER.** Review articles: postoperative delirium: acute change with long-term implications. Anesth Analg. 2011;112:1202-11. [PMID: 21474660]

3. **Björkelund KB, Hommel A, Thorngren KG, Gustafson L, Larsson S, Lundberg D.** Reducing delirium in elderly patients with hip fracture: a multi-factorial intervention study. Acta Anaesthesiol Scand. 2010;54:678-88. [PMID: 20236093]

4. **Lundström M, Olofsson B, Stenvall M, Karlsson S, Nyberg L, Englund U, et al.** Postoperative delirium in old patients with femoral neck fracture: a randomized intervention study. Aging Clin Exp Res. 2007;19:178-86. [PMID: 17607084]

5. **Rubin FH, Neal K, Fenlon K, Hassan S, Inouye SK.** Sustainability and scalability of the hospital elder life program at a community hospital. J Am Geriatr Soc. 2011;59:359-65. [PMID: 21314654]

6. **Chen CC, Lin MT, Tien YW, Yen CJ, Huang GH, Inouye SK.** Modified hospital elder life program: effects on abdominal surgery patients. J Am Coll Surg. 2011;213:245-52. [PMID: 21641835]

7. **Inouye SK, Bogardus ST Jr, Williams CS, Leo-Summers L, Agostini JV.** The role of adherence on the effectiveness of nonpharmacologic interventions: evidence from the delirium prevention trial. Arch Intern Med. 2003;163:958-64. [PMID: 12719206]

8. **Marcantonio ER, Flacker JM, Wright RJ, Resnick NM.** Reducing delirium after hip fracture: a randomized trial. J Am Geriatr Soc. 2001;49:516-22. [PMID: 11380742]
9. **Wong DM, Niam T, Bruce JJ, Bruce DG.** Quality project to prevent delirium after hip fracture. Aust J Ageing. 2005;24:174-7.
10. **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;340:669-76. [PMID: 10053175]
11. **Deschodt M, Braes T, Flamaing J, Detroyer E, Broos P, Haentjens P, et al.** Preventing delirium in older adults with recent hip fracture through multidisciplinary geriatric consultation. J Am Geriatr Soc. 2012;60:733-9. [PMID: 22429099]
12. **Needham DM, Korupolu R, Zanni JM, Pradhan P, Colantuoni E, Palmer JB, et al.** Early physical medicine and rehabilitation for patients with acute respiratory failure: a quality improvement project. Arch Phys Med Rehabil. 2010;91:536-42. [PMID: 20382284]
13. **Tabet N, Hudson S, Sweeney V, Sauer J, Bryant C, Macdonald A, et al.** An educational intervention can prevent delirium on acute medical wards. Age Ageing. 2005;34:152-6. [PMID: 15713859]
14. **Vidán MT, Sánchez E, Alonso M, Montero B, Ortiz J, Serra JA.** An intervention integrated into daily clinical practice reduces the incidence of delirium during hospitalization in elderly patients. J Am Geriatr Soc. 2009;57:2029-36. [PMID: 19754498]
15. **Harari D, Hopper A, Dhesi J, Babic-Illman G, Lockwood L, Martin F.** Proactive care of older people undergoing surgery ('POPS'): designing, embedding, evaluating and funding a comprehensive geriatric assessment service for older elective surgical patients. Age Ageing. 2007;36:190-6. [PMID: 17259638]
16. **Lundström M, Edlund A, Karlsson S, Brännström B, Bucht G, Gustafson Y.** A multifactorial intervention program reduces the duration of delirium, length of hospitalization, and mortality in delirious patients. J Am Geriatr Soc. 2005;53:622-8. [PMID: 15817008]
17. **Allen KR, Fosnight SM, Wilford R, Benedict LM, Sabo A, Holder C, et al.** Implementation of a system-wide quality improvement project to prevent delirium in hospitalized patients. J Clin Outcomes Manag. 2011;18:253-8.
18. **Black P, Boore JR, Parahoo K.** The effect of nurse-facilitated family participation in the psychological care of the critically ill patient. J Adv Nurs. 2011;67:1091-101. [PMID: 21214624]
19. **Colombo R, Corona A, Praga F, Minari C, Giannotti C, Castelli A, et al.** A reorientation strategy for reducing delirium in the critically ill. Results of an interventional study. Minerva Anestesiol. 2012;78:1026-33. [PMID: 22772860]
20. **Martinez FT, Tobar C, Beddings CI, Vallejo G, Fuentes P.** Preventing delirium in an acute hospital using a non-pharmacological intervention. Age Ageing. 2012;41:629-34. [PMID: 22589080]
21. **Gagnon P, Allard P, Gagnon B, Mérette C, Tardif F.** Delirium prevention in terminal cancer: assessment of a multicomponent intervention. Psychooncology. 2012;21:187-94. [PMID: 22271539]
22. **Lapane KL, Hughes CM, Daiello LA, Cameron KA, Feinberg J.** Effect of a pharmacist-led multicomponent intervention focusing on the medication monitoring phase to prevent potential adverse drug events in nursing homes. J Am Geriatr Soc. 2011;59:1238-45. [PMID: 21649623]
23. **Tabet N, Stewart R, Hudson S, Sweeney V, Sauer J, Bryant C, et al.** Male gender influences response to an educational package for delirium prevention among older people: a stratified analysis. Int J Geriatr Psychiatry. 2006;21:493-7. [PMID: 16676296]
24. **Rizzo JA, Bogardus ST Jr, Leo-Summers L, Williams CS, Acampora D, Inouye SK.** Multicomponent targeted intervention to prevent delirium in hospitalized older patients: what is the economic value? Med Care. 2001;39:740-52. [PMID: 11458138]

Current Author Addresses: Drs. Reston and Schoelles: ECRI Institute, 5200 Butler Pike, Plymouth Meeting, PA 19462-1298.

Author Contributions: Conception and design: J.T. Reston, K.M. Schoelles.
Analysis and interpretation of the data: J.T. Reston, K.M. Schoelles.
Drafting of the article: J.T. Reston, K.M. Schoelles.
Critical revision of the article for important intellectual content: J.T. Reston, K.M. Schoelles.
Final approval of the article: K.M. Schoelles.
Obtaining of funding: K.M. Schoelles.
Administrative, technical, or logistic support: K.M. Schoelles.
Collection and assembly of data: J.T. Reston.