Final Scholarly Project: Evidence-Based Strategy to Improve Delirium Detection in Elderly Postsurgical Patients

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Abstract

Postoperative delirium (POD) is a serious adverse outcome that frequently affects older adults. Patients experiencing POD are at greater risk for postoperative mortality, increased length of hospital stay, functional decline, and increased cost of care. Current global population trends indicate that the population of adults over the age of 60 years old will double over the next thirty years. Recent guidelines call for hospitals to implement routine delirium assessment to improve early intervention. Nursing delirium assessment tools are a critical resource for early delirium identification. Nursing delirium assessment tools are often highly sensitive and specific for delirium when used in the correct environment and can be performed quickly. The Iowa Model Revised 2015 guides this evidence-based practice project. This evidence-based practice project evaluates current literature to identify, create a plan, and implement a practice change for routine delirium assessments in the PACU for a large midwestern hospital in an urban setting. Lastly, this project also describes methods for evaluating project effectiveness utilizing hospital admission chart coding review and daily nursing documentation review.

Keywords: delirium, nursing delirium assessment, evidence-based practice, delirium detection, outcomes

Evidence-Based Strategy to Improve Delirium Detection in Elderly Postsurgical Patients

Problem Identification

Introduction

Hospitals must identify, plan, and execute directives which conserve limited resources while improving patient outcomes among patients experiencing delirium after surgery. Postoperative delirium (POD) is a common postsurgical neurologic condition that strains limited healthcare resources and adversely impacts patients (Silva et al., 2021). Unfortunately, POD is common among elderly surgical patients. Among surgical patients older than 60 to 70 years old, an estimated 10% to 20% experience POD (Jin et al., 2020). In the United States, two in every five surgical patients are older than 65 years (Silva et al., 2021). Additionally, a steadily increasing life expectancy due to medical advancements is producing an aging surgical population and therefore more patients at higher risk of developing POD (Hassan et al, 2020). The United Nations identified a global trend indicating that the global population of people older than 60 years old will double over the next thirty years (Hasan et al., 2020). Patients experiencing POD are at greater risk for postoperative mortality, increased length of hospital stay, functional decline, and increased cost of care (Jin et al., 2020). A concerted effort involving multidisciplinary teams is required to mitigate the impending challenge of delirium in an increasingly aging population.

Delirium after surgery is often categorized in two groups distinguished by time frame, emergence delirium and POD. Emergence delirium occurs immediately after surgery and general anesthesia whereas POD is diagnosed within the first day through seventh day postoperatively (Zhang et al., 2020). Elderly patients who experience emergence delirium are at an increased risk of subsequent POD development (Zhang et al., 2020). Patients with delirium experience a

change in perception, behavior, memory, attention and consciousness (Mahanna-Gabrielli et al., 2019). Delayed delirium detection is disastrous for patients due to prolonged hospitalization, delayed postoperative rehabilitation, and an associated increased mortality rate (Kim et al., 2021). In a study of intensive care unit patients with delirium, patients with delirium were independently associated with increased nursing workload, increased overall hospital costs, lower rate of discharge home, and longer hospital length of stay (Seiber et al., 2021). Delirium after surgery coupled with an aging surgical population presents a challenge for hospitals. Hospitals must be introduce initiatives to mitigate POD.

Delirium Diagnosis

The *DSM-5 Guidebook* (American Psychiatric Association, 2013) describes delirium as an acute yet transient change in awareness with a fluctuating course of illness. Delirium may present as hyperactive psychomotor activity, hypoactive psychomotor activity, or a mixed activity level (American Psychiatric Association, 2013). A delirium diagnosis requires five specific criteria to be met: a change in baseline awareness or attention marked by inappropriate environmental interactions; a rapid presentation over a few hours or days; an additional cognitive disturbance such as language difficulties, visuospatial issues, or impaired executive function; that a preexisting neurologic condition is not responsible for the acute change; and that the symptoms are a direct result of another physiologic problem such as a medical condition or a toxin exposure; (American Psychiatric Association, 2013). Surgery generally requires anesthetic medications for ideal operative conditions, thus exposing the patient to potential toxins. A diagnosis guided by the *DSM-5* by a properly trained provider remains the gold standard for delirium diagnosis (Hughes et al., 2020). An accurate delirium diagnosis requires careful attention to elicit the specific combination of symptoms in the correct situation.

Implementing timely delirium care relies on careful delirium detection. Unfortunately, a diagnosis with the *DSM-5* criteria requires a specialized psychiatric provider who received substantial training and a lengthy patient evaluation (Hughes et al., 2020). Nursing screening tools such as the Confusion Assessment Method (CAM) or the Nursing-Delirium Screening Scale (NuDESC) provide a quick assessment to identify patients at risk of POD (Hughes et al., 2020). Nursing screening tools are a vital resource that can help target individuals requiring a psychiatrist evaluation for delirium. The CAM and NuDESC, while not highly sensitive, are extremely specific for POD. In a systematic review and meta-analysis of postoperative delirium tools, the CAM test was found to have a pooled sensitivity of 0.47 and a pooled specificity of 0.99 (Kim et al., 2021). The same study found that the NuDESC tool had a pooled sensitivity of 0.63 and a pooled specificity of 0.94 (Kim et al., 2021). The NuDESC tool provides the added benefit of being time-efficient. Kim et al. (2021) notes that the NuDESC tool takes between 87 seconds and 13 minutes to complete. Additionally, the NuDESC tool was designed to work within the typical nursing workflow, making it easy to implement within a busy nursing environment (Kim et al., 2021). Although nursing delirium screening tools may fail to identify POD in some patients, patients with a positive screening are highly likely to have an accurate delirium diagnosis. Nursing delirium screening tools are a valuable tool for POD identification.

Risk Factors

Some perioperative risk factors for delirium are well within the anesthesia provider's influence. Anesthesia providers must understand possible risk factors for POD to better tailor anesthetics to the unique patient situation. While many patient characteristics remain fixed, anesthesia providers can impact perioperative modifiable risk factors. Risk factors include age over 65, male gender, hearing impairment, visual impairment, preoperative functional

impairment, multimorbidity, frailty, preoperative anemia, surgical duration and complexity, postoperative pain control, lack of social support, preoperative psychiatric diagnosis, and preoperative cognitive dysfunction (Swarbrick & Partridge 2022; Pipanmekaporn et al., 2020; Hughes et al., 2020). Of particular interest to anesthesia providers, some medications frequently encountered during the perioperative period are known to incite POD. Offending medications are diphenhydramine, scopolamine, histamine receptor antagonists, benzodiazepines, ketamine, meperidine, morphine, and zolpidem (Hughes et al., 2020). Unfortunately there is no universally adopted delirium risk prediction tool even with extensive literature that POD is prevalent (Swarbrick & Partridge, 2022). Anesthesia providers must remain vigilant when selecting medications for patients at high risk of delirium.

The American Geriatrics Society (2019) maintains a list of medications that are best avoided in the elderly population. The interdisciplinary expert panel reviews evidence every three years to provide evidence-based recommendations of medications for clinicians caring for elderly patients (The American Geriatrics Society, 2019). This list of medication is known as the AGS Beers Criteria for Potentially Inappropriate Mediation Use in Older Adults (The American Society of Geriatrics, 2019). The same medications noted by Hughes et al. (2020) are mentioned among the listed medications in the Beers Criteria (The American Geriatrics Society, 2019). Anesthesia providers must consider the potential risk versus the potential benefit when selecting medications. The Beers Criteria provides an excellent resource for anesthesia providers to help evaluate risk.

One risk factor controlled exclusively by anesthesia providers is the depth of sedation. Depth of sedation can be measured through electroencephalogram (EEG) analysis devices. For example, a commonly used device is the Bispectral Index (BIS) by Medtronic (Pawar &Barreto

Chang 2022). The BIS monitor provides users with a numeric value indicating the depth of sedation. BIS values of 45 to 60 represent general anesthesia, and BIS values of less than 40 are associated with EEG burst suppression (Medtronic, 2018; Pawar & Barreto, 2022). Currently, some research suggests that EEG burst suppression and burst suppression duration correlate with POD development while other studies refute the claim (Pawar & Barreto Chang, 2022; Hughes et al., 2020). EEG-guided anesthesia is not yet standard practice as guidelines remain unclear due to mixed results in the literature (Pawar & Barreto Chang, 2022). Anesthetic depth monitoring, a potentially revolutionary concept, requires further research and refinement before being accepted as a tool which influenced delirium outcomes.

Pathophysiology

POD is a complex phenomenon with a pathophysiology that is not yet well understood. Mahanna-Gaberelli et al. (2019) identify four hypotheses of POD pathophysiology. The first hypothesis is coined the neurotransmitter hypothesis and entails a neurotransmitter imbalance caused by inappropriate oxidative cellular metabolism (Mahanna-Gaberelli et al., 2019). This first hypothesis is believed to cause inappropriate availability of neurotransmitters such as dopamine or acetylcholine (Mahanna-Gaberelli et al., 2019). The abnormal oxidative cellular metabolism is thought to disrupt typical neurotransmitter pathways (Dune et al., 2021; Oh & Park, 2018). The second hypothesis from Mahanna-Gaberelli et al. (2019) postulates that the surgical stress response from the hypothalamic-pituitary-adrenal axis releases pro-inflammatory cytokines and negatively impacts neurotransmitter levels. Dune et al. (2021) report that multiple studies report an elevated interleukin-6 (IL-6) biomarker in the presence of POD. Dune et al. (2021) notes that there is not yet a single reliable biomarker as a disease marker of delirium. A third hypothesis suggests that postsurgical neuroinflammation might cause POD pathogenesis

(Mahanna-Gaberelli et al., 2019). Several studies support the hypothesis that surgical stress precipitates neuroinflammation, thus inciting POD development (Subramaniyan & Terrando, 2018; Cascella et al., 2018; Berger et al., 2018; Oh & Park, 2019). Researchers identified surgical stress-induced neuroinflammation by evaluating cerebrospinal fluid inflammatory markers (Mahanna-Gaberelli et al., 2019). Last, Mahanna-Gaberelli et al. (2019) suggest that POD unmasks a previously unknown yet future Alzheimer's Disease (AD) or cerebrovascular disease diagnosis through similar mechanisms seen in AD. Current research has not yet implicated the role of any of the hypotheses in the development of POD (Mahanna-Gaberelli et al., 2019). Understanding the myriad of delirium pathogenesis hypotheses provides insight into how researchers aim to treat and prevent delirium.

The four leading hypotheses of POD pathophysiology do not explicitly link the possible relationship between EEG-guided sedation and POD development. Tanabe et al. (2020) demonstrated that POD developed in patients with global slow wave activity measured on postoperative EEG and elevated neuroinflammatory markers found postoperatively in cerebrospinal fluid. Unfortunately, the study by Tanabe et al. (2020) does not evaluate intraoperative EEG analysis and did not provide a hypothesis about intraoperative sedation. A study sponsored by Duke University, named *The INTUID Study*, is currently evaluating how neuroinflammatory markers found in the cerebrospinal fluid correlate with POD development by utilizing preoperative and intraoperative EEG monitoring to predict postoperative neurologic function (Berger et al., 2019). Results from *The INTUIT Study* will hopefully provide a more robust understanding of POD pathophysiology related to intraoperative EEG analysis and neuroinflammatory mechanisms. *The INTUIT Study* is expected to complete in late November

2022 (ClinicalTrials.gov, 2021). POD pathophysiology is a rapidly evolving field as experts attempt to learn more.

Future research is warranted to uncover POD pathophysiology. A vague understanding of POD pathophysiology has left researchers and clinicians confused about how to best treat and prevent POD. Fortunately, POD risk factors are well known and provide a basis for preventing POD.

Clinical Significance

POD will continue challenging healthcare professionals and stress the healthcare system. POD is associated with an increased cost of care and potentially devastating long-term consequences. POD complications are costly to patients, providers, and the hospital. An elderly patient undergoing elective surgery who experiences POD accrues, on average, about $44,000 more annually for care when compared to a similar patient who did not experience POD (Gou et al., 2021). Despite different clinical presentations, POD development is strongly correlated to postoperative cognitive dysfunction (POCD) development (Cascella et al., 2018). POCD represents a decline in neurophysical responses after surgery (Cascella et al., 2018). Individuals with POCD experience impaired memory, slowed information processing, and compromised executive function (Cascella et al., 2018). POCD symptoms often last months after surgery but may persist for years (Kant et al., 2017). Given the potential financial burden and potential long-term impact, POD is not an inconsequential diagnosis.

Impact on Anesthesia Professionals

Due to the aging population, anesthesia providers must take an active role in mitigating the unintended long-term effects of anesthetics in elderly patients. Anesthesia providers must rise to the challenge of caring for an increasingly complex surgical population (Hasan et al., 2020).

Unfortunately, anesthesia providers often do not see the sequelae of anesthetics due to their acute intraoperative role. Delirium present in the PACU is likely first noticed by PACU nurses. Delirium assessments are not yet the standard of care for PACU nurses therefore nurses may not consistently identify and categorize subtle changes in a patient's baseline behavior as delirium after surgery. However, with appropriate training, PACU nurses can utilize validated delirium screening tools to categorize assessment information and determine if a patient is likely experiencing delirium (Kim et al., 2021). Bedside nurses are essential partners in post anesthesia care.

Anesthesia providers must capitalize and act upon valuable information from the immediate postoperative setting and partner with nursing staff to identify early postoperative complications of anesthetics. Nurses can help identify patients with early postoperative delirium through bedside delirium assessment screening (Hughes et al., 2020). Frequently, anesthesia providers oversee patient care in the PACU after surgery. Anesthesia providers must learn to value delirium assessments as a critical piece of evidence. In addition, anesthesia providers must learn what to do with a positive screening. Though delirium treatment is not within the scope of this evidence-based project, it is a future area of opportunity for anesthesia providers. Identifying patients with delirium also poses a potentially valuable bank of information for anesthesia departments. Anesthesia departments can determine the number of patients who developed delirium and then evaluate the anesthetic records to discover opportunities for departmental improvement. Anesthesia department leaders must embrace a partnership with the postoperative nursing team to enhance feedback.

Most importantly, anesthesia providers must critically evaluate how they determine the proposed benefit versus potential risks of perioperative medications in elderly patients.

Anesthesia providers must use evidence-based tools such as the Beers Criteria to stratify risk (The American Geriatrics Society, 2019). Evidence-based tools weighted with individual patient needs to provide clinicians with sound decision-making.

Problem Statement (PICOT)

POD is an unintentional consequence of surgery and must be promptly recognized. Delirium assessments must be incorporated into post anesthetic care to provide early detection and early intervention. PACU nurses play a monumental role in identifying delirium as the healthcare professional with the most bedside interaction. A multifacility healthcare system must prioritize improving delirium care for the aging surgical population. The following PICOT question would be an essential element guiding a quality improvement project to impact POD care. Among elderly (>65 years old) patients receiving an elective surgical procedure classified as both inpatient and outpatient (**P**), how does routine postoperative delirium assessment in the post anesthesia care unit (**I**) compare to no routine delirium assessment (**C**) affect delirium detection (**O**) in the post anesthesia care unit (**T**)?

Project Objectives

The post anesthesia care unit (PACU) presents the first opportunity for a cognitive function assessment after surgery. POD is frequently observed among surgical patients over 65 years old and is associated with increased health care costs and worse postoperative outcomes (Mahanna-Gabrielli et al., 2019). Nurses frequently provide the initial assessment and play an integral role in determining the patient's disposition. Nursing delirium screening tools are a valuable tool in the early detection of delirium. This evidence-based practice project will determine best practice guidelines for postoperative delirium nursing assessment and provider follow-up. This project will also construct a hypothetical framework for implementing

postoperative delirium assessment tools, if indicated by the literature review, and monitoring POD frequency in postoperative patients over 65 years old. This project will also construct a framework for anesthesia provider feedback to enhance recognition of POD frequency.

Objectives

The following objectives will guide this evidence-based practice project.

- Determine best practice guidelines for postoperative delirium screening.
- Increase anesthesia provider awareness of POD frequency.
- Develop hypothetical guidelines for postoperative delirium screening if indicated as feasible by the literature review.
- Develop a comprehensive plan to monitor positive delirium screening occurrence and subsequent delirium evaluation for a medical diagnosis.
- Use the Iowa Model Revised (2015) model to guide project implementation.
- Use the continuous cycle of the Iowa Model Revised to adjust guidelines if outcomes are unsatisfactory.

Literature Review

The author used PubMed and the Cumulative Index to Nursing and Allied Health Literature (CINAHL) full text for current literature. Search strategies were aimed at identifying how delirium affects elderly patients after surgery and the effects of screening for delirium in the post anesthesia care unit (PACU). Thus the author conducted two separate searches of both PubMed and CINAHL to identify all relevant literature.

PubMed was searched using the following search Boolean phrase: (delirium) AND (assessment) AND (outcome) AND ((PACU) OR (post anesthesia care unit) OR (recovery)). Results were filtered for full free articles yeilding145 results. After examining the articles for

relevance, nine articles were included for literature review. The author completed a second PubMed search using the following Boolean phrase: (delirium) AND ((early diagnosis) OR (early detection) OR (early intervention)) AND (outcomes) AND ((elderly) OR (older) OR (geriatric)). The results were filtered for full free articles which yielded 133 results. After evaluating the articles for relevance, five articles were included for the literature review.

CINAHL was searched with the following Boolean phrase: “delirium” AND “post anesthesia care unit” OR “PACU” AND “screening” OR “assessment” OR “evaluation.” Results were filtered for full text and English language which yielded 51 results. After reviewing articles for relevance, nine articles were included in the literature review. A second search of CINAHL was performed with the following Boolean phrase: “delirium” AND “early diagnosis” OR “early detection” OR “early identification” AND “outcomes” AND “elderly” OR “older” OR “geriatric.” The search yielded 47 results which were then reviewed for relevance leaving five articles for the literature review. In total, 29 articles were included in the literature review and evidence synthesis.

Literature Review and Evidence Synthesis

Delirium assessment in the post-anesthesia care unit (PACU) presents a challenge for nurses and providers. The literature is summarized in Table 1 and Table 2 in the supplementary information. Delirium frequently occurs among postoperative patients in the PACU and is often referred to as emergence or PACU delirium. POD is frequently cited as occurring within one day to one week after surgery (Zhang et al., 2020; Kong et al., 2021). A study by Van der Wulp et al. (2020) found that POD prevalence peaked on the first day after surgery among patients who had undergone transaortic valve replacement. Emergence or PACU delirium, however, occurs in the PACU immediately after surgery (Zhang et al., 2020; Kong et al., 2021). Traditionally,

emergence delirium is thought to be a self-limiting result of anesthetics without consequence. Current understanding notes that emergence delirium is not benign and is independently associated with POD (Zhang et al., 2020). Early delirium detection is therefore critical for elderly patient care in PACU.

Implementing a delirium detection strategy will help hospitals provide evidence-based care. Clinical practice guidelines developed by the American Society for Enhanced Recovery and Perioperative Quality Initiative provide a strong recommendation for hospitals to develop pathways to routinely screen for postoperative delirium (POD) in high-risk patients (Hughes et al., 2020). However, Hughes et al. (2020) did not provide a recommended tool or strategy to detect POD, and the authors also did not recommend an ideal time to identify delirium. The clinical practice guidelines by Hughes et al. (2020) will guide this evidence-based practice project's aim to provide early delirium detection in the PACU. The current literature will determine the best time during the PACU stay to implement a delirium assessment to ensure the hospital of interest exemplifies evidence-based care.

There is a general agreement within the literature that POD is preventable and that hospitals must do more to prevent and identify delirium. O'Hanlon et al. (2014) advocate for hospital administrators to support early delirium detection and intervention methods. Additionally, O'Hanlon et al. (2014) posit that patients at high risk of delirium are easily identified and that many factors precipitating delirium are preventable. An estimated 30% to 40% of delirium is considered preventable through early treatment of predisposing factors (Reddy et al., 2017). Reddy et al. (2017) advocate for utilizing nonpharmacologic interventions, such as early mobility, sensory enhancement, sleep hygiene, and adequate fluid and nutrition coupled with effective pain management, interdisciplinary collaboration, and minimum effective

medication doses as methods for preventing delirium. Hospitals must engage the entire care team to effectively prevent and identify delirium.

The evidence within this literature review indicates several important factors for hospitals considering implementing a delirium screening protocol in the PACU setting. This review describes current understanding of delirium present within the PACU and how the presence of delirium effects patient outcomes. Additionally, this review evaluates current state of how anesthesia providers utilize delirium screening tools indicating potential areas of opportunity. Most notable in the literature review for the purpose of this evidence-based practice project is evidence which compares the efficacy of various delirium screening tools within the PACU setting and evidence which describes the feasibility of implementing delirium assessments.

Current Delirium Screening Trends

Two articles examined current trends in how clinicians evaluate POD. Reddy et al. (2017) identified that the CAM-ICU screening tool provides the best-validated tool for bedside use. However, Reddy et al. (2017) did not evaluate how providers use the CAM-ICU tool among various healthcare settings, such as PACU compared to the ICU Saller et al. (2020) evaluated current practices of anesthesia providers in Germany and found that less than half of providers used a delirium screening to identify delirium. Only 38% of anesthesiologists alerted the patient's nurse when delirium was detected, and only 46% notified the primary physician (Saller et al., 2020). Alarmingly, one-fourth of patients admitted to a hospital floor would not be screened for delirium under any circumstances (Saller et al., 2020). The study by Saller et al. (2020) must be interpreted cautiously in the context of this evidence-based practice project. The study took place in a German hospital rather than the hypothetical midwestern hospital in the United States for the context of this evidence-based practice project. Nonetheless, the study by

Saller et al. (2020) indicates that anesthesia providers may underestimate the clinical significance of delirium. Anesthesia providers may require a paradigm shift to best appreciate the clinical significance of delirium after surgery.

Proposed Timeline

The proposed timeline outlines fifteen weeks for the project implementation however this end point exists for the purposes of monitoring implementation practice. The practice change is an indefinite change that will be readdressed when clinical indicators monitored by the QI department combined with current evidence necessitates a new practice change. Two major phases overlay the project timeline. The first, a five-week pilot phase and the second, a ten-week implementation and sustainability phase. The first five weeks consist of a pilot phase which will begin once the electronic health record system updated is approved to include the 4AT delirium assessment. Staff training will begin one week prior to the 4AT tool system integration with a core group of 10 nurses who will pilot the process with the anesthesia department. During the first week of the project, the PIs will attend the weekly anesthesia department meeting to introduce the project and address the needs of the anesthesia providers. PIs will also provide education to the core group of PACU nurses at this time. After training is completed, the 4AT delirium assessment tool will be piloted among the core group of PACU nurses for three weeks. At the end of the three-week period, PIs will administer a survey to the PACU nurses and anesthesia providers to identify any barriers to full-scale implementation. PIs will use one week for data collection and project adjustment, if necessary.

Next, the project will move to the ten-week implementation and sustainment phase. The second major phase is delineated by the timeframe to complete specific goals. PIs will spend three weeks continuing PACU nursing staff education and reinforcing anesthesia provider

education. Next, there will be a one week "go-live" phase involving implementation of the 4AT delirium screening for all patients older than 65 years in the PACU. After the "go-live" period, the implementation and sustainment phase will begin. This phase consists of a six-week period in which there will be daily completion monitoring for the 4AT assessment tool utilizing department KPI data. During the final week of the implementation and sustainment phases, the QI department will begin reporting the retrospective control chart monitoring to the PIs, the PACU nursing department, and the anesthesia department.

Delirium Tools

The 4AT assessment tool was consistently the most efficacious screening tool in the PACU setting. In a systematic review and meta-analysis, the 4AT was found to have higher sensitivity and specificity than the NuDESC and CAM-ICU screening tools (Aldwikat et al., 2022). However, the 3D-CAM tool did have a higher sensitivity but lower specificity than the 4AT tool (Aldwikat et al., 2022). Moisse et al. (2022) also concluded that the 4AT tool performed better when compared to the CAM or NuDESC tools. The 4AT tool was less time-consuming to perform and showed greater sensitivity for delirium (Moisse et al., 2022). The 4AT delirium assessment provides an excellent tool which correctly identifies patients with delirium more often than other delirium assessment tools. The 4AT delirium assessment tool will therefore be utilized in the evidence-based practice project.

Hight et al. (2018) sought to improve the CAM-ICU tool detection for the PACU by adding extended criteria to include disordered thinking and perceptual disturbances. The authors named the tool CAM-PACU (Hight et al., 2018). When 229 patients were screened for delirium 15 minutes after arriving to the PACU using the CAM-ICU tool, delirium was detected in 33 patients (High et al., 2018). Further analysis among all patients utilizing CAM-PACU criteria

identified six patients with delirium who had been screened with the CAM-ICU tool and five patients who had not been initially screened for delirium (High et al., 2018). It appears that the CAM-PACU tool was not directly tested, only the extended criteria were evaluated to determine their presence in PACU patients. The authors did not compare the CAM-PACU and CAM-ICU tools directly, so it is challenging to determine which tool is superior. Additionally, researchers did not compare the CAM-ICU or CAM-PACU tool with the gold standard DSM-V delirium criteria. As this study represents an initial evaluation of the CAM-PACU tool, it is not appropriate to consider the CAM-PACU tool for this evidence-based practice project.

An important consideration when utilizing a delirium assessment tool is timing. Researchers must determine what criteria make delirium signs and symptoms significant. Bettelli and Neuner (2017) recommend assessing for delirium every six hours to help enhance the chance of delirium recognition. However, Bettelli and Neuner (2017) do not cite their rationale for the assessment frequency, therefore interpretation should be cautiously interpreted for this evidence-based practice project.

Studies evaluating the timing of delirium assessments in the PACU highlight the challenge of detecting delirium without being confounded by residual sedation from the anesthetic. Card et al. (2015) evaluated agitation upon anesthesia emergence and delirium presence upon PACU admission, 30 minutes after admission, 1 hour after admission, and at PACU discharge. Card et al. (2015) discovered that although delirium is present in roughly one-third of patients through the CAM-ICU assessment, only 4% of patients had detectable delirium upon PACU discharge. Unfortunately, the study by Card et al. (2015) did not specifically evaluate patients over the age of 65 years. With the expanded patient population, generalizability to the evidence-based practice project is limited.

Objective clinical indicators, such as the Aldrete score, provide tangible points for evaluating the appropriate time to evaluate for delirium. Two studies evaluated delirium once patients obtained an Aldrete score ≥ 9 (Nufeld et al., 2013; Nufeld et al., 2015). Both studies included a patient population older than 70 years which provides essential insight for this evidence-based practice project. An Aldrete score ≥ 9 indicates that patients are hemodynamically stable, exhibit appropriate wakefulness, and are ready for PACU discharge (Nufeld et al., 2013). A disruption in wakefulness, a component in many delirium screenings, may provide a false positive for delirium screening if the delirium test is administered too soon after an anesthetic is discontinued. The Aldrete score provides clinically significant points for clinicians to perform a delirium screening. Delirium was present among 45% of patients older than 70 years in both studies, highlighting the need for routine delirium assessment in the elderly postsurgical population (Nufeld et al., 2013; Nufeld et al., 2015). Nufeld et al. (2013) reported that delirium assessments for patients hospitalized after surgery who tested positive for delirium were continued on weekdays for the duration of their hospitalization. However, Nufeld et al. (2015) did not reevaluate the presence of delirium after the initial PACU assessment. Unfortunately, statistical analysis indicated the NuDESC and CAM-ICU tools displayed poor sensitivity among patients older than 70 years (Nufeld et al., 2013). The Aldrete score provides an objective measure to indicate adequate anesthetic recovery and an appropriate time to evaluate for delirium.

Not all studies utilized an objective score to indicate an appropriate time to implement a delirium screening assessment. Several studies evaluated delirium presence at the time of PACU discharge (Card et al., 2015; Radtke et al., 2008; Saller et al., 2019; Winter et al., 2015). PACU discharge as an endpoint provides limited information on clinically relevant endpoints for this

evidence-based practice project. Nufeld et al. (2013) indicated that an Aldrete score ≥9 indicates PACU discharge readiness. In summary, current literature suggests that 4AT assessment at the time of PACU discharge or once the Aldrete score is ≥ 9 will provide the most beneficial assessment criteria for nurses performing a meaningful delirium assessment in PACU.

Delirium Outcomes

POD likely impacts many important postoperative outcomes among surgical patients. However, the literature does not demonstrate an association between POD and postoperative outcomes. A study by Nufeld et al. (2015) reported that POD was not associated with patient survival, physical and cognitive functioning, and healthcare utilization. The findings from Nufeld et al. (2015) are significant because they describe the effects of delirium detected in the PACU and not just delirium in the postoperative setting. However, the study has significant limitations, there was a self-reporting bias in the 18-month outcomes survey, and ten patients were lost to follow-up (Nufeld et al., 2015). Additionally, the study included a small sample size of 91 patients, which may not have provided adequate power for the study outcomes. Regardless, the study contains valuable information for this evidence-based practice project as it evaluated the intended population of elderly surgical patients and outcomes of delirium detection in the PACU.

The literature reports mixed outcomes when reporting outcomes associated with delirium, however, study size and protocol must be noted when evaluating the results. The findings from Nufeld et al. (2015) are at odds with several studies demonstrating poorer outcomes for patients who developed delirium. Hesse et al. (2019) initially aimed to evaluate the trajectory of electroencephalogram data to predict POD, but researchers included follow-up data analysis with valuable information. Hesse et al. (2019) demonstrated that delirium detected in the PACU was significantly correlated with longer hospital length of stay and higher 30-day readmission rates.

An advantage of the study by Hesse et al. (2019) is that it was a large multicenter study including 626 patients. The large sample size and including multiple healthcare institutions may better detect outcomes not found in a study utilizing one healthcare institution with fewer patients.

Nufeld et al. (2013) evaluated the short-term impacts of delirium detected in the PACU on elderly surgical patients and discovered that PACU delirium was associated with poorer verbal fluency after surgery. Additionally, patients who were delirious in the PACU were more likely to be discharged to an extended care facility when compared to patients who were never delirious (Nufeld et al., 2013). The study sample size was small and took place at a single institution which does not permit broad extrapolation of results. However, the study results by Nufeld et al. (2013) were consistent with the results of a previous multicenter study. Poor verbal fluency and discharge to an extended care facility illustrate the potential types of poorer outcomes when patients are diagnosed with delirium after surgery.

New evidence challenges the belief that delirium first detected in the PACU is less clinically significant than delirium that develops on the first postoperative day. Choi et al. (2019) also demonstrated that early delirium detected immediately after surgery among patients receiving hemiarthroplasty after a displaced femoral neck fracture was associated with poorer outcomes. Interestingly, researchers compared outcomes among a control group of patients who did not develop delirium, patients who developed delirium within 24 hours of surgery, and patients who developed delirium more than 24 hours after surgery. Choi et al. (2019) reported that patients who developed delirium greater than 24 hours after surgery had a two-year survival rate of 83.6% survival. However, patients who developed delirium within 24 hours of surgery had a two-year survival rate of 71% indicating a poorer survival rate. Despite the difference in survival rate, the delayed delirium group did not have a statistically significant difference in two-

year mortality compared to patients who did not develop delirium (Choi et al., 2019). It is important to note that Choi et al. (2019) vaguely reports the delirium detection methods and do not report how delirium was assessed in the PACU. Choi et al. (2019) noted that the surgeon assessed delirium immediately in the recovery room and daily in the general ward. Further research is warranted to clarify the effect of delirium when detected on the day of surgery on long-term outcomes.

The compounding effects of delirium risk factors superimposed on delirium are important to understand when evaluating postoperative outcomes. A study by Gandossi et al. (2021) evaluated the impact of delirium and frailty among elderly patients who received surgical intervention for a proximal hip fracture. Delirium and frailty were independently associated with poorer functional status at discharge (Gandossi et al., 2021). Interestingly, when delirium and frailty were evaluated together, the sum of delirium and frailty effects was less than the respective individual effects (Gandossi et al., 2021). The authors call for early intervention when delirium and frailty are detected to help improve patient functional status at discharge (Gandossi et al., 2021). Although the presence of delirium and frailty do not exhibit compounding effects on postoperative outcomes, delirium must be addressed early to improve functional status.

One quality improvement project focused on improving POD detection, and POD-associated outcomes demonstrated improved outcomes with improved delirium detection. Brooks et al. (2014) implemented an evidence-based practice quality improvement project which included routine delirium screenings for elderly patients in the preoperative setting and upon postoperative admission to a hospital room. Researchers did not include PACU delirium assessment, indicating that the results must be cautiously interpreted for this evidence-based practice project. Brooks et al. (2014) found that overall delirium detection improved after

implementing routine delirium assessment. However, Brooks et al. (2014) did not meet an initial goal of early delirium detection with the preoperative Mini-Cog assessment. The preoperative nursing setting, therefore, may not be an ideal location to identify patients at high risk for POD. Brooks et al. (2014) also discovered that patients who developed POD had a longer length of hospitalization, a higher mortality rate, were more likely to be readmitted to the hospital within 30 days, and were more likely to be discharged to a rehabilitation facility. Brooks et al. (2014) included evidence-based interventions for every patient who developed delirium; therefore, detecting delirium alone may not independently improve outcomes.

Length of hospital stay in patients who develop delirium after surgery is an important factor for hospitals to consider. A small pilot study by Todd et al. (2015) found a statistically significant change in length of stay when nurses implemented CAM tool screening on all postoperative hip fracture patients older than 65 years. In the study, patients received a delirium assessment upon admission and once during each shift. If delirium was detected, nurses notified the covering provider and implemented evidence-based nursing interventions aimed at reducing delirium. Todd et al. (2015) discovered a statistically significant reduction in length of stay with routine delirium assessment and multidisciplinary involvement in evidence-based interventions. Although the study does not exclusively evaluate PACU delirium assessments, the study provides valuable information for this evidence-based practice project. First, Todd et al. (2015) highlight the importance of collaboration among the interdisciplinary team when delirium is present. Second, Todd et al. (2015) indicate the importance of nurses providing routine assessments, whereas other research evaluates the impact of non-nurse delirium assessments. Routine nurse-driven delirium assessments facilitate early intervention and shorter hospital length of stay for patients experiencing delirium.

Overall, current literature indicates that early delirium detection and intervention improve outcomes among elderly postsurgical patients. Additionally, delirium identified in the PACU indicates poorer patient outcomes. Delirium detection in PACU may not independently improve outcomes, but it helps identify an extremely high-risk subset of patients. Moreover, the literature indicates the importance of multidisciplinary collaboration when considering delirium. Delirium frequency determined by PACU nursing assessment may be an essential piece of information to anesthesia providers. This quality improvement project should therefore strive to improve early delirium detection.

Delirium Assessment Feasibility

Several studies indicated the feasibility of implementing various delirium assessments in the PACU setting. Two studies indicate that delirium assessment is feasible in the PACU setting (Winter et al., 2015; Woelfel et al., 2019). Winter et al. (2015) indicated that the NuDesc screening tool was a feasible option for PACU nurses. Woelfel et al. (2019) evaluated a specific tool for individuals with military service that was feasible for Veteran's Health Affairs PACU settings. Unfortunately, the quality improvement project included a small sample and may not be generalizable to a nonmilitary hospital setting. Additionally, Todd et al. (2015) identified the CAM assessment tool as easy to use and helpful in identifying patients with delirium on inpatient hospital units after surgery. Nurses continued to include the CAM tool in practice after the study ended. Unfortunately, Todd et al. (2015) evaluated nurses on a postsurgical hospital floor and not a PACU setting, providing limited evidence for this evidence-based practice project.

An additional study by Ewens et al. (2021) demonstrated that staff who completed education about a delirium assessment tool increased knowledge of how to use the delirium tool and risk factors for delirium appropriately. Additionally, rates of delirium assessment increased

after completing education on the delirium tool and a subsequent delirium tool roll-out (Ewens et al., 2021). However, a significant limitation of this study is that researchers did not evaluate whether the staff who completed the delirium education feedback were the same staff assessing patients for delirium (Ewens et al., 2021). Therefore, it is difficult to determine if delirium education or required delirium assessment accounted for the increased knowledge and assessment compliance. Despite the low level of evidence with significant limitations, Ewens et al. (2021) study demonstrate that staff education should be considered for this evidence-based practice project. Staff education about delirium assessments improves knowledge and assessment compliance, therefore, the project will utilize staff education.

Evidence Summary

Evidence found within this literature review helped provide the basis for this evidence-based practice project. This literature review describes the importance of assessing for delirium at the earliest appropriate time after surgery. The literature indicates that currently, anesthesia providers undervalue the importance of delirium screening tools immediately after surgery. Anesthesia providers must change their perspective to provide best practiced care for elderly patients at high risk of POD. Patients who first developed delirium in the PACU are at higher risk of poor postoperative outcomes indicating a critical need for identifying delirium present upon PACU discharge. The 4AT delirium assessment tool is the best validated tool for use in the PACU setting. Lastly, nurse-driven delirium assessment tools increase delirium detection and are easily implemented with staff education. Based on the current evidence, this evidence-based practice project will implement the 4AT delirium screening tool upon PACU discharge after providing education to PACU nurses and anesthesia providers.

Evidence-Based Practice Model

This hypothetical project will use the Iowa Model Revised (2015) for evidence-based practice to provide a framework for project planning, implementation, and outcomes monitoring. The Iowa Model provides an excellent structure for introducing practice-changing techniques in specific clinical environments within a large hospital system. The Iowa Model is easily adapted to unique scenarios such as the perioperative setting. Lastly, the Iowa Model promotes continued reevaluation to sustain results and modify interventions. A comprehensive diagram of the Iowa Model is outlined in Appendix A. The author obtained permission to use the Iowa Model Revised (2015) and the Iowa Model tools from the University of Iowa Hospitals and Clinics for this project (Cullen et al., 2017).

The Iowa Model Revised

The Iowa Model Revised (2015) contains seven steps and three critical decision points within the process (Cullen et al., 2017). If decision points indicate that a user should not proceed, the user follows the chart back to an earlier step to modify the project (Cullen et al., 2017). An advantage of the Iowa Model is the practice change pilot before full implementation. A pilot is a valuable tool to identify early challenges to a practice change.

The Iowa Model will guide project investigators (PIs) from an academic setting in a hypothetical evidence-based practice project for a practice change in the PACU of an urban midwestern hospital. PIs will work with perioperative nursing staff and anesthesia providers to create an early identification process for patients experiencing delirium after surgery. The project will first be piloted among a small group of nurses for feasibility before a full rollout to the entire PACU. PIs will evaluate adherence to the early identification protocol, number of patients identified by the protocol, knowledge of delirium, and awareness of delirium. The following

information indicates how project leaders will utilize the Iowa Model within the context of this evidence-based practice project.

The first step in the Iowa Model is to identify a triggering issue or opportunity. As previously described, POD must be a top priority in perioperative settings caring for patients over 65 years old. This project will be designed for a single hospital looking to implement early POD detection in accordance with the PQI6 guidelines.

The second step of the Iowa Model asks users to clearly state their question or purpose. The purpose of this scholarly project is to provide early identification of patients experiencing postoperative delirium in the PACU. The secondary purpose of this final scholarly project is to provide actionable feedback to the anesthesia and PACU nursing departments. PIs completed this step while describing the PICO question.

The Iowa Model (Cullen et al., 2017) identifies determining topic priority as the first critical decision point. Project investigators (PI) must relay the urgency of early POD recognition to key stakeholders in leadership roles to garnish support for POD detection strategies. The project will align with the organization's strategic priorities as the project will help address the projected increase in POD over the next thirty years. Strategies to mitigate POD will help provide a future action plan for hospital expenses and reduce adverse outcomes.

Once the issue is deemed a priority, the Iowa Model identifies in step three that users must establish a team. This evidence-based practice project would include all parties affected by the practice change. Parties include anesthesia department members, post-anesthesia care unit (PACU) nurses, perioperative nurse educators, and administrative staff. Team members will be integrated into an action plan outlining individual responsibility, a timeline, and criteria to evaluate project success.

After forming a team, the fourth step in the Iowa Model is to assemble, appraise, and synthesize a body of evidence. An essential step in making an evidence-based practice change is evaluating current literature and integrating evidence into practice (Cullen et al., 2017). It is within the scope of this final scholarly project to assemble, appraise, and synthesize current evidence regarding the use of nursing delirium screening tools, POD screening in the PACU, and POD outcomes. PIs have appraised and synthesized literature regarding the best practice for providing effective feedback to anesthesia providers. The Iowa Model's guidelines and tools for conducting a literature review will be utilized for this project.

The author first searched the scholarly research databases Cumulative Index to Nursing and Allied Health Literature (CINAHL) and PubMed with search terms modeled after the PICO question and use appropriate limiting terms. The initial search result yield is noted among search results, and search results were then be evaluated for relevance and omitted as necessary. The author used the research appraisal tools found in the Iowa Model tools to evaluate all evidence (Cullen et al., 2017). After the literature appraisal was completed, the author analyzed evidence in a synthesis table to objectively display results and make themes apparent. The author discussed findings by showing similarities and differences within the literature and objectively representing the entire body of evidence.

After appraising the evidence, PIs face the second critical decision point in the Iowa Model. PIs must decide whether there is sufficient evidence to support a pilot practice change. The Iowa Model recommends similar themes and conclusions across articles, ample high-quality research articles, and relevant clinical guidelines to support a practice change (Cullen et al., 2017). The literature review and evidence summary within this project describe this critical decision point.

From the extensive literature search and review of data, the need for practice change is indicated in order to prevent POD. Due to this practice change, PIs designed a pilot initial practice change as described in the IOWA model. The Iowa Model is unique in asking users to test a practice change prior to implementing a department-wide practice change. The Iowa Model recommends considering four sub-steps described as engaging patients and verifying preferences; resources, constraints, and approval; developing a localized protocol; and developing a baseline data collection plan. PIs will also include all resource considerations when designing the pilot. Project pilot considerations must include acquiring ample human and material resources. Estimated costs include both materials and labor expenditures. PIs must also consider appropriate approval pathways for project implementation.

The PIs will then develop a localized protocol, known as a policy for this project, specific to the hospital. The protocol must be specific to the project, have inclusion and exclusion criteria, and should describe what to do with results from the screening tool (Cullen et al., 2017). The practice change plan will include a review period which is an opportunity for nurses to provide feedback and review current research to ensure the project reflects current evidence-based practiced. The policy will be adjusted as needed during the review process. The pilot practice change must lastly include a specific plan for outcomes monitoring. The outcomes will align with the project objectives to create a clear understanding of if the project objectives are met.

During the next phase of project implementation, PIs must promote adoption of the policy pilot. PIs will identify and train the core group of individuals involved with the pilot practice change. PIs will communicate the pilot start and end date to all involved parties. PIs will coordinate with the technology services department of the hospital system to incorporate the

screening tool into the PACU nursing documentation. PIs will collaborate with PACU nurses to best incorporate the delirium assessment tool into the typical nursing workflow.

The last phase during step five prepares for decision point three. During the final phase, PIs determine if the pilot through a data collection and review along with preparing clinicians for a permanent practice change. The third decision point evaluates the post-pilot data to determine if the intervention is feasible for a PACU department practice change.

Once the intervention is determined to be appropriate for unit-wide adoption, the implementation plan will follow step six of the Iowa Model, integrating and sustaining the practice change. PIs would again utilize the four steps highlighted by the Iowa Model's implementation strategies (Cullen et al., 2017). See Appendix C for the complete table. PIs will now focus on expanding the initial pilot from the core group of PACU nurses to encompass all PACU nurses within the department.

Introducing a permanent practice change calls on key themes also utilized during the pilot phase. PIs will follow the Iowa Model’s recommendations of creating awareness and interest, building knowledge and content, promoting action and adoption, and pursuing integration and sustained use. PIs must convey the shared goal interest when presenting budget considerations and requesting administrative approval. Specifically, project investigators will highlight risks associated with PACU delirium screening, projected benefits from the literature review, implementation costs, and projected reduction in unexpected readmissions after surgery.

Some implementation plans overlap during the Creating Awareness and Interest and the Build Knowledge & Content phases (Cullen et al., 2017). Some of the education presented during the initial implementation plan phase will support building knowledge. Project investigators will also continue building organizational support by ensuring that the

technological infrastructure can support the added technology needs in the electronic health record system. Organizational support will also come from team dynamics among the perioperative nursing department, anesthesia department, and senior leadership. All involved parties must embrace and be willing to support a practice change.

The seventh and final step of the Iowa Model requires users to disseminate results of their evidence-based practice project. After six months, PIs will internally disseminate findings from PACU delirium screening. PIs will work with the quality improvement team at the hospital to analyze the results and create a presentation outlining the results from the evidence-based practice project. The PIs would present the findings to the senior leadership and the PACU nurses. PIs will also disseminate findings at a graduate student conference, highlighting graduate student practicum poster projects.

Implementation Plan

Project investigators will use the Iowa Model Revised, as previously described, to guide the project implementation. First, initial collaboration with key stakeholders determines the project's future success. Project Investigators (PIs) would first need to gain internal review board (IRB) approval prior to proceeding. However, because this project is hypothetical, there is no risk to human participants, and the PIs will forgo IRB approval. Next, PIs would collaborate with Information Technology (IT) department, Quality Improvement (QI) department, anesthesia department leaders, and nursing unit leaders to discuss the need for change. PIs will present the literature review findings and discuss how implementing delirium screening would improve delirium detection and facilitate early intervention for patients who develop delirium.

PIs will then present the proposed policy change through the hospital’s policy approval process. The hospital approval process will require a review by the hospital legal team to assure

acceptable legal implications if the policy is adopted. Upon obtaining approval, PIs will then collaborate with the hospital policy committee which updates existing hospital policy and evaluates proposed policy changes.

PIs will then begin collaborating with the PACU nursing department and the anesthesia department. Initial meetings with representatives of the PACU nursing department and anesthesia department will include the importance of screening for delirium, current areas of opportunity in the PACU, the proposed practice change, and the proposed responsibilities of each provider in the PACU. The PIs will ask for a bedside clinician representative from the PACU nursing department and the anesthesia department to work closely with the PIs during the implementation and sustainment phases as super users. The super users will also work with the IT department when beta testing the new assessment in the electronic health care record flow sheets. When meeting with PACU nursing leadership, PIs will ask to be introduced to the shared governance council and the staff responsible for maintaining the Key Performance Indicators (KPIs).

The hospital of interest utilizes KPIs in every department to track departmental outcomes daily on a display board visible to the entire staff. If the department does not meet its daily goal, it conducts a brief review and identifies factors that preclude daily success. The KPI board is an extremely useful tool to access for this evidence-based practice project. Once introduced to the staff, the PIs will then meet with the PACU shared governance council and KPI representatives and discuss the evidence-based practice project's importance and objectives. The shared governance council and KPI representatives will be asked to include delirium tool completion as a measure during the implementation and sustainment phases and at one year after project implementation. During project implementation, feedback from the nurses will be assessed

through a Pareto chart which will indicate specific problems pertaining to delirium tool completion and the frequency at which the problems occur. Pareto chart data will provide PIs actionable feedback for project adjustments as needed. Bedside staff involvement is critical for long-term success as it instills a sense of ownership in the project.

The 4AT delirium assessment is an open access tool and does not require a subscription or user licensing. There is minimal cost associated from a technology standpoint for utilizing the assessment. However, the IT department will be responsible for integrating the 4AT flowsheet within the nursing documentation options. When meeting with the IT department, PIs will explain that the 4AT assessment must be readily accessible for PACU nurses within the flowsheet documentation. A representative PACU nurse will assist with beta testing to ensure the 4AT delirium assessment is functional and reasonably fits within the PACU nursing workflow. All bedside clinicians must be able to find the assessment tool for reference and continuity of patient care. Lastly, PIs will request the option to run a report evaluating the 4AT delirium assessment completion for all patients greater than 65 years old who were admitted to the PACU. The report will assist the nursing staff with monitoring delirium assessment compliance. Additionally, it is crucial to include why the PIs advocate to include the 4AT delirium assessment tool to garnish support from the nursing staff.

The QI department will assist in providing long-term indicator monitoring of the 4AT delirium assessment tool. Early identification may aid in earlier intervention for patients experiencing delirium. The QI department will be tasked with creating a control chart which identifies the frequency of patients returning to the hospital within 30 days of a surgical procedure who had delirium present on admission. The QI department will use the following ICD-10 codes which indicate delirium: F05, F05.0, F05.8, and F05.9. The QI department will

monitor the codes monthly beginning at the project pilot. Any statistically significant change will be flagged when data is reported to the PIs, the anesthesiology department, and the PACU nursing department for further evaluation. The QI department will report indicator findings whether significant or not significant monthly.

Initially, 10 PACU nurses of the department's 50 nurses will be trained on how to administer the 4AT delirium scale. The PACU nurses will also receive education during a one-hour in-service regarding the importance of delirium assessment and the long-term sequelae of delirium among elderly postoperative patients. There will be two nurses per shift during normal PACU business hours who will be administering the 4AT delirium assessment during the three-week pilot period. The PIs will collaborate with the PACU leadership and the PACU shared governance council to identify the most experienced PACU nurses who will be willing to participate in the pilot. The nurses will assess all assigned patients who meet eligibility criteria for the delirium assessment. The PACU charge nurse will delegate nursing assignments in accordance with current unit practice. Nursing assignments will not be altered to accommodate the project. At the end of the pilot period, the nurses will be surveyed to determine any barriers to a full-scale implementation.

All anesthesia providers will receive a 15-minute in-service outlining the delirium detection project and discuss the expectations for anesthesia providers. Anesthesia providers will be informed that an initial, small number of PACU nurses will be evaluating patients older than 65 years for delirium once the patient has recovered enough to be discharged from the PACU. Current PACU nursing care at the hospital of interest dictates that all patients receive the Aldrete assessment to determine discharge readiness. Discharge readiness entails that the patient is ready to be discharged home or discharged to a medical-surgical or intermediate care unit. Patients

expected to proceed to the intensive care unit will not be included in this project. Aldrete assessments are a current standard of care for all PACU patients. Therefore, this project will not provide additional education or training on the Aldrete assessment. Nurses in the PACU will use an Aldrete score of ≥9 to indicate discharge readiness and therefore delirium assessment readiness. PIs will also include critical project dates including the end of the pilot period and the beginning of the implementation phase. PIs will provide a feedback form to use during or at the end of the pilot period to ensure a smooth implementation phase. Anesthesia providers will also be informed that PACU nurses are to communicate with the covering anesthesia provider in PACU for all patients who receive a positive delirium assessment result.

Lastly, the covering PACU anesthesia provider must evaluate the patient and determine if the patient needs any changes to their plan of care. It is out of scope for this project to recommend specific interventions to the anesthesia providers. If a patient is to be hospitalized after surgery, anesthesia providers must communicate a positive delirium screening result with the patient's inpatient covering provider team to ensure continuity of care. Patients slated for hospital discharge after surgery who have a positive delirium assessment are to be reevaluated by the anesthesia provider. Further care will then be prescribed at the anesthesia provider's discretion. Anesthesia providers are encouraged to collaborate with the patient's surgeon and utilize established hospital care guidelines for patients with delirium.

The pilot period will utilize the ten nurses trained in delirium assessment and all of the anesthesia providers who provide care to patients in the PACU. The nurses and anesthesia providers will follow proposed procedure for delirium assessment in elderly patients for three weeks as described in Appendix C. The implementation plan will explicitly state that the pilot will not extend beyond three weeks so pilot participants should not be utilizing the 4AT delirium

assessment between the end of the pilot and the beginning of the implementation phase. Pilot participants will be provided with contact information for the PIs in the event of an urgent question or concern when the PIs are not on-site. At the end of the third week of the pilot, all involved nurses and anesthesia providers will receive an email with a link to a survey to evaluate their experience. The survey will use a Likert scale to describe the end user's perceptions of how the pilot performed. The survey will also include an open response section to describe any concerns with the pilot and suggestions for improvement. Pilot participants will have five days to respond to the survey. PIs will review the returned surveys and adjust the proposed protocol as needed.

Next, the project will move to the implementation and sustainment phase. PIs will continue PACU nursing staff education, reinforcing anesthesia provider education. During the three-week education period, PIs will also work with nursing educators to ensure that there is a plan in place to educate future department hires. PIs will also work with the shared governance council for the PACU and confirm that the 4AT delirium assessment is included in the department KPIs during the project implementation and sustainment phases. PIs will perform two one-hour in-services for the nursing staff outlining the 4AT delirium assessment tool, discussing the importance of screening for delirium, and the impact of delirium in elderly surgical patients. Information about delirium will come directly from the 4AT delirium assessment tool source. At the beginning of the in-service, nurses will be provided with a brief survey evaluating their knowledge of delirium. A PI will also be present at the weekly staff meetings the two weeks prior to the "go-live" phase to answer any questions about the project. PIs will also send an email reminder to the anesthesia staff and nursing staff one week prior to the “go-live” phase.

Next, there will be a brief "go-live" phase involving implementation of the 4AT delirium screening for all elective surgical patients older than 65 years in the PACU who are targeted to be discharged home, to a medical-surgical unit, or an intermediate care unit. On the first day of this phase, PIs will create information board in the anesthesia break room and the PACU nursing break room which outlines: the importance of delirium assessment, what to do with a positive delirium screening result, how to complete a delirium assessment, and copies of hospital guidelines for delirium care. During this time, the PIs will be available for questions during normal PACU hours. PIs will encourage the PACU nurses to use the assessment tool and will provide coaching when necessary. PIs will also be open to feedback from the nursing and anesthesia staff if the bedside staff have difficulty with completing the assessment or the required anesthesia provider follow-up. Nurse will be reminded each morning to complete the 4AT delirium assessment before each shift during the pre-shift huddle.

After the one week "go-live" period, the implementation and sustainment phase will begin. During this phase, there will be daily completion monitoring for the 4AT assessment tool. The PACU charge nurse or a designated PACU nurse will perform a chart audit of all patients over 65 who received care in the PACU to evaluate for completion of the 4AT delirium assessment. During the pre-shift huddle, nurses will be informed of the previous days assessment compliance. On days with 100% compliance, PIs will place a basket of candy in the PACU nurse breakroom with a sign thanking them for their work. During the final week of the implementation and sustainment period, PACU nurses and anesthesia providers will receive an email with a survey of the delirium project and a brief evaluation of their delirium knowledge. The same topics from the baseline quiz administered during the education phase will be repeated on the post-implementation survey. The results will be compared to the surveys will be

compared to evaluate knowledge gained during the project. At the end of the implementation and sustainment period for the purposes of the evidence-based practice project, the shared governance council will then utilize the KPI of completed delirium assessment at their discretion. The PIs will then ask the QI department to formulate a control chart identifying patients admitted with an ICD coded delirium diagnosis after surgery. The PIs will facilitate a relationship among the QI department, the PACU nursing department, and the anesthesia department. The QI department will evaluate indicators for success and will report back to the anesthesia and nursing departments if there is an unexpected increase in patients who were hospitalized and had delirium after surgery. Long-term collaboration among the QI, PACU nursing, and anesthesia departments will help ensure project sustainment.

Postoperative Delirium Assessment Policy

Routine delirium screenings after surgery facilitates early intervention and ideal care for patients experiencing delirium. Elderly patients are at increased risk of postoperative delirium, and delirium is frequently undiagnosed (Hughes et al, 2020; Kim et al., 2021). Guidelines from the PQI6 recommend that healthcare facilities institute routine delirium assessments for patients at risk of delirium (Hughes et al., 2020). The guidelines help hospitals protect high-risk patients from adverse outcomes. Delirium detected within 24 hours of surgery is a significant finding and is associated with poorer outcomes when compared to patients who developed delirium more than 24 hours after surgery (Choi et al., 2019). Improved delirium detection may lead to earlier intervention (Kim et al., 2021). Initiating delirium screening as early as possible in the postoperative setting help avoid a missed diagnosis.

To address the projected increased volume of elderly patients developing delirium after surgery, the following policy is proposed for the hospital. All surgery patients more than 65

years old must receive a delirium screening upon achieving an Aldrete score ≥ 9 or when deemed able to be discharged from the post anesthesia care unit (PACU). The PACU nurse will use the 4AT delirium assessment tool to assess for the presence of delirium features. A score ≥ 1 must be reported to the anesthesia provider who cared for the patient in the PACU. The anesthesia provider must then evaluate the patient and determine the best course of care. If the patient is to be transferred to an inpatient bed, the PACU nurse must include the delirium screening result in the nursing care handoff. The comprehensive policy is outlined in Appendix C.

Budget

Costs associated with the quality improvement project are found in detail in Table 3. The total estimated cost is $13,924. The budged will cover time to reimburse the PACU nursing and anesthesia departments for training costs associated with the quality improvement project. Miscellaneous costs will cover the cost of providing staff incentives during the "go-live" period and for paper and office supplies that will be used for the post-class surveys and break room display boards. Many clinical and nonclinical employees will need to be compensated for their time ensuing that this project is properly implemented. This project will require review and therefore paid time from the hospital nursing policy review committee and legal teams. The hospital nursing policy review committee is comprised of approximately six nurse managers and will take approximately three hours to review the policy. The legal review will take place through one hospital employed attorney and is expected to take two hours. The information technology department will need to ensure that the electronic health record is functional and updated for all required bedside clinicians. Three weeks or 120 working hours are allotted for the initial IT integration needs. Fortunately, the 4AT delirium assessment does not require a subscription or user licensing fees which limits technological implementation costs. Lastly, the

QI department will provide extensive support for outcomes monitoring. Initial data aggregation and is expected to take three days or 24 working hours. Continued monitoring will require about four hours each month from the QI department. The first year expected budget for the QI department includes 68 working hours of paid time. Lastly, the PACU shared governance council will be a critical partner for this project. The shared governance council will help influence the PACU nurses to accept the practice change and will help PIs with constructing the pilot phase. During the implementation phase, the shared governance council will aid in tracking assessment tool utilization compliance. The shared governance council is made up of four staff nurses and this project will utilize one hour of meeting time.

Anticipated Barriers

The evidence-based practice project is not without anticipated barriers to success. Likely barriers stem from financial concerns, resistance to change, and departmental ownership of the new process. Aside from initial costs, this project is not anticipated to accrue major expenses. Because the anesthesia and nursing departments did not budget staff training expenses for this project, this project will require funding from grants. The PIs will apply for grants to cover the expense of training staff, and the cost of office supplies and candy previously mentioned.

Additionally, there is the anticipated concern of resistance to change. PIs will mitigate the resistance to change by utilizing all available resources for education and maintaining an open line of communication with the bedside staff. PIs will also ensure that they have the full support of hospital leadership and key stake holders prior to initiating the project so that the need for change comes from sources that staff is familiar with and respects.

Lastly, the practice change should be managed by the teams that it is affecting. This project is designed so that the departments effected by the practice change will take ownership of

the practice change. One anticipated barrier is the best management of a positive delirium screening in a patient who had an outpatient procedure. Specific delirium intervention recommendations are not within the scope of the evidence-based practice project. The PACU nursing and anesthesia teams should feel empowered to make decisions for their patients based on best available evidence and guidelines from the hospital. Additionally, the responsible teams should feel empowered to work with their colleagues in other disciplines to evaluate current evidence and determine how to change their practice.

Outcomes Monitoring

The evidence-based practice project is designed so that the hospital and the affected departments can easily take ownership of monitoring the effectiveness of the practice change. PIs will collaborate with the PACU nursing shared governance council to discuss the project and ask that the council spearheads monitoring for completion of the delirium assessment tool. The PIs will facilitate collaboration between the shared governance council and the IT department to develop an automated report that charge nurses can access and easily run at the end of their shift. The electronic health care record used by the hospital includes the ability for users with certain access levels to run specific reports to evaluate hospital performance. PIs will ensure that the limited reporting ability necessary for monitoring the outcome is within the access level of the PACU charge nurses. The report will pool all patients admitted to the PACU over the past 24 hours and will show whether the 4AT delirium assessment tool was completed.

During the implementation and sustainment phases, the unit KPI goal will be a 4AT delirium assessment tool completion of $\geq 90\%$. Charge nurses will talk with nurses who were unable to complete the delirium assessment to understand what prevented them from completing the assessment. Responses will be recorded in a pareto chart which measures the frequency of

specific incidents precluding goal attainment. Common themes will be addressed and will potentially lead to process modifications if appropriate. At the end of the implementation and sustainment phase, the PACU shared governance council will then decide if it is beneficial to continue daily delirium assessment completion monitoring if the compliance rate meets the goal of ≥ 90% completion. PIs will ask the PACU shared governance council to evaluate delirium assessment compliance at one year after implementation to determine long-term success. Ideally, compliance at one year after implementation will be 100%.

PIs will also collaborate with the QI department to implement a delirium screening indicator monitoring process. Patients who develop delirium after surgery are at an increased risk for unexpected hospitalization and worse postoperative outcomes. When patients are admitted to the hospital, they are assigned an International Classification of Diseases (ICD) 10 code attributed to their ailments. The ICD 10 coding system is critical for accurate hospital billing and is universally used. There are four codes that are specific to various forms of delirium which might present after surgery. The codes are F05, F05.0, F05.8, and F05.9 (*ICD-10 Version:2019*., n.d.).

The QI department will be tasked with creating a retrospective analysis of ICD 10 codes that indicate the frequency of delirium on admission among patients who were hospitalized less than 30 days after a surgical procedure. The numerator for the ratio will be the number of patients who were admitted to the hospital within 30 days of surgery who had delirium present on admission. The denominator for the ratio will be the number of patients admitted to the hospital. Expert data analysts from the QI department will determine the amount of retrospective data required to determine statistical significance. Hospital admissions will be reviewed monthly, and data will be plotted on a control chart to evaluate trends over time.

Due to proposed earlier detection and potential earlier intervention, the number of patients with delirium present on admission when readmitted within 30 days of a surgery is expected to decrease. A statistically significant decrease in hospitalizations two months after the implementation and sustainment phase of the delirium project will indicate that the project is successful. If there is not a statistically significant reduction, PIs will consider reasons additional opportunities for improvement. A limitation of this evidence-based practice project is that it is specific to delirium identification and not delirium treatment or prevention. Future evidence-based practice projects should be aimed at delirium treatment and prevention in the perioperative area.

Limitations

The evidence-based practice project is aimed at improving delirium detection among post-surgical patients. Implementing nurse-driven delirium assessments in the PACU is still a novel concept. Although this project targets delirium present in the PACU, delirium may develop after a patient is discharged from the PACU and therefore be missed by the delirium screening. In addition, not all surgical patients will recover in PACU after their anesthetic. Some patients proceed from the operating room to the intensive care unit. Skipping PACU creates an opportunity to miss the routine delirium screening. Future work in delirium identification includes continued delirium assessment implementation throughout the course of post-surgical hospitalization.

An additional limitation of this project is not addressing the ideal treatment algorithm for patients diagnosed with delirium. The project relies on preestablished delirium treatment protocols used within the hospital and on provider judgement. Future work would include identifying an evidence-based approach to delirium treatment.

Lastly, the project creates a great opportunity for data evaluation for the anesthesia department. The PQI6 provided a strong recommendation to minimize medications known to increase the risk of POD (Hughes et al., 2020). Specifically, the PQI6 mentions the Beers criteria as medications to avoid (Hughes et al., 2020). Anesthesia providers routinely administer medications on the Beers criteria list and often are not present to see the long-term effects of the drugs on their patients. Anesthesia providers find themselves in a unique position when it comes to learning from firsthand experience. Anesthesia providers must rely on their education and current evidence to guide their practice. Other healthcare provider specialties see long-term outcomes of their practice due to the longer patient interaction time frame. Evidence-based practice is the culmination of evidence, patient preferences, and provider knowledge and experience. Delirium persists for weeks to months after diagnosis, much after anesthesia providers end a patient interaction. Anesthesia practice said another way, has an element of an open loop control system. Most control systems have a stimulus that would inhibit further outflow. A common nonmedical example is a heating system. If the temperature drops below the set point, the furnace heats the environment. Once the target temperature is reached, the thermostat signals for the furnace to turn off. A simplified example in anesthesia practice is titrating supplemental oxygen. The provider adjusts the delivered oxygen concentration until the desired oxyhemoglobin saturation is obtained. However, benzodiazepine medication to patients older than seventy years without knowledge of the patient's condition two months later is an example of an open loop control system. Anesthesia providers must rely on current evidence to transform their open loop control system into a closed loop control system. This evidence-based practice project is another way for anesthesia providers to close their control system loop. Data from outcomes monitoring can easily be reported back to the anesthesia department. Further data

evaluation from the electronic medical record can link the monitored outcomes with variables within the anesthetic process. Specific medications, presence of delirium, hospital readmission, patient age, patient comorbidities, and type of anesthesia are all critical pieces of information that would help a provider integrate meaningful data into their personal experiences. Connecting anesthesia providers with outcomes not frequently evaluated in anesthesia practice may help anesthesia providers when making future clinical decisions.

Conclusion

Delirium will continue to challenge all areas of healthcare as the population ages. Anesthesia providers and PACU nurses must collaborate to improve delirium detection after surgery. Nurse-driven delirium assessments are a simple intervention which are validated for use in the PACU. Delirium assessments amplify the importance of nursing assessment skills as accurate delirium assessments help get vital resources involved in patient care in a timely manner. Due to the increased frequency in ambulatory surgery among the elderly, a population at high risk of POD, clear guidelines must be established to provide the best possible care. Anesthesia providers who help determine PACU discharge readiness are an important fail safe in preventing patients from being discharged without appropriate delirium specific care. Open communication between the PACU nurse and anesthesia provider ensures that patients with delirium receive the best possible care. Identifying patients with delirium after surgery will help hospitals to prevent unexpected readmissions after surgery implicating potential hospital cost savings. Future work includes feedback for anesthesia providers and a process to include delirium assessments for patients who do not receive care in the PACU after surgery. By doing so, this helps hospitals provide the best possible care for patients at high risk of delirium.

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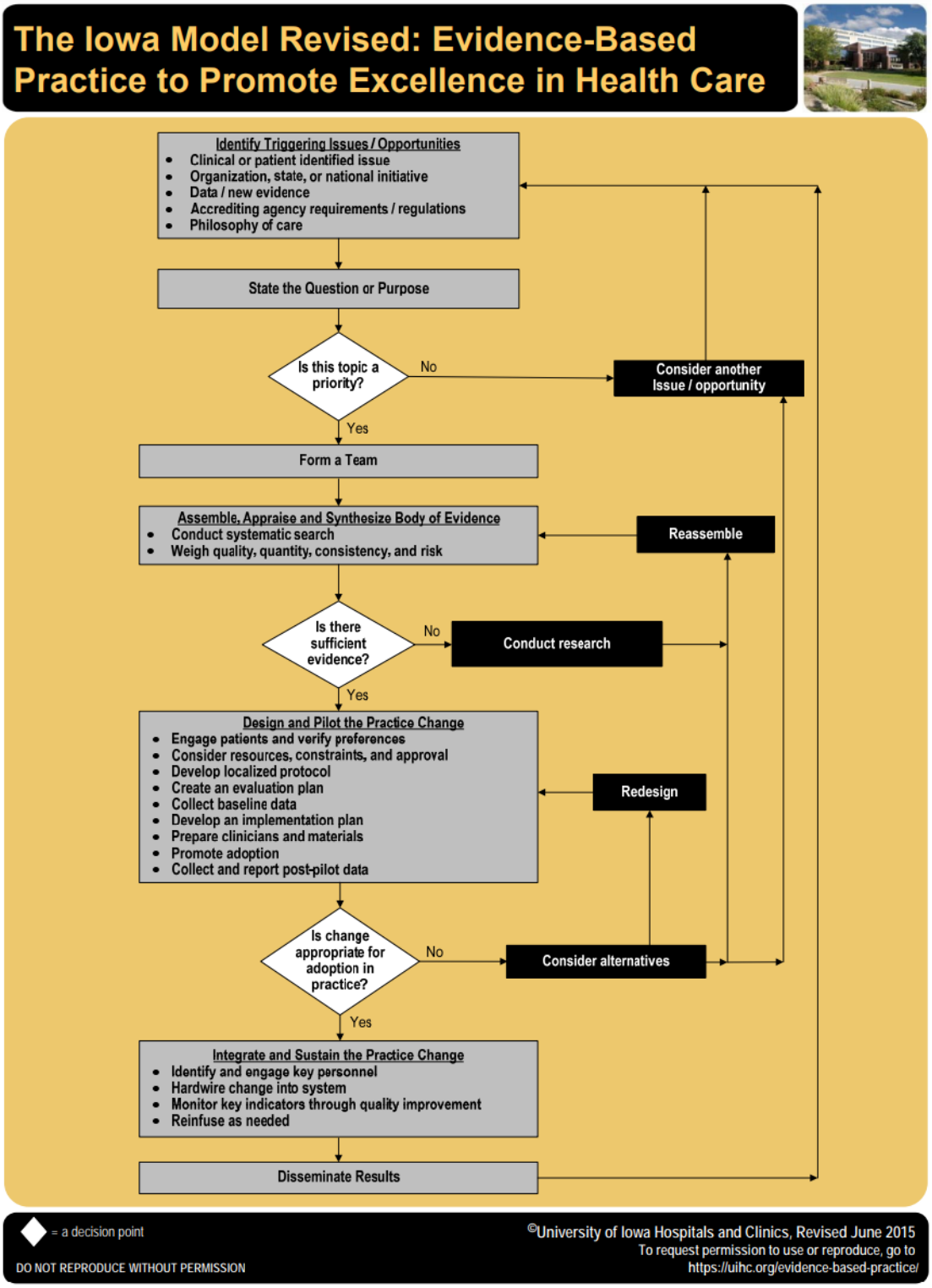
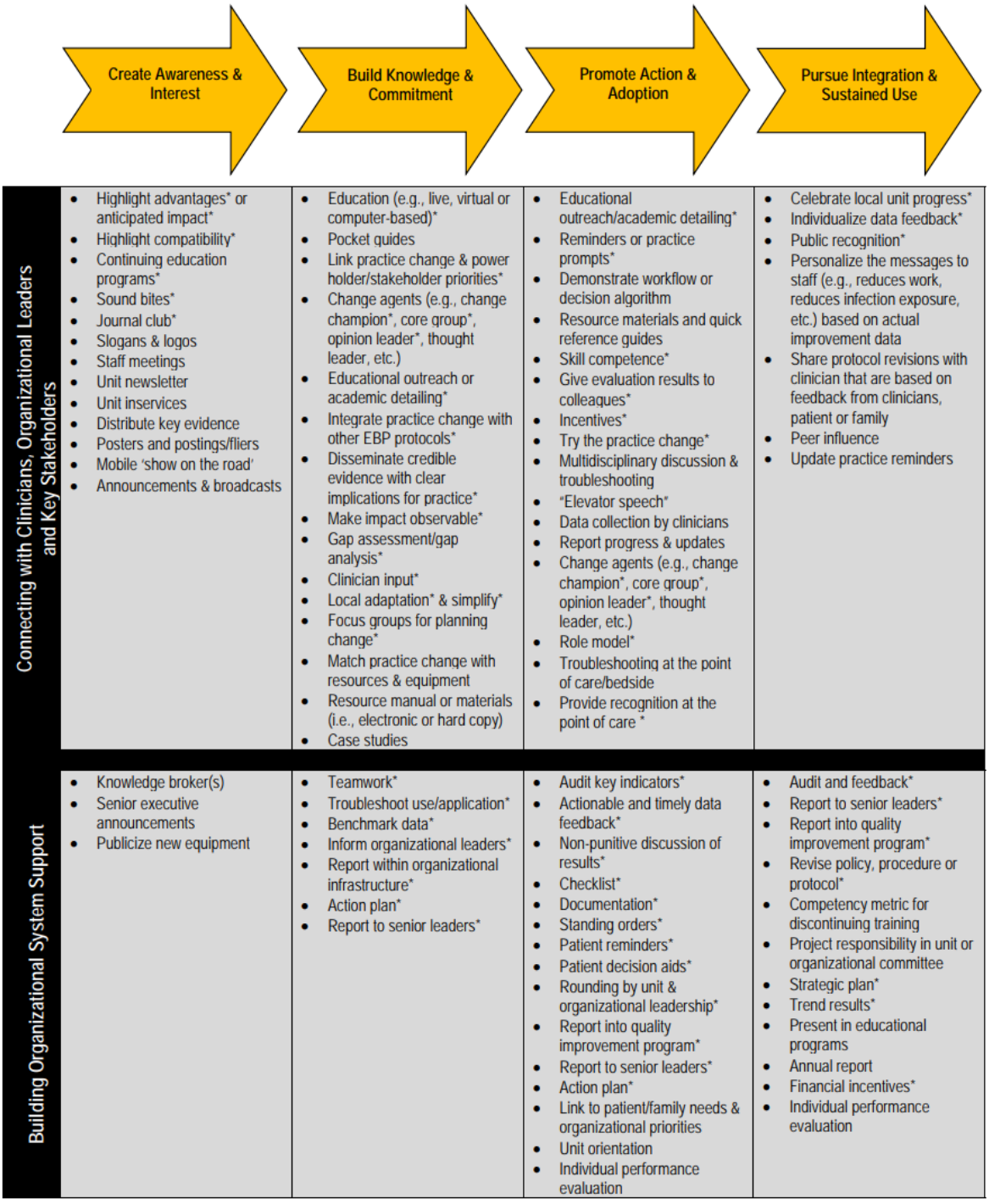
Appendix A



Note. The Iowa Model Revised. From "Iowa model of evidence-based practice: revisions and validation," by Iowa Model Collaborative, 2017, *Worldviews on Evidence-Based Nursing*, 14(3), 175-182. Copyright 2015 by the University of Iowa Hospitals and Clinics. *Reprinted with permission.*

Appendix B

Implementation Strategies for Evidence-Based Practice



Note. Implementation Strategies for Evidence Based Practice. From "Planning for implementation of evidence-based practice," by Cullen, L., and Adams, S.L., 2012, Journal of Nursing Administration, 42(4), 222-230. Copyright 2012 by the University of Iowa Hospitals and Clinics. Reprinted with permission.

Appendix C

Policy Draft	
Title: Postoperative Delirium Assessment	**Number**
Issue Date:	**Effective Date:**
Developed/Revised By: Aimee Baker	
Reviewed By:	**Date Reviewed:**
Approved By:	

Scope- This policy is in effect for the following proposed hospital business units: Post Anesthesia Care Unit and Anesthesia Services

Statement of Purpose:
The purpose of this policy is to promote evidence-based practice of delirium care among elderly post-surgical patients.

Definitions:
Aldrete Score: scoring system evaluating activity, respiration, circulation, neurologic status, and oxygen saturation used to evaluate PACU discharge readiness (Naglehout & Elisha, 2017).
Delirium: neuropsychiatric syndrome commonly observed in hospitalized surgical patients characterized by acute and fluctuating disturbances in attention, awareness, cognitive function and psychomotor activity (Silva et al., 2021)
SBAR Handoff: Situation, background, assessment, response standardized communication tool used in nursing handoffs (Shahaid, 2018)

Policy:
This policy provides a standard work process for assessing for delirium in patients older than 65 years who received a general anesthetic. The intent is to align hospital practice with current guideline recommendations from the American Society for Enhanced Recovery and Perioperative Quality Initiative (Hughes et al., 2020). This policy does not guarantee a specific outcome

Guideline:
1. Timing
    a. Once patients achieve an Aldrete score of ≥ 9 or are deemed ready for PACU discharge, the PACU nurse may administer the delirium screening tool.
2. Delirium screening tool
    a. For all patients aged 65 years and older, the post anesthesia care unit (PACU) nurse must complete the 4AT delirium assessment tool.
3. Documentation
    a. The 4AT delirium assessment will be documented in the patient's electronic medical record.

   b. With a 4AT delirium assessment result of ≥ 1, the PACU nurse must communicate the screening result with the PACU anesthesia provider. The PACU nurse must document the completed follow-up in the patient's medical record.
4. Follow-up
   a. Ambulatory surgery or patients discharged the same day
      i. The PACU nurse must notify the covering provider when a patient presents with a positive delirium screening. Further delirium treatment and intervention is at the discretion of the PACU anesthesia provider.
   b. Inpatient surgery or patients hospitalized after surgery
      i. The PACU nurse must notify the covering anesthesia provider in PACU of a positive delirium screening.
      ii. The PACU nurse must include delirium screening result as part of the SBAR handoff to the inpatient nurse.

References:

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Table 1

Summary and Synthesis Table for Guidelines, Reviews, and Other Literature

Citation	**Type of Evidence and Limitations**	**Scope**	**Relevant Findings**	**Other**
Aldwikat, R. K., Manias, E., Tomlinson, E., Amin, M., & Nicholson, P. (2022). Delirium screening tools in the post-anaesthetic care unit: a systematic review and meta-analysis. *Aging Clinical and Experimental Research*, 34(6), 1225–1235. https://doi.org/10.1007/s40520-021-02057-w	Systematic Review and Meta-Analysis Limitations: small number of included articles (n=4), high heterogeneity, generalizability difficult	Evaluated diagnostic accuracy of delirium screening tool in the PACU.	4AT 95% sensitivity and 99% specificity in PACU and 90% sensitivity with 84% specificity in inpatient geriatrics. 3D-CAM 100% sensitivity and 88% specificity. NuDESC 27% sensitivity and 99% specificity.	3D-CAM not tested in patients with cognitive, hearing, and visual impairments, and emergency surgery.
Saller, T., Hofmann-Kiefer, K. F., Saller, I., Zwissler, B., & von Dossow, V. (2020). Implementation of strategies to prevent and treat postoperative delirium in the post-anesthesia caring unit. *Journal of Clinical Monitoring and Computing*, 35(3), 599–605. https://doi.org/10.1007/s10877-020-00516-9	Expert Opinion Survey of current practice through a web-based questionnaire. Limitations: qualitative online survey, presumed bias of social desirability, neither nurses nor surgeons were surveyed.	Understand present strategies for delirium screening and therapy in German PACUs.	44% of anesthesiologists used the CAM-ICU or NuDESC when screening for delirium 65% of anesthesiologists did not use a tool when evaluating for delirium. When delirium diagnosed 38% informed nurses of delirium and 46% notified physician in charge, 12% consulted a psychiatrist. Delirium screening applied in 46% of patients even when delirium suspected. A delirium screening was carried out for at least one clinical condition in 77% of wards.	European guidelines call for POD screening as standard procedure. Only 10% of hospitals screened for delirium in the PACU.

Citation	Type of Evidence and Limitations	Scope	Relevant Findings	Other
Hughes, C. G., Boncyk, C. S., Culley, D. J., Fleisher, L. A., Leung, J. M., McDonagh, D. L., Gan, T. J., McEvoy, M. D., & Miller, T. E. (2020). American Society for Enhanced Recovery and Perioperative Quality Initiative Joint Consensus Statement on Postoperative Delirium Prevention. *Anesthesia & Analgesia*, 130(6), 1572–1590. https://doi.org/10.1213/ane.0000000000004641	Clinical Practice Guideline	Postoperative delirium prevention in high-risk patients, older adults undergoing cardiac and noncardiac surgery.	Provided a strong recommendation with grade C evidence, that health systems develop a process to assess for POD in older high-risk patients. Daily routine delirium assessments must utilize a validated tool.	Optimal timing and implementation of delirium screening needs further research. Lack of formalized assessment practices results in failure of recognition among care providers. Insufficient evidence exists to recommend a specific tool, shorter assessment tools may be preferred due to clinical time constraints.
Mossie, A., Regasa, T., Neme, D., Aweke, Z., Zemedkun, A., & Hailu, S. (2022). Evidence-Based Guideline on Management of Postoperative Delirium in Older People for Low Resource Setting: Systematic Review Article. *International Journal of General Medicine*, Volume 15, 4053–4065. https://doi.org/10.2147/ijgm.s349232	Evidence-Based Guideline	Recommendations for the prevention, diagnosis, and treatment of POD in older people.	4AT tool found to be more sensitive than the NuDESC and CAM tools. 4AT tool not as specific as the CAM. 4AT tool is less time consuming than the CAM test.	Must confirm delirium diagnosis with the DSM-V as the standard reference. Completed a systematic literature review.
van der Wulp, K., van Wely, M. H., Rooijakkers, M. J., Brouwer, M. A., van den Boogaard, M., Pickkers, P., Olde Rikkert, M. G., Delewi, R., van Mieghem, N. M., Baan, J., Morshuis, W. J., & van Royen, N. (2020). Delirium After TAVR. *JACC: Cardiovascular Interventions*, 13(21), 2453–2466. https://doi.org/10.1016/j.jcin.2020.07.044	Literature Review Limitations: Not a systematic review.	Review of the importance of delirium recognition, prevention, and treatment in patients requiring transaortic valve replacement (TAVR).	POD after TAVR occurs in 8%-23% of patients. Peak POD prevalence is on the first day after surgery. The CAM-ICU is noted the most useful bedside tool.	

Citation	Type of Evidence and Limitations	Scope	Relevant Findings	Other
Kong, H., Xu, L., & Wang, D. (2022). Perioperative neurocognitive disorders: A narrative review focusing on diagnosis, prevention, and treatment. *CNS Neuroscience & Therapeutics*, 28(8), 1147–1167. https://doi.org/10.1111/cns.13873	Narrative Review	Review of perioperative neurocognitive disorders (NCD) including POD, delayed neurocognitive recovery and postoperative NCD.	POD is considered in the immediate postoperative period up to 7 days after surgery or until discharge. Emergence delirium occurs immediately after anesthesia emergence for minutes to hours. DSM-V is the gold standard for diagnosis. CAM, CAM-ICU, bCAM, 3D-CAM, ICDSC, and 4AT most often used.	
Bettelli, G., & Neuner, B. (2017). Postoperative delirium: A preventable complication in the elderly surgical patient. *Monaldi Archives for Chest Disease,* 87(2). https://doi.org/10.4081/monaldi.2017.842	Literature Review and expert opinion Limitations: not systematic, low-level evidence, does not include overview of POD assessment tools	Literature overview and recommendations for reducing incidence and severity	Postoperative management should include assessing for POD every six hours.	Rationale for POD assessment frequency not provided.
O'Hanlon, S., O'Regan, N., MacLullich, A. M. J., Cullen, W., Dunne, C., Exton, C., & Meagher, D. (2013). Improving delirium care through early intervention: from bench to bedside to boardroom. *Journal of Neurology, Neurosurgery & Psychiatry*, 85(2), 207–213. https://doi.org/10.1136/jnnp-2012-304334	Expert Opinion Limitations: Does not provide a systematic review of evidence	Expert opinion on improving delirium care from bedside and administrative perspectives.	Reports that delirium is predictable and likely preventable for hospitals. Delirium is expensive for hospitals to treat. Hospitals must find interventions that maintain autonomy and dignity while preserving patient safety. Recognition and delirium documentation unlikely improved with financial	

Citation	Type of Evidence and Limitations	Scope	Relevant Findings	Other
			disincentives. Ensure that delirium risk status monitoring becomes embedded into daily routines.	
Cross, J. (2018). How do I improve delirium care for older surgical patients? *Nursing Older People*, 30(3), 19. https://doi.org/10.7748/nop.30.3.19.s18	Expert Opinion	Recommendations for clinicians caring for hospitalized older surgical patients.	Early assessments and discussion with the patient's family on hospital admission are key. All patients should have cognitive screening to identify their risk.	
Reddy, S., Irkal, J., & Srinivasamurthy, A. (2017). Postoperative delirium in elderly citizens and current practice. *Journal of Anaesthesiology Clinical Pharmacology*, 33(3), 291–299. https://doi.org/10.4103/joacp.joacp_180_16	Literature review of current practice	Review of current practice understanding of POD etiology, pathophysiology, prevention, treatment, and screening	The CAM was the best performing delirium tool reviewed. Elective surgery patients should have a preoperative cognitive evaluation to determine their baseline.	Does not exclusively highlight PACU delirium screening

Note. Post Anesthesia Care Unit (PACU), Postoperative Delirium (POD), Confusion Assessment Method (CAM), Confusion Assessment Method for the Intensive Care Unit (CAM-ICU), Brief Confusion Assessment Method (bCAM), the 3-Minute Diagnostic Interview for Delirium using the Confusion Assessment Method (3D-CAM), 4A's Test (4AT), Intensive Care Delirium Screening Checklist (ICDSC), Nursing Delrium Screening Scale (NuDESC), Diagnostic and Statistical Manual of Mental Disorders-5th edition (DSM-V).

Table 2

Summary and Synthesis Table for Research and Evidence-Based Practice Projects

Citation	Subjects	Design/Methods	Outcomes	Relevant Results and Findings	Limitations/Comments
Card, E., Tomes, C., Lee, C., Wood, J., Nelson, D., Graves, A., Shintani, A., Ely, E., Hughes, C., & Pandharipande, P. (2015). Emergence from general anaesthesia and evolution of delirium signs in the post-anaesthesia care unit. *British Journal of Anaesthesia*, 115(3), 411–417. https://doi.org/10.1093/bja/aeu442	Adult patients emerging from anesthesia after non-cardiac surgery were evaluated for delirium and agitation.	Prospective observational study. Principal investigator trained 5 PACU nurses to conduct CAM-ICU delirium assessments. CAM-ICU assessment done at PACU admission, 30 minutes, 1 hour, and PACU discharge. n=400	19% agitated at emergence. 31% delirious at PACU admission. 16% delirious during PACU stay. 15% CAM-ICU positive at 30 minutes. 8% CAM-ICU positive at 1 hour. 4% CAM-ICU positive at discharge.	Perioperative opioids independently associated with delirium (p=0.02). Delirium on emergence common, most common on PACU admission, decreases with PACU stay.	Excluded: non-English speaking or deaf patients, severe dementia, anoxic brain injury, neuromuscular disorders. POD defined as delirium that continued beyond the PACU or occurred in the ICU or hospital ward. Likely underdiagnosed, did not confirm delirium with DSM-V diagnosis. CAM-ICU less sensitive.
Neufeld, K., Leoutsakos, J., Sieber, F., Joshi, D., Wanamaker, B., Rios-Robles, J., & Needham, D. (2013). Evaluation of two delirium screening tools for detecting post-operative delirium in the elderly. *British Journal of Anaesthesia*, 111(4), 612–618. https://doi.org/10.1093/bja/aet167	English-speaking patients >70 years old who had received a general anesthetic.	Prospective cohort study, n=91. CAM-ICU, NuDESC, and neuropsychiatric evaluation conducted within 60 minutes of each other with varied order among patients. Tests were performed once patient had obtained Aldrete score ≥ 9.	Detection by neuropsychiatric evaluation showed delirium was present in 45% of PACU assessments and 32% of all assessments. CAM-ICU sensitivity 28% and specificity of 98% in PACU. NuDESC (threshold ≥2) 32% sensitivity and 92% specificity in PACU. NuDESC (threshold ≥1) 80% sensitivity and	Neither the CAM-ICU nor the NuDESC screening tools are sensitive enough to identify delirium in the PACU setting.	Excluded: severe hearing impairment, cognitively incapable of providing informed consent, prior enrollment from a repeat surgery. Neuropsychiatric evaluation was the reference standard for the CAM-ICU and NuDESC evaluations. Comment: High agreement among researchers when administering the NuDESC and CAM-ICU tests. Limitations: Tests were administered by researchers and not nurses. Single hospital

Citation	Subjects	Design/Methods	Outcomes	Relevant Results and Findings	Limitations/Comments
			69% specificity in PACU.		study focusing on exclusively elderly patients.
Neufeld, K. J., Leoutsakos, J. M. S., Oh, E., Sieber, F. E., Chandra, A., Ghosh, A., Schretlen, D. J., & Needham, D. M. (2015). Long-Term Outcomes of Older Adults with and Without Delirium Immediately After Recovery from General Anesthesia for Surgery. *The American Journal of Geriatric Psychiatry*, 23(10), 1067–1074. https://doi.org/10.1016/j.jagp.2015.03.004	English-speaking, age >70, and able to provide informed consent.	Prospective cohort study, n=91. Evaluated baseline Activities of Daily Living (ADL), Instrumental Activities of Daily Living (IADL), Mini-Mental Status Exam (MMSE), word fluency using letter (p and s) and category (animals), digit span forward and backward before surgery. Then a psychiatrist performed a delirium assessment using the DSM-IV delirium diagnosis in the PACU at the time the Aldrete score was ≥ 9. At approximately 19 months postop, researchers contacted the patient or a proxy to determine mortality, cognitive function, physical function, and healthcare utilization.	45% of patients were delirious in PACU. No difference between delirious and non-delirious median survival time. No significant difference between delirious and non-delirious ADL, IADL, and MMSE scores at follow-up. No difference between delirious and non-delirious in healthcare utilization outcomes except a greater fall rate in the non-delirious group.	Delirium present in the PACU was not associated with patient survival, physical cognitive functioning, and healthcare utilization.	Objective: assess the association of POD in the PACU with longer-term survival, cognitive and physical function, and healthcare utilization. Limitations: small study, relatively healthy community-dwelling patients, possible lack of power so high chance of Type II error, many variables tested so high chance of a Type I error, self-reporting of health-services and falls may lead to a recall bias with under reporting, telephone cognitive testing during follow up may have limited test sensitivity
Radtke, F., Franck, M., Schneider, M., Luetz, A., Seeling, M., Heinz, A., Wernecke, K., & Spies, C. (2008). Comparison of three scores to screen for delirium in the recovery	Adults >18 years old admitted to the recovery room between 0900-1700 in a German hospital.	Observational prospective cohort study, N=173. After patients determined ready for discharge, research team evaluated for	Delirium presence 14%. CAM sensitivity 0.43, specificity 0.98. DDS sensitivity 0.14, specificity 0.99.	All tests were highly specific, but the NuDESC was the most sensitive test (sensitivity 0.95).	Exclusions: psychiatric or neurological illness, previous cerebral insult, and any history of drug, alcohol, or opioid abuse.

Citation	Subjects	Design/Methods	Outcomes	Relevant Results and Findings	Limitations/Comments
room. *British Journal of Anaesthesia*, 101(3), 338–343. https://doi.org/10.1093/bja/aen193		presence of delirium with CAM, NuDESC, and DDS tools. Delirium presence determined by using DSM-IV criteria.	NuDESC sensitivity 0.95, specificity 0.87 (threshold ≥ 2).		Recommend delirium confirmation with DSM-IV criteria. Limitations: small sample size, low delirium rate (14%), delirium scores only measured once per visit.
Saller, T., MacLullich, A. M. J., Schäfer, S. T., Crispin, A., Neitzert, R., Schüle, C., Dossow, V., & Hofmann-Kiefer, K. F. (2019). Screening for delirium after surgery: validation of the 4 A's test (4AT) in the post-anaesthesia care unit. *Anaesthesia*, 74(10), 1260–1266. https://doi.org/10.1111/anae.14682	Adults >18 years old undergoing scheduled surgery under general anesthesia.	Prospective evaluation, N=543. At the point of PACU discharge, research assistants performed the 4AT and NuDESC evaluations. Reference standard of DSM-V gathered from CAM-ICU score and semi-structured interview by a physician.	22 patients were delirium positive (4.4%), with an average age of 76 years old. 4AT sensitivity 95.5%, specificity 99.2%. NuDESC sensitivity 27.3% and specificity 99.4%.	4AT is a useful tool for delirium detection in the PACU.	Exclusions: dementia, severe psychiatric or neurological diseases, emergency surgery. Limitations: did not include patients treated postoperatively in the ICU or cognitively impaired patients, did not screen patients preoperatively for delirium or cognitive status. Large study, low screening failure rate, index tests performed in a random order.
Winter, A., Steurer, M., & Dullenkopf, A. (2015). Postoperative delirium assessed by post anesthesia care unit staff utilizing the Nursing Delirium Screening Scale: a prospective observational study of 1000 patients in a single Swiss institution. *BMC Anesthesiology*, 15(1). https://doi.org/10.1186/s12871-015-0168-8	German-speaking patients >16 years old in a Swiss PACU weekdays 0900-2000.	Prospective evaluation, n=1000. At point of PACU transfer patients assessed for delirium by 8 nurses trained in both NuDESC and clinical significance of delirium.	43 patients presented with delirium (4.3%), 30 of which were >70 years old Orthopedic and urology patients had disproportionately higher delirium, 4.6% and 5.8% respectively, patients were statistically older as well.	NuDESC test was easily feasible for nurses in the PACU but may result in low delirium incidence. Delirium was disproportionately found among patients older than 70 years of age and among patients who had	Exclusions: patients who did not speak German Recovered 20 patients per day, remaining patients directly transferred to surgical inpatient ward. NuDESC ≥ 2 indicated delirium. Did not use a DSM reference standard, possibly missed diagnosis (Type I error). Unlike many studies, utilized nursing staff instead of researchers.

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				orthopedic or urologic surgery.	Limitations: vague timing description for screening, no repeated assessments, not enough power to compare patients with delirium and those without.
Woelfel, J. M., Vacchiano, C. A., West, C., & Titch, J. F. (2019). Nursing Perceptions and Workload Impact of a Standardized Emergence Delirium Assessment Scale in a Postanesthesia Care Unit. *Journal of PeriAnesthesia Nursing*, 34(4), 729–738. https://doi.org/10.1016/j.jopan.2018.11.005	Military veterans in PACU who required general anesthesia for surgery. PACU nurses who cared for military veterans.	Quality improvement project with a pre-post implementation evaluation. Before ED-WW tool implementation, nursing staff anonymously surveyed to determine emergence delirium assessment methods and emergence delirium perceptions. Nurses used the ED-WW tool to score every patient. PACU nurses were surveyed after implementation to evaluate perceived clinical utility and subjective workload.	Pre-implementation: no delirium screening protocol in place, 63% of nurses (n=5) agreed or strongly agreed emergence delirium is under diagnosed, that it is a common occurrence in the PACU, and that it is challenging to assess. Post-implementation: fewer nurses thought emergence delirium was under diagnosed (not statistically significant), no difference in nurses ability to assess for emergence delirium, no difference in perception of emergence delirium as a common problem, workload impact of ED-WW tool measured by NASA-TLX survey was very low.	ED-WW tool is clinically feasible in Veterans Affairs Medical Center PACU. Emergence delirium is common and likely underdiagnosed in the military population. 21% of patients demonstrated at least one behavior associated with emergence delirium.	Purpose: evaluate current method of emergence delirium assessment in a Veterans Affairs Medical Center PACU, assess feasibility of ED-WW tool adoption, recommend EBP changes based on project findings. Limitations: small sample of PACU nurses, potential for observer effect bias, project leader's daily presence, ED-WW tool is undergoing validation and field testing, ED-WW tool is specific to individuals with military experience

Citation	Subjects	Design/Methods	Outcomes	Relevant Results and Findings	Limitations/Comments
Hight, D. F., Sleigh, J., Winders, J. D., Voss, L. J., Gaskell, A. L., Rodriguez, A. D., & García, P. S. (2018). Inattentive Delirium vs. Disorganized Thinking: A New Axis to Subcategorize PACU Delirium. *Frontiers in Systems Neuroscience*, 12. https://doi.org/10.3389/fnsys.2018.00022	Adult patients in a New Zealand PACU with a mean age of 59 years who had undergone a general anesthetic.	Secondary analysis of data in a larger ongoing observational study, n=251. CAM-ICU and RASS were administered 15 minutes after arrival to PACU, also collected data on presence of disordered cognition (hallucinations, unreactive buy eye-open, unable or unwilling to give verbal responses).	33 patients (14%) were diagnosed with delirium by CAM-ICU criteria, an additional 11 patients showed signs of disordered thinking and received CAM-PACU designation.	Can potentially improve CAM-ICU sensitivity for PACU setting with addition of assessing for disordered cognition	Limitations: difficult to distinguish hypoactive delirium from residual sedation, did not use DSM-V to compare delirium diagnosis, do not measure clinical impact of PACU delirium.
Choi, Y. H., Kim, D. H., Kim, T. Y., Lim, T. W., Kim, S. W., & Yoo, J. H. (2017). Early postoperative delirium after hemiarthroplasty in elderly patients aged over 70 years with displaced femoral neck fracture. *Clinical Interventions in Aging*, Volume 12, 1835–1842. https://doi.org/10.2147/cia.s147585	Patients older than 70 years without preoperative delirium who underwent hemiarthroplasty for a femoral neck fracture.	Single-center retrospective observational cohort study, n=356. Patients received a standardized anesthetic without premedication and underwent surgery by one of two surgeons. Patients were then hospitalized on the same unit and received standardized postoperative care. Researchers reviewed medical records of all included patients to compare	Evaluated primary outcome of occurrence of POD and two-year survival rate of elderly patients undergoing hemiarthroplasty. 110 patients (30.9%) developed delirium after surgery, of which 53.6% developed delirium within 24 hours. In a binary logistic regression model, dementia (OR 2.36, 95% CI 1.07-4.98, p=0.027), and general anesthesia (OR 2.24, 95% CI 1.19-4.42 p=0.015) were significantly related to	Patients with immediate delirium more often received general anesthesia than the delayed delirium and control groups. Certain comorbidities and advanced age are associated with delirium. Immediate delirium was associated with lower two-year survival rates when compared to delayed delirium	Limitations: retrospective analysis and therefore cannot assess a direct causal relationship between delirium and mortality, single center study with a specific surgery type may make the findings difficult to generalize, does not describe delirium assessment protocol and therefore may have missed a delirium diagnosis.

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			immediate delirium. In a multivariate analysis, dementia (OR 3.67 CI 1.13-4.21 p=0.021), parkinsonism (OR 3.68, 95% CI 1.18-11.48, p=0.025), and ASA grade (OR 1.93, 95% CI 0.99-3.75, p=0.052) independently predicted delirium. Patients with delirium had significantly lower survival rates (p<0.001).	and control groups (p=0.031).	
Todd, K. S., Barry, J., Hoppough, S., & McConnell, E. (2015). Delirium detection and improved delirium management in older patients hospitalized for hip fracture. *International Journal of Orthopaedic and Trauma Nursing*, 19(4), 214–221. https://doi.org/10.1016/j.ijotn.2015.03.005	Postoperative hip fracture patients aged 65 years and older.	Quality improvement project, n=23 pre-implementation, n=33 postimplementation. Evaluate the impact of implementation of the delirium detection procedures and clinical protocol by nurses on an orthopedic unit. Determined current length of stay, discharge location, and patient satisfaction. Educated nurses, pharmacists, and surgeons/physicians on the CAM assessment and clinical protocol. Implemented the CAM	Length of stay was reduced by 22% (p<0.001), 13% improvement in discharge disposition (patients not requiring a higher level of care than pre-hospitalization, p=0.17). 15% improvement in patient satisfaction (p=0.15).	Systemic approach to delirium identification among postoperative hip fracture patients with improved outcomes is feasible. Nurses reported the CAM tool was helpful to detect delirium and easy to use.	Limitations: small sample size, non-controlled study, patients not matched with comorbidities among the pre-implementation and post-implementation groups, some outcomes measures (length of stay and discharge disposition) are driven by insurance, patient preference, and hospital protocols.

Citation	Subjects	Design/Methods	Outcomes	Relevant Results and Findings	Limitations/Comments
		assessment and clinical protocol. Evaluated CAM accuracy and adherence to clinical protocol. Post intervention evaluated rate of delirium, how delirium detection and management affected length of stay, discharge location, and patient satisfaction.			
Hesse, S., Kreuzer, M., Hight, D., Gaskell, A., Devari, P., Singh, D., Taylor, N., Whalin, M., Lee, S., Sleigh, J., & García, P. (2019). Association of electroencephalogram trajectories during emergence from anaesthesia with delirium in the postanaesthesia care unit: an early sign of postoperative complications. *British Journal of Anaesthesia*, 122(5), 622–634. https://doi.org/10.1016/j.bja.2018.09.016	Patients admitted to the PACU after receiving general anesthesia for non-cardiac surgery	Prospective Observational Cohort Study, n=626. Collected EEG recordings intraoperatively, standard emergence protocol after anesthesia cessation, assessed orientation to self and location immediately after emergence. Then assessed for delirium using the CAM-ICU tool at 15 minutes after PACU arrival and 60 minutes after end emergence documented.	Overall incidence of PACU delirium was 20%. Anesthesia duration of greater than 3 hours had a substantial increase in PACU delirium. Prolonged anesthesia emergence by 5 minutes lead to a 25% increase in odds of PACU delirium EEG burst suppression during maintenance phase but not induction of anesthesia was associated with 75% increased odds of developing PACU delirium. EEG trajectories that were not spindle-dominant had greater than 6 times the odds of	PACU delirium was associated with longer hospital length of stay and higher 30-day readmission rates.	Limitations: CAM-ICU not developed for PACU setting, not large enough study to draw definitive conclusions

Citation	Subjects	Design/Methods	Outcomes	Relevant Results and Findings	Limitations/Comments
			developing PACU delirium.		
Brooks, P., Spillane, J. J., Dick, K., & Stuart-Shor, E. (2014). Developing a Strategy to Identify and Treat Older Patients With Postoperative Delirium. *AORN Journal*, 99(2), 256–276. https://doi.org/10.1016/j.aorn.2013.12.009	Patients 65 years of age or older admitted for elective surgery who might be at risk for POD.	Quality Improvement Project, n=96. Used the Plan-Do-Study-Act cycle for quality improvement. Developed a postoperative delirium screening and treatment algorithm. Performed Mini-Cog assessment in preoperative area then assessed after transfer to the inpatient floor. ICU patients received RASS assessment each shift and if positive were assessed using the CAM assessment. Surgical floor patients were assessed with the CAM tool each shift.	One of the 12 patients who had a positive mini-cog assessment had a positive CAM assessment. Identified a 13% delirium presence during the intervention compared with 8% delirium presence during the previous year.	Ability to detect POD increased. Mortality, hospital length of stay, readmission rate, and rate of discharge to a rehabilitation facility were greater among patients who developed POD.	Limitations: did not assess nursing satisfaction, required surgical nurse practitioner presence for Mini-Cog assessment completion, limited sample inclusion, did not address possible confounding variables, small sample size.
Zhang, Y., He, S. T., Nie, B., Li, X. Y., & Wang, D. X. (2020). Emergence delirium is associated with increased postoperative delirium in elderly: a prospective observational study. *Journal of Anesthesia*, 34(5), 675–687. https://doi.org/10.1007/s00540-020-02805-8	Patients 65-90 years old who had major noncardiac surgery and were admitted to the PACU	Prospective observational study. N=942 Investigators who were trained by a psychiatrist, administered the CAM-ICU assessment and RASS tools 10 minutes after PACU admission, 30 minutes after PACU admission, and upon PACU discharge. Patients were then	37% of patients developed delirium during PACU stay. 11.4 % of patients developed POD. Emergence delirium is independently associated with POD (OR 1.717, 95% CI 1.078-2.735, p=0.023). Patients with emergence delirium had worse	Emergence delirium is independently associated with POD. Patients must be screened for delirium in the PACU.	Limitations: used two different delirium screening tools, nurses were not included, single center study Note: used a multivariable regression model to determine multiple associations

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		assessed during the first five days after surgery twice daily with the CAM assessment tool for the presence of delirium. Then patients were then assessed daily for postoperative complications on day 6 through day 30 after surgery.	perioperative outcomes.		
Wu, J., Gao, S., Zhang, S., Yu, Y., Liu, S., Zhang, Z., & Mei, W. (2021). Perioperative risk factors for recovery room delirium after elective non-cardiovascular surgery under general anaesthesia. *Perioperative Medicine*, 10(1). https://doi.org/10.1186/s13741-020-00174-0	Patients older than 18 years admitted to the PACU after elective non-cardiac surgery who had general anesthesia	Prospective cohort study. N=228 Intraoperative anesthesia providers were blinded to delirium presence. Researchers used the CAM-ICU tool to screen patients for PACU. Used multivariate logistic regression to evaluate factors associated with delirium in the PACU.	Anesthesia maintenance with inhalation agents, malignant disease, ASA status III-V, elevated serum total or direct bilirubin, and invasive surgery were identified as risk factors for PACU delirium.	Identifying patients at risk of PACU delirium should facilitate earlier diagnosis and intervention.	Limitations: incomplete methods description, does not include at what point patients were screened for delirium, does not include nurses, single center study
Ewens, B., Seaman, K., Whitehead, L., Towell-Barnard, A., & Young, M. (2021). A delirium prevalence audit and a pre and post evaluation of an interprofessional education intervention to increase staff knowledge about delirium in older adults. *BMC Nursing*, 20(1).	Clinical staff across 12 wards in a large general hospital in Australia.	Audit of delirium assessment presence preintervention. Then staff education about a delirium assessment tool and implementation of a delirium assessment tool. Last, researchers evaluated delirium assessment rates and	Use of delirium assessment tool increased from 8.4% to 43% over a one-year period. Statistically significant increase in identifying the appropriate use of the Montreal Cognitive Assessment (74.3% improved to	Education for clinicians about a delirium assessment tool might help staff identify the appropriate use of a delirium tool.	Limitations: high dropout rate between the preintervention and postintervention surveys, no record indicating if staff who received the education were the same staff caring for the patients that were audited for delirium assessment completion, cannot determine if required use of the delirium tool or

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https://doi.org/10.1186/s12912-021-00692-2		staff knowledge of delirium.	92.5%, p=0.015). Knowledge of delirium risk factors increased after the intervention. Overall knowledge of delirium was not affected by the intervention.		delirium tool education contributed to delirium tool knowledge.
Gandossi, C. M., Zambon, A., Oliveri, G., Codognola, M., Szabo, H., Cazzulani, I., Ferrara, M. C., Mottadelli, C., Galeazzi, M., Amoroso, I., Zarcone, C., Principato, G., Corsi, M., Mazzola, P., Zatti, G., Foti, G., & Bellelli, G. (2021). Frailty, post-operative delirium and functional status at discharge in patients with hip fracture. *International Journal of Geriatric Psychiatry*, 36(10), 1524–1530. https://doi.org/10.1002/gps.5561	Patients older than 65 years who had a proximal hip fracture that underwent surgical repair.	Prospective observational cohort study. Patients received a comprehensive geriatric assessment which was used to construct a frailty index. POD was evaluated daily by expert geriatricians and trained fellows using the 4AT and then the DSM-V criteria. All patients received daily visits from the orthopedic surgeon, geriatrician, and 30 minutes of physical therapy. Outcome measure was the patient's Cumulated Ambulation Score.	Frailty alone (RR 1.33, 95% CI 1.14-1.55) and POD alone (RR 1.38, 95% CI 1.2-1.59) were both associated with poor functional status. Frailty with POD mildly increased the risk of a poor outcome (RR 1.47, 95% CI 1.28-1.69).	Frailty, POD, and the combination of frailty and POD are associated with poor functional status at discharge. The combination of frailty and POD have less of an effect than the sum of the individual effects of frailty and POD.	Limitations: single center study, only diagnosed patients with DSM-V delirium criteria after a positive 4AT screening which may have missed some patients with delirium, follow-up limited to the acute phase following hip fracture surgery.
Neufeld, K. J., Leoutsakos, J. M. S., Sieber, F. E., Wanamaker, B. L., Gibson Chambers, J. J., Rao, V., Schretlen, D. J., & Needham, D. M. (2013). Outcomes of Early Delirium	English-speaking patients aged 70 years or older undergoing elective or emergent surgery.	Prospective cohort study. N=91 Baseline cognitive status obtained by a research assistant before surgery using five assessments:	PACU delirium presence was 45%. 38% of patients discharged home were delirious. 53% of hospitalized patients who exhibited PACU	Elderly postoperative patients can be evaluated for delirium after reaching an Aldrete score ≥9.	Excluded: patients cognitively incapable of providing informed consent Limitations: sample size reduces power to detect outcomes,

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Diagnosis After General Anesthesia in the Elderly. *Anesthesia & Analgesia*, 117(2), 471–478. https://doi.org/10.1213/ane.0b013e3182973650		Activities of Daily Living, Instrumental Activities of Daily Living, Forward and Backward Digit Span, Letter and Category Word Fluency, and the Mini-Mental State Exam. Physicians evaluated patients for delirium postoperatively using DSM-IV criteria upon the patients having an Aldrete score ≥9. The same delirium assessment was repeated daily for five days after surgery upon admission to the hospital.	delirium had symptoms resolve within one day. 10% of hospitalized patients were delirious on hospital discharge. PACU delirium was significantly associated with decline in verbal fluency (p=0.07). Patients with delirium in the PACU had a greater probability of discharge to an institution (p=0.05).	Early delirium diagnosis in the PACU is associated with delirium on hospital units.	

Note. Post Anesthesia Care Unit (PACU), Postoperative Delirium (POD), Confusion Assessment Method (CAM), Confusion Assessment Method for the Intensive Care Unit (CAM-ICU), Brief Confusion Assessment Method (bCAM), the 3-Minute Diagnostic Interview for Delirium using the Confusion Assessment Method (3D-CAM), 4A's Test (4AT), Intensive Care Delirium Screening Checklist (ICDSC), Nursing Delirium Screening Scale (NuDESC), Diagnostic and Statistical Manual of Mental Disorders-5th edition (DSM-V), American Society of Anesthesiologists (ASA).

Table 3

Summary of costs associated with project implementation

Item	Cost	Multiplier	Total
Staff RN	$35/hour	1 hour x 60 RNs	$2,100
Anesthesiologist	$160/hour	0.25 hours x 30 Anesthesiologists	$1,200
CRNA/CAA	$90/hour	0.25 hours x 30 CRNA/CAA	$675
Policy Review Committee	$335/hour	3 hours	$1,005
Legal Review	$100/hour	2 hours	$200
Information Technology Department	$46/hour	120 hours	$5,520
Quality Improvement Department	$40/hour	68 hours	$2,720
Shared Governance Council	$140/hour	2 hours	$280
Large bag of candy	$34.50	2	$69
Color ink cartridge	$65	1	$65
Printer paper	$53	1	$53
Construction paper	$7	1	$7
Color marker pack	$20	1	$20
Large box of pens	$10	1	$10
			$13,924