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Original Study

A Delirium Risk Modification Program Is Associated With Hospital Outcomes

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ABSTRACT

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Background: Delirium has been associated with negative health consequences, which can potentially be improved by delirium risk modification. This study sought to determine if a quality improvement project to identify and modify delirium risk and discharge to rehabilitation is associated with improved outcomes for patients and health care systems.

Methods: In older veterans admitted to a tertiary VA hospital, delirium risk was assessed using cognitive impairment, vision impairment, and dehydration. Delirium risk was communicated to providers via electronic medical record. To modify delirium risk, interventions were provided in cognitive stimulation, sensory improvement, and sleep promotion. Primary outcomes included length of stay, restraint use, discharge to rehabilitation, and hospital variable direct costs. Outcomes were compared using a propensity-matched cohort of patients without intervention. Number of intervention categories was compared with primary outcomes.

Results: Patients (n = 1527) were older (78.2 ± 8.3 years) and male (98%). Propensity-matched patients (n = 566) were well matched for age, gender, cognitive deficits, vision impairment, and dehydration. Patients with interventions were discharged to rehabilitation similarly (mean difference [MD] 2.2%, 95% CI −2.5−6.9) and had lower lengths of stay (MD −0.7 day, 95% CI −1.3 to −0.1), lower restraint use (MD −4.0%, 95% CI −6.7 to −1.2) and trended toward lower variable direct costs (MD −$1390, 95% CI −3586−807). Increasing number of interventions was associated with shorter length of stay, lower rate of restraint use, and lower variable direct costs.

Conclusions: This delirium risk modification project was associated with patient outcomes and reduced costs. Serious consideration should be given to delirium risk identification and modification programs.
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Older hospitalized patients are at heightened risk for adverse events. Hospital adverse events increase placement in skilled care facilities after hospital discharge.[1] Although falls, pressure ulcers, and nosocomial infections are traditionally spotlighted, delirium, an acute change in awareness and attention,[2] is an underrecognized hospital danger[3] that is associated with placement.[4] Delirium occurs in up to 25% of hospitalized patients,[5] 50% of surgical patients,[6] 20% of nursing home patients,[7] and 75% of patients in the intensive care unit (ICU),[8,9] and is associated with increased morbidity and mortality.[10] Although generally thought to be an acute disorder, delirium is associated with long-term deficits in cognitive and physical function.[11,12]

Delirium-prevention strategies are of critical importance,[13] because of the outcomes of reduced functional ability, high prevalence of cognitive impairment, and increased nursing home placement.[7] Previous studies demonstrated that 14% of patients admitted to postacute facilities are delirious on admission.[14] In-person screening for mental status is required[15] for delirium identification, because methods such as the Minimum Data Set Resident Assessment Protocol are less likely to pick up delirium accurately.[16]

The association of delirium with long-term functional decline makes prevention paramount. Programs to prevent incident delirium have shown effectiveness,[3] but are not widely used.[17] Program adoption is limited by health care system elements, including a dearth of strong delirium advocates, the necessary upfront capital investment, as well as a lack of sustained facility commitment to realize cost savings, recognition of the importance of delirium, and a unified pathophysiology and treatment model.[5,18] Medical centers may not recognize the savings actuarially, thus making the business case difficult to demonstrate.[19] However, delirium remains a common, morbid, and costly patient safety emergency.

Delirium-prevention programs identify patients at risk and use multicomponent nonpharmacological interventions that are imbedded in routine care. The Delirium Toolbox was designed to target 3 intervention categories (Table 1): sensory improvement, cognitive stimulation, and sleep promotion. This Delirium Toolbox was accessible to nurses on each ward so they were able to offer the appropriate supplies to patients. In addition to this tangible component, education is provided to nursing staff regarding how to identify delirium risk and intervene to manage this risk. Our program shares similar features with previous delirium-prevention programs, including delirium risk identification, multicomponent delirium risk modification, and educational initiatives.

The intent of Delirium Toolbox was to develop and implement a sustainable program that mitigates delirium risk and demonstrates improved patient outcomes (lower restraint use and discharge to rehabilitation), while building a business case (decreased length of stay and variable direct cost) for medical center leadership. Secondary analyses were to determine if the number of items distributed to patients from the Delirium Toolbox was associated with improved outcomes.

Methods

The Delirium Toolbox was developed through a hospital-wide Healthcare Failure and Effects Mode Analysis (HFEMA) process. The Department of Veterans Affairs Boston Healthcare System (VABHS) Institutional Review Board and Research and Development Committee approved the analysis and dissemination of this project.

Setting

This quality improvement project was conducted at the VABHS West Roxbury campus; the 125-bed tertiary referral Veterans Affairs medical center for New England. Veterans, 65 years of age and older, admitted to an acute care medical ward, were approached for participation. Patients admitted for observation only or to an ICU, who were unable to communicate, or who had been inpatient for 48 hours or longer before screening, were excluded from the analysis.

Table 1
Delirium Toolbox Items

Category	Toolbox Item
Correct sensory input	Reading glasses
	Magnifying glasses
	Hearing amplifiers
Stimulate cognition	Jigsaw puzzles
	Crossword/word search activity Books
	Playing cards
	Modeling clay
	Stress balls
Promote sleep	Earplugs
	Eye masks
	Headphones

Interventions

Delirium risk screening

Cognitive performance, sensory impairment, and dehydration were targeted through a brief in-person assessment to determine delirium risk. Each risk factor was assigned 1 point, and this risk prediction rule was validated in a separate cohort.[20] Cognitive performance was assessed using 3 brief measures: (1) Days of the Week Backward (DOWB), (2) Months of the Year Backward (MOYB), and (3) the Clock-in-the-Box (CIB) test. Days of the Week and Months of the Year Backward are measures of attention used in previous delirium studies.[21] The CIB is a modified clock-draw task (range 0–8, with 8 indicating best) that has been associated with cognitive performance in older patients.[22,23] For this project, cognitive impairment was considered any error on DOWB or MOYB, or a CIB score of 4 or less. Patients unable to read the written instructions of the CIB or without access to their corrective eyewear were considered to be visually impaired. Dehydration was assessed through elevated blood urea nitrogen to creatinine ratio with 18.0 or higher considered abnormal. Delirium risk assessments were communicated to health care staff by a progress note in the electronic medical record. The delirium risk assessment was streamlined over the duration of this project (Appendix 1).

Delirium toolbox interventions

The Delirium Toolbox includes items to (1) correct sensory input, (2) stimulate cognition, and (3) promote sleep (Table 1). These interventions were chosen because of their correlation with modifiable delirium risk factors.[3,24]

Educational interventions

Delirium education was provided to patients, family members, and hospital staff. Patients and families (when present) were introduced to the concept of delirium and the importance of preventing it. Nurses were targeted as the prime recipients of the educational initiative. Information about epidemiology, recognition, prevention, and management of delirium was disseminated through a multimodal educational initiative and nurse "champions" were trained to advocate for recognition of delirium risk and reinforce early intervention on their wards.

Outcome Measurement

The selected outcomes were pertinent to medical center goals. Patient outcomes were collected via electronic medical record chart review. Length of stay was calculated from the date of admission to the date of discharge. Restraint use was identified using a keyword search of the electronic medical record, because VABHS requires documentation of restraints within 12 hours of application. Discharge to rehabilitation was obtained from the electronic medical record and patients who died in the hospital were excluded. Hospital variable direct costs were collected from the VA decision support system (DSS),[25] a centrally maintained administrative database. To address the limitations of DSS,[26] we performed a sensitivity analysis of the cost data (Appendix 2).

Statistical Analysis

Overall analysis

Baseline characteristics of those who received Delirium Toolbox interventions were compared with those who did not (concurrent controls), using a Student t test with the reported difference between sample means and 95% confidence intervals (95% CIs) reported. Because those with and without Delirium Toolbox interventions had