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Postoperative Delirium Prevention in the Older Adult: An Evidence-Based Process Improvement Project

Tracy Layne

Sheila A. Haas
Loyola University Chicago, shaas@luc.edu

Judy E. Davidson
University of California San Diego Health System

Audrey Klopp
Loyola University Chicago

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Postoperative delirium is a major complication in hospitalized older adults. Implementation of a screening tool and evidence-based delirium-prevention protocol on a surgical unit increased nurses' knowledge regarding delirium, increased identification of delirium, and produced medical treatment alterations leading to positive patient outcomes.

Over $6.9 billion is spent annually in the United States for medical care costs associated with delirium (Akunne, Murthy, & Young, 2012; Flagg, Cox, McDowell, Mwose, & Buelow, 2010). Because delirium is underdiagnosed commonly or misdiagnosed in hospitalized patients, however, the cost actually may be much higher (Allen et al., 2011). Economic burden and adverse outcomes caused by delirium can be avoided by early identification, application of evidence-based preventive interventions, and proper treatment of affected patients (Barr et al., 2013; Solberg, Plummer, May, & Mion, 2013).

Delirium is defined as an acute mental status change with cognitive disruption due to an underlying medical condition (American Psychiatric Association [APA], 2013). An estimated 50% of hospitalized older adults suffer from acute delirium, a diagnosis that correlates with negative patient outcomes. Without diagnosis, patients with delirium are not treated for underlying causes, such as sepsis and/or electrolyte imbalances, and often are restrained or receive sedatives that may cause other complications (Brooks, 2012; Meako, Thompson, & Cochrane, 2011). Because of the risks associated with delirium, the APA, the National Clinical Guideline Center, and the Canadian Coalition for Seniors' Mental Health (2006) supported use of a standard delirium assessment. These entities also supported a multi-component intervention program to decrease delirium in hospitalized patients; prevention and early identification of delirium may reduce negative patient outcomes.

Literature Review

Electronic databases, including Ovid Medline and Cumulative Index of Nursing and Allied Health Literature, were searched from seminal work in the 1990s through 2014 to identify existing research on delirium. Key terms used in the search included *delirium screening tools* and *delirium prevention*. Abstracts were reviewed for both searches and articles selected based on inclusion of postoperative patients age 65 and older. Authors assessed article quality using the Johns Hopkins Nursing Evidence-Based Practice Research and Non-Research Evidence appraisal tools (Newhouse, Dearholt, Poe, Pugh, & White, 2007). An additional review and appraisal to confirm correct levels and quality ratings was conducted by another rater.

Delirium Screening Tools

Two screening tools were identified: the Confusion Assessment Method (CAM) (Inouye et al., 1990) and the Delirium Symptom Interview (DSI) (Albert et al., 1992). Many studies have shown the CAM to have a high sensitivity of 66.7%-100% and a high specificity of 90.8%-100% (Inouye et al., 1999; Rathier & Baker, 2011). Only one validation study completed for the DSI assessed results between two lay

Tracy Layne, DNP, RN, CCRN, is Program Development Specialist for Critical Care Services, Scripps Health in San Diego, CA.

Sheila A. Haas, PhD, RN, FAAN, is Professor and former Dean, Marcella Niehoff School of Nursing, Loyola University, Chicago, IL.

Judy E. Davidson, DNP, RN, CNS, FCCM, is Research Nurse Liaison, University of California San Diego Health System, San Diego.

Audrey Klopp, PhD, RN, NHA, is Assistant Professor, Loyola University, Chicago, IL.

interviewers on multiple patients; the K coefficient for ratings among the lay interviewers was identified as 0.90, which establishes reliability but not validity (Albert et al., 1992). Authors of both a meta-analysis and literature review recommended use of the CAM in screening for delirium in medical-surgical patients (Canadian Coalition for Seniors' Mental Health, 2006; Conn & Lieff, 2001).

Delirium Prevention Interventions

Along with moderate and low-quality studies found in the literature regarding interventions to prevent delirium, three clinical practice guidelines were identified. The National Clinical Guideline Center (2010) Clinical Practice Guidelines are based on a systematic review of the literature with meta-analysis. The two remaining guidelines (Canadian Coalition for Seniors' Mental Health, 2006; Registered Nurses of Ontario, 2004) were based on systematic reviews of the literature with recommendations. All three guidelines recommended use of specific interventions to prevent delirium that were incorporated into the delirium prevention protocol for this project. Most sources suggest multi-component programs tailored to patient-specific needs may decrease negative outcomes. Recommendations provided by the National Clinical Guideline Center (2010) were used for the basis in developing a Delirium Prevention Protocol for this project.

Improvement Needs

The goals of this evidence-based process improvement project were to identify patients at risk for developing delirium and prevent its onset, identify patients at earlier stages of delirium, and implement an evidence-based delirium prevention protocol. Specific outcome measurements for the project included knowledge gained by health care providers during educational sessions, registered nurse (RN) adherence to use of the assessment tool and protocol, patients with acute onset of delirium, newly positive delirious patient, and the rate of delirium (number of cases detected divided by number of potential cases of delirium during the project) as compared to the rates found in the literature.

The process improvement project design used an evidence-based delirium screening tool and an evidence-based delirium prevention protocol. PICO is an acronym commonly used to guide evidence-based improvement projects: P – patient/problem, I –intervention, C – comparison, and O – outcome (Newhouse et al., 2007). The following PICO question was developed: In older adult postoperative patients, does assessment using the CAM (Inouye et al., 1990) and implementation of an evidence-based Delirium Prevention Protocol, as compared to usual care, increase identification of delirium and/or trigger a change in nursing interventions and/or medical treatment? The end point of the project was to evaluate outcomes after 10 positive CAM results and 10 negative CAM results were observed.

The project was conducted on a 40-bed medical-surgical unit at a 140-bed tertiary care hospital, part of a large integrated health care system in southern California. All patients meeting inclusion requirements (postoperative, over age 65) were included in the analysis. Because delirium assessment and treatment are considered best practice, the institutional review board deferred oversight of this project. No patient consent was needed, and project oversight was provided by quality improvement staff.

Delirium Assessment

Based on results of the literature review, the CAM (Inouye, 1990) was chosen for delirium screening. The CAM takes less than 5 minutes to administer; it is used widely and is reliable in detecting delirium in hospitalized patients (Rice, Bennett, Ciesi, & Linville, 2014). Registered nurses already used the CAM-ICU (Ely et al., 2001) for screening intensive care patients, and the decision was made to use the related tool to decrease variation across the continuum of care.

The CAM recognizes four major areas of cognitive decline when delirium is present: acute onset/fluctuating course of confusion and/or behavioral changes, inattention, disorganized speech, and altered level of consciousness (Inouye et al., 1990). A patient with positive CAM results *must* have *both* acute onset of confusion and behavioral change/inattention (first two items on the tool) and *either* disorganized speech or altered level of consciousness (third and fourth items on the tool). The nurse was required to assess the patient using the CAM every shift and with any new onset of behavioral or cognitive changes. The CAM result was to be documented in the narrative of the patient's electronic medical record (EMR) on admission, every shift, and as needed based on a change in patient cognitive status.

Prior to implementation, comparisons were made between results of the CAM by a clinical nurse specialist with expertise in delirium and the project coordinator (primary author) on 15 patients. Ninety-two comparisons also were completed by the author and the clinical nurses prior to implementation to establish inter-rater reliability. The initial validation between the expert and the author resulted in 100% agreement for 15 patients. The kappa coefficient originally was to be used to determine reliability, with a kappa greater than 0.70 implying inter-rater reliability. However, use of the kappa coefficient was not appropriate or necessary because there was no disagreement.

The 92 tandem assessments between the author and the clinical nurse yielded four disagreements of CAM results. Data were entered into SSPS (IBM, Chicago, IL) and a kappa coefficient of 0.77 was established, implying strong inter-rater reliability. Percent agreement of results also was calculated between the results of the CAM by the author and the clinical nurse (94% agreement).

Delirium Prevention Protocol

Interventions for the Delirium Prevention Protocol were based on evidence in the literature (see Figure 1). Interventions focus on three areas: cognitive function and reorientation, identification of risk factors, and assessment for and response to underlying causes of delirium. All at-risk patients received the basic interventions under Level One and Level Two. An educational brochure and an education session also were initiated for high-risk patients and documented in their educational plans in the EMR. If a patient was assessed with new positive CAM results, the nurse would implement Level Three interventions on the protocol; these involved assessing possible pathophysiological causes of delirium and collaborating with the pharmacists regarding medications that could be causing delirium.

For a newly recognized positive CAM result, the hospitalist was notified. Ongoing efforts to alleviate the problem with interventions detailed in Level Three of the protocol were assessed. New orders were documented in the order section of the patient's medical record; communication with the pharmacist and the physician was documented in the communication record in the EMR.

The patient educational brochure developed for this project was adapted from the Vanderbilt University Medical Center's ICU-Delirium educational brochure, with permission (B. Punn, personal communication, February 16, 2012). The brochure offers information about causes and signs of delirium. It also lists ways in which family members can assist in decreasing the incidence and/or severity of delirium.

Action Plan and Evaluation

Educational Sessions

Registered nurses (clinical nurses, charge nurses, resource nurse, unit managers) received education on the pathophysiology, precipitating factors, and negative outcomes of delirium during 1-hour sessions and case study presentations (using an audience response system) before implementing the evidence-based program. Tests were administered before and after presentation of different case scenarios, and scores for both scenarios were documented and compared. Certified nursing assistants (CNAs) were required to attend a 30-minute presentation about interventions. Education sessions were mandatory, as supported by managers. Eight sessions were available to nurses and three sessions were available to CNAs to accommodate the unit's scheduling needs.

Curriculum was based on the Geriatric Nursing Education Consortium (Meako et al., 2011). It included use of the CAM (Inouye, 1990) for accurate identification of patients experiencing delirium as well as discussion of interventions to decrease the incidence of delirium. Content validity of the education curriculum and case study tests was established by an expert panel composed of a psychiatrist, two nursing experts on delirium, hospitalist, and pharmacist specializing in delirium and geriatric practices.

Education sessions also were held for pharmacists. The pharmacy team selected the Beers criteria to assess for drugs that may cause delirium (Beers, 1997). When a nurse consulted them concerning a patient with a positive CAM result, pharmacists determined they would review the patient's medications to assess for a pharmacological cause of delirium. This information then would be relayed to the physician to identify appropriate interventions and treatment changes.

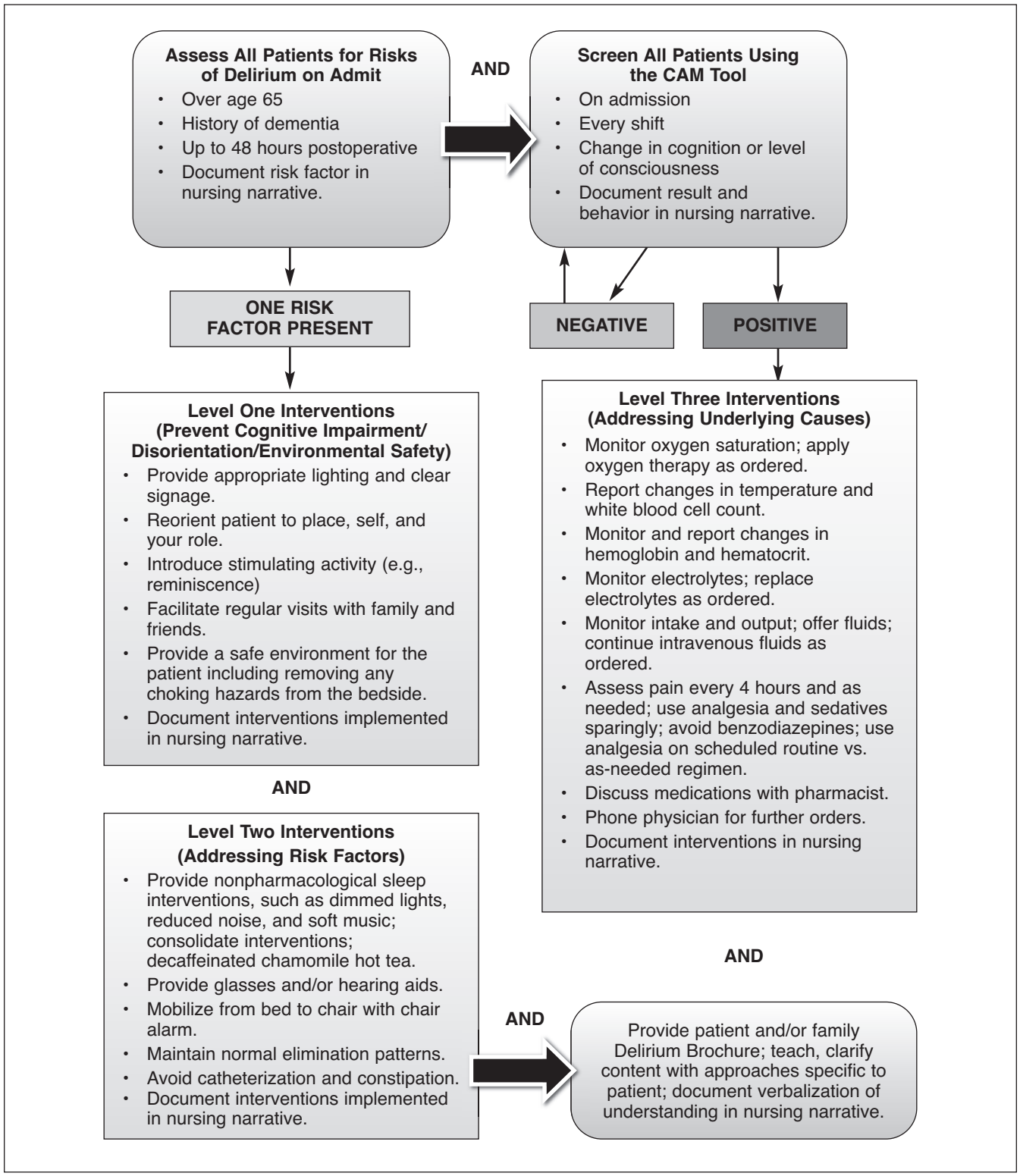
Participatory Observations

Purposive sampling was used as is traditional for process improvement projects to target the population of interest. This was completed by obtaining daily surgical schedules and identifying patients who met inclusion criteria. Once patients were identified, RNs caring for those patients were observed. The project coordinator only completed participatory observations of a nurse once during that shift. This provided a broader assessment of nurses without observing one nurse more than other nurses working on the unit.

Participatory observations include interaction and involvement in the culture and environment of the unit and consisted of actively influencing behaviors and attitudes (Polit & Beck, 2012). Participatory observations were designed to provide immediate remediation if the CAM was not completed properly and/or appropriate interventions were not implemented based on risk assessment and/or CAM results. Observations targeted several distinct opportunities (change of shift, mid-morning, mid-afternoon, late evening). During these observations, the primary author asked the nurse to complete a CAM and then monitored interventions implemented based on the CAM results. Participatory observations continued until 10 negative CAM results and 10 positive CAM results were reviewed.

An audit form, completed with each participatory observation, was tailored to address assessment of risk factors and presence or absence of delirium by the RN using the CAM, and interventions implemented by the RN based on assessment results. Data were collected concerning implementation of the selected Level One and Level Two interventions for at-risk patients. These included reorientation, use of hearing and/or vision aids as necessary, use of an updated white board with the current date and daily goals listed, provision of an uncluttered and safe environment, patient and family delirium education completed and documented in the patient's education care plan, and mobilization implemented. If the CAM result was positive, collected data indicated if the nurse collaborated with the pharmacist concerning medications that could be causing delirium, and if the physician was called immediately about the positive CAM results. Documentation of any change in treatment and new orders also was noted.

FIGURE 1.
Delirium Prevention Protocol



Sources: Akunne et al., 2012; Allen et al., 2011; Canadian Coalition for Seniors' Mental Health, 2006; Conn & Lieff, 2001; Flaherty et al., 2010; Holroyd-Leduc, Khandwala, & Sink, 2010; Inouye et al., 1999; Khurana, Gambhir, & Kishore, 2011; Kratz, 2008; Laurila, Laakkonen, Laurila, Timo, & Rejo, 2008; Milisen, Lemiengre, Braes, & Foreman, 2004; National Clinical Guideline Center, 2010; Peisah, Chan, McKay, Kurrle, & Ruetens, 2011; Rathier & Baker, 2011; Registered Nurses of Ontario, 2004; Twedell & Aguiree, 2010; Vidan et al., 2009; Young & Inouye, 2007

Staff Champions

Nurse and CNA champions on the pilot unit were identified with assistance from the unit manager. Champions assist in the dissemination of guidelines and influence the multidisciplinary team, and are aligned strongly with the organizational goal in the implementation of evidence-based practice guidelines (Ploeg et al., 2010). Identified nursing champions assisted in the education process, and influenced positive outcomes and sustainability of the protocol and practice change.

Sustainability/Feasibility

Leadership support and ongoing evaluation of protocol adherence and patient outcomes will be needed to assist with project sustainability. The evidence-based protocol also aligns with the organization's strategic goals related to strategies for fall reduction. To optimize sustainability after the completion of the testing phase of the project, the unit manager was engaged as a team partner throughout the process.

An environment of encouragement, collaboration, and cooperation was fostered by the author, managers, supervisors, and champions on the units. Academic detailing (1:1 rounding and feedback; Nemec, 2011) was utilized to assure protocol adherence and facilitate change following educational intervention (Patel, 2011). It includes personalized education for leaders focused on specific details of the project, such as objectives and outcome measures, so they are capable of sustaining change. The unit leadership team was considered the process owner of this change. As the change was occurring, academic detailing by the author included rounding with the manager to assure change was occurring and field questions from staff. Ownership by leaders includes ongoing evaluation of contextual variables, modification of the protocol based on workflow processes, and additional education as needed.

TABLE 1.
Test Scores Before and After Education

Concept	Pre-Test Correct (%)	Post-Test Correct (%)
Assessment for delirium	46	98 **
Risks of delirium	45	89 **
Types of delirium	74	94 *
CAM criteria	34	88 **
Medications	52	91 **
Interventions	55	100 **
Physiological causes of delirium	60	100 **

p=0.01*, *p*=0.001**

TABLE 2.
Adherence to Protocol Observations
Ten Negative CAMS
(*N*=10)

Attribute	% Compliance
Reorientation	100
Safe environment	100
Updated whiteboard	100
Glasses/Hearing aids	100
Brochure given	20
Education documented	20
CAM documented	100
Mobilization	90

Results

Educational Sessions

Test scores for the seven identified concepts used in the educational sessions were compared. Data were entered into SSPS (IBM, Chicago, IL) and a two-sample test of proportions was calculated. Percentage rates also were determined. All concepts were statistically significant (*p*=0.0001) (see Table 1).

Adherence Rates

Nurses were observed completing the CAM as well as instituting the interventions described by the protocol. Easily seen interventions were included in the participatory observations (see Tables 2 & 3). The CAM assessment and the interventions were observed as all or nothing. However, stakeholders believed it was important to examine adherence to each portion of the protocol to identify areas of specific problems for future improvement of workflow processes.

CAM Documentation

Of these 20 observed CAM assessments, the clinical RN used the CAM for assessment and properly documented in the EMR in 90% (*n*=18) of cases. An additional 52 medical records of patients meeting inclusion criteria were audited. Of these, the CAM was completed and documented in 81% of EMRs.

Protocol Adherence

Of the 20 CAM observations, only 20% (*n*=4) of all necessary

actions were documented. The most frequently missed step was giving the patient and/or family the educational brochure and documenting the education given in the EMR. Documentation of collaboration with the pharmacists also was lacking (see Tables 2 & 3).

Change in Treatment

Eight of 10 patients (80%) identified with a newly positive CAM result had a change in medical treatment (see Table 4). Most notably, opioid intolerance was the physiological cause for new onset of delirium in this patient sample. Of those with no treatment changes, one patient's delirium was thought to be anesthesia induced and one was attributed to physiological impact of a craniotomy for a meningioma. Delirium cleared for the patients who had a treatment change and/or new orders received.

Screening resulted in changes in treatment for the newly identified delirious patient and led to resolution of delirium. Although there was a small sample, results did suggest early identification of delirium and treatment of the underlying cause can afford better patient outcomes.

Delirium Rates

Medical records for patients (*n*=52) meeting inclusion criteria for the duration of the project were audited. Ten patients had a new onset of delirium based on the 10 positive CAMs identified throughout participatory observations in the study. Between the medical record audits and the participatory observations (*n*=72), results indicated a delirium rate of 13%. This number is low compared to the literature, which project an incidence of up to 77% in older adults following surgery (Fineberg et al., 2013).

Two possible explanations can be offered for the low rates of delirium found on this unit when compared to the literature. Preformatted admission order sets were revised 2 years before this project, excluding the possibility of routine benzodiazepine prescription. In addition, this unit had a high volume of patients undergoing elective surgery, and these patients may not have as many comorbid health conditions as patients having emergent surgery.

TABLE 3.
Compliance of Protocol Observations
Ten Positive CAM Results
(*N*=10)

Attribute	% Compliance
Reorientation	100
Safe environment	100
Updated whiteboard	100
Glasses/Hearing aids	100
Brochure given	10
Education documented	20
CAM documented	90
Mobilization	100
Collaboration with pharmacist	20
MD contacted	90
New orders received	80

TABLE 4.
Delirium Cases and Change in Treatment

Patient	Delirium Attribution	Treatment Alteration/MD Orders
1	Urinary tract infection	Antibiotics initiated*
2	Lorazepam (Ativan®) and hydrocodone (Norco®) scheduled routine	Lorazepam discontinued; hydrocodone ordered PRN*
3	Opioid intolerance (oxycodone)	Opioid discontinued and added to patient's allergies*
4	Multidrug: benzodiazepines/opioids ordered	Lorazepam discontinued and haloperidol (Haldol®) ordered PRN*
5	Opioid intolerance (oxycodone)	Opioid discontinued and added to patient's allergies*
6	PCA morphine intolerance	PCA discontinued and Percocet ordered PRN*
7	Anesthesia	No new orders received by MD
8	Oxygen saturation 88%; hypoxia	Oxygen initiated*
9	Hemoglobin and hematrocrit low	Two units packed red blood cells transfused*
10	Frontal craniotomy for meningioma	No new orders received

**Denotes resolution of delirium with treatment implementation*

Clinical nurses are in an optimal position for identifying delirium in older adults after surgery.

Limitations

Because no baseline rates of delirium were available, no comparison can be completed for results of project implementations; there was no way to determine if the identification and/or prevention protocol actually reduced rates of delirium. The current EMR at this facility provides no area for documenting the CAM result or nursing interventions. Nurses were required to free text the CAM result in the EMR as well as free text the education in the patient's education plan. Documentation requirements for the process were compiled and a suggestion was made to streamline or decrease them. Staff in the Informational Technology Department were asked to add a decision support area to the neurological section of the EMR, so nurses have written instructions for implementing interventions when an at-risk patient is identified or when a positive CAM result is selected. However, the impact of scoring on patient treatment plans and resolution of delirium was encouraging.

A debriefing session was held at the end of the project. Nurses found the protocol to be useful in practice. However, they disagreed on the adherence rates with the protocol, specifically collaborating with the pharmacist; they stated they commonly worked with the pharmacist on the unit but may have forgotten to document the communication in the EMR. The discussion also led to the conclusion that expecting nurses to document consistently in three different areas of the EMR was unrealistic; a new process of documenting in one area of the EMR was needed.

Nursing Implications

Clinical nurses are in an optimal position for identifying delirium in older adults after surgery. Implementation of an easy-to-use screening tool such as the CAM and application of a delirium prevention protocol can guide nurses to implement appropriate interventions to prevent delirium, reduce the severity of delirium, and/or alter the course of delirium. Early identification of delirium may result in a change in the course of patients' treatments and provide better outcomes. Educational sessions increase knowledge and awareness of identifying delirium and evidence-based interventions to either prevent delirium or reduce complications incurred due to delirium.

Conclusion

Early identification of delirium and treatment of underlying physiological causes will improve patient outcomes. Nurses may prevent delirium using evidence-based interventions. They also may identify delirium in its earliest stages and collaborate with other health care personnel to reduce the severity or change the treatment plan and physiological course of delirium. Patients with an easily identifiable cause generally respond to treatment changes. MSN

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