A Clinical Practice Guideline for Reducing Postoperative Delirium in Geriatric Patients

Lindsey M. Meyers Enger

University of Maryland School of Nursing

DNP Scholarly Project

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Postoperative delirium (POD) is the most common complication in older adults following surgical procedures and is preventable in up to 40% of cases, although undiagnosed in more than half of clinical cases (American Geriatrics Society [AGS], 2015). According to Brown and Purdon (2013), "delirium is an acute form of dysfunction whose symptoms include disorientation, impairment of attention and memory" (p. 414), whereas postoperative cognitive dysfunction (POCD) is a persistent cognitive disorder with symptoms ranging from simple memory impairment to more severe dementia and Alzheimer's-like symptoms. Postoperative delirium presents acutely within approximately 24 hours and usually resolves within 48 hours postoperatively (Sieber, Mears, Lee, & Gottschalk, 2011). The duration of POCD is much longer, often persisting for weeks to months (Strom, Rasmussen, & Sieber, 2014). The purpose and scope of this project will focus on POD, a preventable complication in the immediate postoperative period.

Depending on the type of procedure, 10-80% of elderly surgical patients will experience POD, with higher rates associated with hip fracture, cardiac, and emergency surgery (Strom et al., 2014). Postoperative mortality rises with increased severity and duration of POD. Additionally, increased length of stay, increased healthcare expenses, and higher rates of long-term care placement following discharge can occur with POD. It is estimated that annually the U.S. spends $150 billion on delirium complications (Inouye et al., 2015). Patients aged 65 and older are at a high risk for developing POD and these patients account for more than one-third of inpatient surgical operations in the U.S. (Inouye et al., 2015). Therefore, it is essential that anesthesia providers be able to identify patients at high risk for developing POD and also be

knowledgeable of the best clinical practices in order to minimize the occurrence and long-term effects of POD in older surgical patients.

Indeed POD is a common problem for healthcare institutions both internationally and throughout the United States. Similarly, POD is a concern at a large, urban, nonprofit teaching institution in the northeastern U.S. Anesthesia is often associated with the development of POD. Currently at this institution, patients are not assessed for POD risk factors preoperatively, and there are no standardized guidelines at the institution on which to base the anesthetic plan for older surgical patients, thus contributing to the prevalence of POD. Interventions found to be associated with positive outcomes and reduced POD include identification and mitigation of risk factors and delirium contributors such as pain, infection, hypoxia, and comorbidities as well as education for healthcare professionals on POD (AGS, 2015; Brown & Purdon, 2013; Inouye et al., 2015; Sieber et al., 2011; Strom et al., 2014). As a result, the intervention to be implemented is a clinical practice guideline (CPG) that will serve to educate anesthesia providers on POD as well as minimize anesthesia-related contributors of POD.

The purpose of this scholarly project is to develop a clinical practice guideline on the perioperative assessment of POD and the related anesthesia management of the surgical patient age 65 and older at a large urban teaching hospital. This guideline will enhance the quality and consistency of care with the intent of improving outcomes for geriatric surgical patients. It is anticipated that after completion of this project, anesthesia providers will be able to identify patients at high risk for POD and utilize the best evidence based clinical practices to customize the anesthetic plan with the goal of reducing the incidence of POD. Preventing POD will result in improved patient outcomes and alleviate the associated financial burden on the institution.

Theoretical Framework

The theory of unpleasant symptoms (TOUS) is a middle-range nursing theory that provides the theoretical framework for understanding the problem of POD and guiding clinical practice (Lenz, Pugh, Milligan, Gift, & Suppe, 1997). The purpose of the TOUS is to improve understanding of symptom experience in various contexts and to provide information useful for designing effective interventions to prevent, ameliorate, or manage unpleasant symptoms and their negative effects (Lenz et al., 1997). The central concept of TOUS is symptom(s). The other key concepts are influencing factors (physiological, psychological, and situational factors) and performance outcomes.

The TOUS is operationalized in this project to explain the practice problem of POD. Two key propositions of the TOUS explain how the theory fits the practice problem: a) symptoms are the central component such that multiple symptoms may be linked to one another exacerbating the outcome of POD and b) reciprocal relationships exist among influencing factors, symptoms, and the performance outcome, which explains the complexity of multiple factors that contribute to POD (Lenz et al., 1997). For instance, POD could worsen symptoms such as pain or anxiety and also have a negative impact on influencing factors by worsening an individual's physical condition, mental state, and lifestyle or living situation. These are all critical components of POD that must be considered when generating practice changes. The TOUS provides a comprehensive, though straightforward framework to gain a better understanding of POD as a multifactorial outcome in order to implement successful practice interventions such as the recommendations outlined in the CPG. The clinical practice guideline will aid clinicians in identifying high-risk geriatric patients and developing appropriate anesthetic options for them with the ultimate goal of reducing POD.

Literature Review

The purpose of this literature review is to present the most current intraoperative recommendations on pharmacologic, nonpharmacologic, and anesthetic interventions for the prevention of POD in older surgical patients as well as to examine the Confusion Assessment Method (CAM), a widely used tool for assessing delirium. Literature selected for this review includes a national CPG by AGS (2015) with a supplement by Inouye et al. (2015), a meta-analysis by Moyce, Rodseth and Biccard (2014), a randomized controlled trial by Wang et al. (2012), a cohort study by Sieber et al. (2011), and two systematic reviews (De & Wand, 2015; Wei, Fearing, Sternberg, & Inouye, 2008). A detailed summary of the evidence is included in Appendix A.

Authors of each of the studies discussed the effects of pharmacological agents on POD in older adults. Three studies examined the use of antipsychotics in patients at risk for POD (AGS, 2015; Moyce et al., 2014; Wang et al., 2012). Wang et al. (2012) conducted a randomized controlled trial with 457 participants and found haloperidol significantly decreased the incidence and delayed onset of POD. However, current recommendations do not support the use of haloperidol or antipsychotics prophylactically to prevent POD (AGS, 2015; Moyce et al., 2014). Additionally, analgesics are principal pharmacological agents utilized in the intraoperative period to treat pain and authors agree that pain management is essential to prevent the development of delirium. Sieber et al. (2011) conducted a cohort study of 236 participants and found opioid consumption was not associated with POD, ($p = .61$). Regardless, the AGS (2015) recommends non-opioid analgesics such as acetaminophen and nonsteroidal anti-inflammatory drugs are preferable. To summarize, the evidence supporting adequate analgesia is stronger than

the evidence suggesting use of nonopioid analgesics to prevent POD (AGS, 2015). Therefore, sufficient patient analgesia should be achieved irrespective of the type of pharmacological agent.

The second focus area comprises nonpharmacologic intraoperative interventions. Moyce et al. (2014) and AGS (2015) reported nonpharmacologic interventions to be particularly effective at preventing POD. Many conditions such as infection, dehydration and pain contribute to the development of POD (AGS, 2015; Moyce et al., 2014; Sieber et al., 2011). Therefore, intraoperative interventions to prevent POD in geriatric surgical patients should encompass pharmacologic measures such as appropriate administration of antibiotics and analgesics, as well as nonpharmacologic interventions such as fluid and electrolyte management and avoidance of hypoxia (Moyce et al., 2014). Intraoperative evaluation of these factors should be ongoing along with continued awareness and medical management of underlying conditions and comorbidities. Nonpharmacologic interventions assist providers to identify and target factors that contribute to POD, thereby decreasing POD incidence and morbidity.

Furthermore, the effects of the type and depth of anesthesia on POD is widely discussed among the literature. However, similar to pharmacologic interventions, findings and recommendations vary. Moyce et al. (2014) and Sieber et al. (2011) found no difference in POD incidence with regard to the type of anesthesia administered when comparing general with spinal or regional anesthesia and inhalational with intravenous anesthesia. Regardless, the AGS (2015) suggests the use of regional anesthesia may aid in postoperative pain management, which may be beneficial as pain is a contributing factor to the development of POD. Although Moyce et al. (2014) found lighter anesthetic depth to be associated with a decreased incidence of POD, the AGS (2015) concluded the net risks versus benefits of the effect of light anesthesia on

developing POD cannot be determined with the available evidence. Thus, there are no definitive recommendations for a specific type or depth of anesthesia over another for preventing POD.

Finally, the utility of the CAM in assessing delirium was examined in the literature. An overview of the CAM is found in Appendix B. Wei et al. (2008) conducted a systematic review of 239 articles and reported a sensitivity of 94% and specificity of 89%. De and Wand (2015) also performed a systematic review of 31 studies (n=5824), which evaluated 21 delirium screening tools and found the CAM to be the most widely used tool to detect delirium. Multiple studies (De & Wand, 2015; Inouye et al., 2015; Wei et al., 2008) recommend the CAM instrument be administered by trained evaluators for optimum performance and reliability. The CAM Training Manual is available to facilitate use of the tool (Wei et al., 2008). Thus, the literature supports the use of the CAM in multiple settings by trained clinicians (De & Wand, 2015; Inouye et al., 2015; Wei et al., 2008)

In conclusion, this literature review examined the effects of intraoperative interventions on POD in older surgical patients. Despite some differing intraoperative recommendations, authors agree adequate analgesia throughout the perioperative period is essential to preventing POD (AGS, 2015; Moyce et al., 2014; Sieber et al., 2011). Furthermore, AGS (2015) and Moyce et al. (2014) strongly support nonpharmacologic interventions such as ongoing evaluations of geriatric patients throughout the perioperative period, from identification and mitigation of risk factors preoperatively to managing medical conditions intraoperatively and assessing patients for complications such as infection postoperatively that may all contribute to POD. The clinical practice guideline will incorporate recommendations throughout the perioperative period that received strong support in the literature for POD prevention as well as incorporation of the CAM to assess for postoperative delirium.

Methods

Design, Setting and Sample

The design is a quality improvement project that includes the development and evaluation of a CPG for the reduction of postoperative delirium. The setting of the project is the anesthesia department of a large, urban, teaching hospital in Baltimore, MD. The project consisted of three phases, each with a different sample. In phase one, the sample (n=2) included an anesthesiologist and a CRNA who comprise the expert panel and grade the CPG. In phase two, the sample (n=2) consists of the Chief Anesthesiologist and Chief CRNA who reviewed the finalized CPG. The sample (n=32) for the third phase of the project included anesthesia providers recruited at the departmental meeting. Inclusion criteria for sample participants in phase three are anesthesia providers included anesthesiologists and CRNAs, attendance at the departmental meeting when the CPG was presented, and voluntary completion of a practitioner feedback survey. Exclusion criteria for participants were anesthesia providers occupying positions on the expert panel and department chiefs that composed the samples in phase one and two.

Procedure

Phase one. The project began with the recruitment of an expert panel in phase one. The expert panel consisted of one CRNA and one anesthesiologist at the organization who evaluated the CPG, found in Appendix C, with the Appraisal of Guidelines for Research and Evaluation (AGREE) II instrument. The prospective expert panelists were initially invited to participate on the panel and informed of the project via an informal meeting. Follow-up emails were then sent as confirmation of the providers' commitment to participate on the expert panel. The members of the expert panel were emailed the CPG and AGREE II instrument with instructions and a

timeline for evaluating the CPG as well as an agenda for the first meeting of the expert panelists. After grading the CPG with the AGREE II tool, the team of expert panel members and students met during the first month to discuss the panel's feedback and recommendations. The CPG was then revised based on the feedback obtained from the first expert panel meeting. In the second month, the team reconvened for a second meeting where the revised CPG was presented to the expert panel, final amendments were made to the CPG, and the presentation of the CPG at the departmental meeting was planned.

Phase two. Phase two of the project occurred in the second month of implementation. During this phase a meeting was conducted with the Chief Anesthesiologist and Chief CRNA. The purpose of this meeting was to present the finalized CPG to the department chiefs and obtain feedback and approval to present the CPG at the departmental meeting to the anesthesia providers. Also, the presentation of the CPG at the departmental meeting was scheduled during this phase.

Phase three. The final phase of the project implementation involved the presentation of the CPG to anesthesia providers at the departmental meeting in the third month. Following the presentation, the Practitioner Feedback Questionnaire (PFQ) was distributed to anesthesia providers and then collected at the end of the departmental meeting. A complete timeline is provided in Appendix D.

Data Collection and Analysis

The AGREE II instrument, found in Appendix E, was used for data collection during the first phase of the project. The purpose of the AGREE II is to assess the quality of guidelines, provide a methodological strategy for the development of guidelines and inform what information and how information should be reported in guidelines (AGREE, 2009). The

AGREE II contains 23 key items divided into six domains and two global rating items. Each item is scored on a 7-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). A quality score is computed for each of the six domains. The score is a percentage calculated by summing the scores for each item in the domain by each appraiser and subtracting the minimum possible score, then dividing that result by the difference between the maximum and the minimum possible scores. The face validity, criterion validity and construct validity were established with a two-level factorial design and an adequate sample (80% power) to detect a difference of one point on the 7-point scale between groups (Brouwers et al., 2010a). The AGREE II instrument is valid in measuring guideline quality as the individual items in the tool identify differences in the quality of guidelines. The reliability of the AGREE II instrument has been established using Cronbach's alpha coefficients (Brouwers et al., 2010a; Brouwers et al., 2010b). The internal consistency ranged from 0.64 to 0.89 for each of the domains and requires two to five appraisers to reach an inter-rater reliability of 0.7 (Brouwers et al., 2010b).

In phase one, the AGREE II instrument was distributed electronically to the expert panel to evaluate the CPG. Data consists of scores for each AGREE II item as well as comments from each of the three expert panelists. During the first phase of implementation, AGREE II data was collected from each panel member on paper forms with no identifiers to maintain anonymity of sample participants. Data was collected by an impartial volunteer and stored in a locked box.

In phase three, the Practitioner Feedback Questionnaire (PFQ) was utilized for data collection at the departmental meeting. The PFQ is included in Appendix F and has been modified to include demographic data. The purpose of the PFQ is to assess practitioners' beliefs about draft guidelines by clinicians in the setting where the guideline will be implemented (Brouwers, Graham, Hanna, Cameron, & Browman, 2004). The PFQ includes 18 core items

divided into four factors and five additional items that are scored using a 5-point Likert scale (*strongly agree – strongly disagree*) (Brouwers et al., 2004). The validity and reliability of the PFQ tool has been established and internal consistencies among factors range from 0.75 to 0.85 (Brouwers et al., 2004). A paper and pencil method was used for the distribution and completion of the PFQ by the sample of anesthesia providers, and the survey was collected at the conclusion of the meeting.

Following the distribution and collection of the AGREE II instrument and the PFQ as described above, data was synthesized and organized in Excel for analysis. Descriptive statistics were utilized to analyze the data collected from the AGREE II and the PFQ. The demographic data from the PFQ was also analyzed with descriptive statistics to describe the sample of anesthesia providers in phase three. Data analysis is included in Appendix G and Appendix H.

Protection of Human Rights

This is considered a quality improvement project for the purposes of a specific organization and is intended neither for generalizable knowledge nor to be applied to another health setting. The proposal was submitted to the University of Maryland Baltimore (UMB) Institutional Review Board (IRB) for a Non Human Subjects Research (NHSR) determination. The proposal was also submitted to the IRB of the organization where the project was implemented. Participants contributing to the project were volunteers and no identifiable information was collected to protect the anonymity of participants. Data was collected in a secure box by an impartial volunteer and forms were stored in a locked file cabinet. Data to be used for data analysis was stored on a password-protected computer. There was no external funding and no competing interests for this project.

Results

Population

The sample from phase one (*n*=2) comprised the expert panel and consisted of one anesthesiologist and one CRNA, one being male and one female. The sample from phase three (*n*=32) consisted of anesthesiologists and CRNAs, of which 47% completed the PFQ. Of the sample completing the questionnaire (*n*=15), 53% of participants were CRNAs, 27% were anesthesiologists and 20% declined to respond. The average number of years practicing anesthesia of participants completing the PFQ was 7.7 years.

Analysis

Descriptive statistics were computed for data analysis in phase one and phase three. In phase one the expert panel rated the CPG with the AGREE II tool. Scores for each of the six domains of the AGREE II were calculated along with an overall score. The scoring of the AGREE II is detailed above in the methods section. The scores for each domain ranged from 66.7% to 91.7% with an average score of 80.6%. The scores for Domain 1-6 are 88.9%, 66.7%, 76.0%, 91.7%, 68.8%, and 91.7%, respectively. Domain 2, Stakeholder Involvement, received the lowest score and Domain 4, Clarity of Presentation, and Domain 6, Editorial Independence, received the highest score. The overall assessment, which rates the overall quality of the CPG, received a score of 91.7% by the expert panel. Additionally, both panel members stated they would recommend the guideline for use in their practice.

In phase three the CPG was presented to the anesthesia group at the departmental meeting and those in attendance were asked to complete the PFQ. The questionnaire included 22 items that are scored from 1 (strongly disagree) to 3 (strongly agree). Strongly agree was the mode for 77% of the items, neither agree nor disagree was the mode for 3 of the items (14%) and strongly

disagree was the mode for 2 of the items (9%). Additionally, one of the participants commented that long-term follow-up would be difficult for anesthesia to track.

Discussion

The scholarly project sought to increase awareness of POD within the anesthesia department through the development of an evidence based clinical practice guideline on the perioperative assessment of POD and the related anesthesia management of the surgical patient age 65 and older, at a large urban teaching hospital. The overall goal is to reduce the incidence of POD in order to improve outcomes for geriatric surgical patients and reduce costs for the institution.

The CPG was developed after a thorough literature review and was rated by an expert panel of anesthesia providers in the setting where the guideline is to be implemented. The guideline was then edited based on the feedback and ratings from the AGREE II tool by the expert panel. Project implementation consisted of a formal presentation of the CPG to the anesthesia group of CRNAs and anesthesiologists at the departmental meeting where the PFQ was completed to gauge the providers' opinions of the CPG and their likelihood of adopting and utilizing the CPG within their practice.

Strengths of the project included a thorough literature review and the development of a comprehensive CPG encompassing the entire perioperative period from the preoperative to the postoperative period. Additionally, the project included a diverse expert panel representative of the anesthesia group in the setting where the guideline is to be utilized. Initially three anesthesia providers were invited to form the expert panel, but one declined to participate. However, this did not impact the diversity or interrater reliability of the expert panel and AGREE II results. Another strength of the scholarly project was the high ratings obtained from the AGREE II

scores as well as the scores from the PFQ. This positive feedback from both the expert panel and the anesthesia providers speak to the content of the CPG and the willingness of the providers to adopt the CPG.

Several limitations of the scholarly project were also noted. Initially, the projected sample of anesthesia providers for phase three at the departmental meeting was *n*=51. However, the actual sample of anesthesia providers was *n*=32. Also, only 15 of the providers who attended the departmental meeting completed the PFQ, further reducing the sample size to *n*=15, which accounts for the 53% attrition rate. Finally, there were several missing responses that were noted during data collection and analysis. The score calculation was modified to account for the one missing response from the AGREE II. The PFQ had four missing data responses (two for item 9 and two for item 10) as well as three participants neglected to completed the demographic data indicating their practice title as an anesthesiologist or CRNA.

Summary

The multifactorial nature of POD coupled with the growing number of older surgical patients, necessitates an increased awareness and evidence-based approach to the anesthetic delivery in the care of this vulnerable patient population. Key findings from the literature focus on effective analgesia and appropriate medical management of the geriatric surgical patient as well as use of the CAM to evaluate for POD. Due to the significance of the problem and complexity of POD, the body of evidence is ever expanding, which is why the CPG includes a recommendation to update the guideline every two years with the most current literature. In conclusion, the development of a CPG for anesthesia providers on POD will guide the assessment and management of older surgical patients with the aim of reducing POD and the associated negative sequelae.

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Appendix A

Evidence Table

							Rating	
#	Author	Date	Evidence Type	Sample Size	Results/ Recommendations	Limitations	Strength	Quality
1	De & Wand	2015	Systematic Review	5824	• CAM most widely used instrument to identify delirium • Specific training is required for optimum performance • Delirium rating scale best for psychogeriatric population but requires psychiatric training • Nurses' Delirium Screening Checklist best suited to surgical & recovery room setting • Single Question in Delirium is promising for oncology patients • Memorial Delirium Assessment Scale has good validity in surgical & palliative care settings, but may be better used to assess delirium severity	• Methodological problems of some included studies such as bias and limited generalizability • Restrictions of literature search, which excluded non-English language versions of delirium screening tools • Not all validated tools were identified	I	B
2	American Geriatrics	2015	Clinical Practice	N/A	• Nonpharmacological interventions should be	• Feasibility restrictions for thoroughness of	IV	B

	Society (AGS)		Guideline		used to prevent delirium • Educational programs should be provided for healthcare providers • Medical evaluation should be done to identify and manage delirium contributors • Pharmacological recommendations: I. Pain management (preferably with non-opioids) should be optimized to prevent delirium II. Avoid medications that are likely to precipitate delirium III. Cholinesterase inhibitors should not be newly prescribed to prevent or treat postoperative delirium IV. Benzodiazepines should not be first line treatment of agitation associated with delirium V. Antipsychotics and benzodiazepines should be avoided for treatment of hypoactive delirium	literature review • Limited quality of available evidence • External validity threat due to extrapolation of studies from outside the surgical setting		
3	Inouye et al.	2015	Expert opinion	N/A	• 5 major risk factors for delirium are age >65,	• Limited quality of available evidence	IV	B

					chronic cognitive decline or dementia, poor vision or hearing, severe illness, and presence of infection • The hallmark for delirium diagnosis is acute cognitive change from baseline • Consider use of electroencephalographic monitors of anesthetic depth to reduce POD • Avoid medications that induce delirium • Optimize pain control • Consider regional anesthesia to improve pain control • Implement educational programs and multicomponent nonpharmacological interventions	• Limited generalizability; guidelines should not supersede clinical judgment or individual patient choices or values		
4	Moyce, Rodseth, & Biccard	2014	Meta-analysis	29	• Perioperative geriatric consultations that involve multi-component interventions are associated with decreased incidence of postoperative delirium • Lighter anesthesia is associated with decreased incidence of	• Only 2 interventions (geriatric consultation & anesthesia depth) were adequately powered; other interventions may be efficacious but cannot be determined • Limited generalizability;	I	B

					postoperative delirium	geriatric consultations limited to orthopedic surgery • Bias due to poor randomization & lack of blinding for studies with consultation interventions • No standardization of anesthetic technique or doses of pharmacological interventions between studies • No standardization for pre-op risk assessment or post-op testing • Sample sizes and magnitude of effect not reported		
5	Wang et al.	2012	RCT	457	• Haloperidol significantly decreased incidence of postoperative delirium • Haloperidol delayed onset of delirium and increased number of delirium-free days • No difference in all-cause 28-day mortality between groups • Length of ICU stay was	• Baseline psychiatric and cognitive screening tests not performed; pre-existing conditions may influence occurrence of delirium • Differences in duration of surgery and anesthesia	I	B

					shorter in haloperidol group than control	between groups • Unexpected low incidence of delirium in control group increased risk of type 2 error • Reasonably consistent results and recommendations		
6	Sieber, Mears, Lee, & Gottschalk	2011	Non-experimental Cohort study	236	• Participants who developed delirium had a higher Charlson comorbidity score and were more likely to have probable dementia and cardiovascular complications • There was no difference in incidence of delirium with respect to type of anesthesia (spinal or general) • There was no association between use of opioids and delirium in patients with or without dementia • Postoperative delirium was not associated with the amount of opioid consumed • Opioid dose on postoperative days 1 and	• Limited generalizability; study included only patients w/ hip fracture • Study unable to determine relationship between opioid consumption and delirium on longitudinal basis because delirium only assessed on postoperative day 2 (day 1 delirium episodes may have been missed) • Missing pain scores may have affected results	III	B

					2 was not predictive of delirium • Dementia and ICU admission, not opioid consumption, were most predictive of postoperative delirium			
7	Wei, Fearing, Sternberg, & Inouye	2008	Systematic Review	1071	• CAM overall sensitivity of 94% • CAM overall specificity of 89% • Interrater reliability is generally moderate to high • CAM adapted for use in multiple settings (ICU, emergency, & institutional settings) • CAM has been translated into 10 languages • Training is recommended for optimal use	• Some articles may have been missed in literature search (such as those published in foreign languages)	I	B

Appendix B

The Confusion Assessment Method (CAM)

(1) ACUTE ONSET AND FLUCTUATING COURSE
Is there evidence of an acute change in mental status from the patient's baseline?
Did this behavior fluctuate during the past day, that is, tend to come and go or increase and decrease in severity?

(2) INATTENTION
Does the patient have difficulty focusing attention, for example, being easily distractible, or having difficulty keeping track of what was being said?

(3) DISORGANIZED THINKING
Is the patient's speech disorganized or incoherent, such as rambling or irrelevant conversation, unclear or illogical flow of ideas, or unpredictable switching from subject to subject?

(4) ALTERED LEVEL OF CONSCIOUSNESS
Overall, how would you rate this patient's level of consciousness?
Alert (normal)
Vigilant (hyperalert)
Lethargic (drowsy, easily aroused)
Stupor (difficult to arouse)
Coma (unarousable)

THE DIAGNOSIS OF DELIRIUM REQUIRES A PRESENT/ABNORMAL RATING FOR CRITERIA:
(1) AND (2) AND EITHER (3 OR 4)

Ref: Inouye SK, et al. Ann Intern Med. 1990;113:941-8

Appendix C

Clinical Practice Guideline

A Clinical Practice Guideline for the Reduction of Postoperative Delirium in Geriatric Patients

I. Overview
- A. Purpose: To address the need for a clinical practice guideline at a mid-Atlantic urban hospital to reduce postoperative delirium in elderly surgical patients requiring anesthesia
- B. Population: Elderly surgical patients aged 65 and older
- C. User: Anesthesia providers
- D. Background: The most common and life-threatening complication following geriatric surgery is postoperative delirium (POD) (American Geriatrics Society [AGS], 2015a). Up to forty percent of POD can be preventable (AGS, 2015a). The overall incidence rate varies widely and may affect anywhere between nine and eighty-seven percent of geriatric surgical patients (Whitlock, Vannucci, & Avidan, 2011). Clinical presentation of POD varies; consequently, more than half of the cases are misdiagnosed (AGS, 2015a). Presentation can be classified by motoric subtypes: hypoactive (e.g., withdrawn, lethargy, apathy, confusion), hyperactive (e.g., agitation, aggression, confusion, mood lability, psychotic symptoms, disruptive behaviors), mixed (e.g., both hypoactive and hyperactive symptoms), or unclassified (e.g., normal psychomotor activity) (AGS, 2015a; Saxena & Lawley, 2010). The abstracted recommendations below provide guidance on the prevention of POD in elderly surgical patients.
- E. Rigor of Development
    1. Search strategies: Literature was searched from PubMed, CINAHL, EBSCO, Google Scholar, and the Cochrane Library databases using the terms *postoperative delirium*, *delirium*, *anesthesia*, *surgery*, *geriatric*, *Confusion Assessment Method,* and *CAM* with the option to apply equivalent subjects selected.
    2. Inclusion and Exclusion Criteria: Inclusion criteria consisted of available quantitative, full text academic journal articles in English, published within the last ten years. Editorials and pilot studies were excluded.
    3. Strengths and Limitations: The guideline's strength is that the recommendations are from the highest levels of available evidence; systematic reviews, meta-analyses, and randomized controlled trials. Limitations include feasibility restrictions for thoroughness of the literature review and a limited quality of available evidence.
    4. Consensus Techniques: Consensus amongst the designated expert panel will be sought prior to introducing the guideline.
    5. Procedure for updating the guideline: Because POD is a growing area of clinical research, regular updates of every 2 years is recommended to keep the guideline current with the latest literature.
- F. Applicability

1. Facilitators and barriers: the administrators and leaders will play critical roles in provider's adoption and use of guidelines. The provider's habit of managing anesthesia and the culture of the anesthesia department may be the barriers to adopt the guideline.
2. Recommendation of how the guideline can be used in the clinical setting: The overall aim of these recommendations is to provide a guide of pharmacological and nonpharmacological techniques to prevent POD
3. Resource implications: the leaders and expertise in the anesthesia or related department will be a valuable resource.
4. Auditing Criteria: the guideline should be audited every half-year, and adjusted based on the audit and most current research.

G. Editorial Independence: No funding body exists to influence the content of the guideline. Additionally, no competing interests of guideline development group members have been recorded and addressed

II. Preoperative Recommendations

A. Assess for preoperative risk factors for Delirium

1. Age greater than 65 (AGS, 2015a; Scholz, et al., 2015; Oh, et al., 2015; Pinho, et al., 2015)
2. Cognitive impairment (AGS, 2015a; Fong, et al., 2015; Oh, et al., 2015)
3. Severe illness or comorbidity burden (AGS, 2015a; Scholz, et al., 2015; Oh, et al., 2015; Pinho, et al., 2015)
4. Vision and hearing impairment (AGS, 2015a; Oh, et al., 2015)
5. Alcohol use (AGS, 2015a; Scholz, et al., 2015)

III. Intraoperative Recommendations

A. Analgesia: The anesthesia provider should administer analgesics throughout the perioperative period to ensure adequate pain management (AGS, 2015a; Moyce et al., 2014; Sieber et al., 2011). Non-opioid medications are preferred (AGS, 2015a).

B. Medical management: The anesthesia provider must be diligent in giving appropriate antibiotics as well as avoidance of hypoxia and hypercarbia, dehydration, and electrolyte imbalances, which may contribute to delirium (Moyce et al., 2014).

C. Antipsychotics: The use of haloperidol prophylactically for the prevention of delirium is not recommended (AGS, 2015a; Moyce et al., 2014).

IV. Postoperative Recommendations

A. Acquire geriatric consultation for medical management of patient. (AGS 2015a; AGS 2015b; Moyce et al., 2013; Siddiqi et al., 2007)

B. Pharmacologic recommendations to decrease POD in the postoperative phase of surgery include:

1. When appropriate use regional anesthesia for pain management (AGS 2015a; AGS 2015b).
2. Non-opioids for treatment of pain are preferred (e.g., acetaminophen, NSAIDs, and gabapentin) (AGS 2015a; AGS 2015b).
3. Avoid inappropriate medications
    a. Anticholinergics and drugs with anticholinergic properties
        i. Tricyclic antidepressants: amitriptyline, doxepin, imipramine

ii. Antihistamines: cyproheptadine, diphenhydramine, hydroxyzine
iii. Antimuscarinics: oxybutynin, tolterodine
iv. Antispasmodics: hyoscyamine, scopolamine
v. First-generation antipsychotics: chlorpromazine, thioridazine
vi. H2-receptor antagonists: cimetidine, ranitidine
vii. Skeletal muscle relaxants: cyclobenzaprine, tizanidine
viii. Antiemetics: promethazine
ix. Olanzapine
x. Paroxetine

b. Sedative-hypnotics
i. Benzodiazepines: alprazolam, diazepam, lorazepam, midazolam
ii. Sedative-hypnotics: zolpidem, zaleplon

c. Meperidine (AGS 2015a; AGS 2015b).
d. Avoid medications that contribute to serotonin syndrome (AGS 2015a; AGS 2015b).

4. Avoid polypharmacy (i.e., starting five or more medications) (AGS 2015a; AGS 2015b).

C. Postoperative non-pharmacologic interventions that reduced POD include:
1. Immediate application of hearing and visual aids upon emergence (AGS 2015a; AGS 2015b).
2. Fluid and electrolyte repletion (AGS 2015a; AGS 2015b).
3. Adequate ventilation (i.e., avoiding hypoxia and hypercarbia) (AGS 2015a; AGS 2015b).
4. Bright light therapy (i.e., application of bright light after extubation for two hours and repeated daily) (Moyce et al., 2013)

V. 24 hour postoperative evaluation

A. Confusion Assessment Method to be performed during postoperative evaluation

Acute change and fluctuating course

a. Evidence of an acute change in mental status from the patient's mental status prior to hospitalization, and
b. Evidence that abnormal behavior fluctuates during the day (i.e., tends to come and go or increase and decrease in severity).

Inattention

a. Evidence of difficulty focusing attention, e.g., being easily distractible, or having difficulty keeping track of what is being said.

Disorganized thinking

a. Evidence that thinking is disorganized or incoherent, such as rambling or irrelevant conversation, unclear or illogical flow of ideas, or unpredictable switching from subject to subject.

Altered level of consciousness

a. Any evidence of any mental state other than a normal level of alertness. (Altered states include vigilant or hyperalert, lethargic,

drowsy or easily aroused, stuporous or difficult to arouse, coma or unarousable.)

B. Only trained providers should assess patients for POD with the validated Confusion Assessment Method (CAM) algorithm. Untrained providers may result in misdiagnosis of POD. (AGS, 2015b)

C. Delayed recognition of postoperative delirium results in increased duration and severity of POD and increased mortality rates. (AGS, 2015b).

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Appendix D

Method Timeline

- Submit proposal to committee members by May 2016
- Present proposal to committee members by May 2016
- Submit project proposal to UMB and hospital Institutional Review Boards (IRBs) by May 2016
- Implement project from September 2016 to December 2016
    - Send invitations to prospective expert panelists by June 2016
    - Send initial email to expert panelists with CPG and AGREE II tool by August 2016
    - Convene with expert panel for initial meeting by September 2016
    - Convene with expert panel for follow-up meeting by October 2016
    - Convene with Chief Anesthesiologist and Chief CRNA by October 2016
    - Present CPG at departmental meeting by November 2016
    - Distribute and collect practitioner feedback survey by November 2016
- Analyze, synthesize and evaluate data by February 2017
- Present final scholarly project report to Committee by March 2017

Appendix E

Items of AGREE II Tool Organized by Domain

Appendix Table. **Domains of AGREE II Appraisal Instrument**

Scope and purpose
1. The overall objective(s) of the guideline is (are) specifically described.
2. The health question(s) covered by the guideline is (are) specifically described.
3. The population (patients and public) to whom the guideline is meant to apply is specifically described.

Stakeholder involvement
4. The guideline development group includes individuals from all the relevant professional groups.
5. The views and preferences of the target population (patients, public, etc.) have been sought.
6. The target users of the guideline are clearly defined.

Rigor of development
7. Systematic methods were used to search for evidence.
8. The criteria for selecting the evidence are clearly described.
9. The strengths and limitations of the body of evidence are clearly described.
10. The methods for formulating the recommendations are clearly described.
11. The health benefits, side effects, and risks have been considered in formulating the recommendations.
12. There is an explicit link between the recommendations and the supporting evidence.
13. The guideline has been externally reviewed by experts before its publication.
14. A procedure for updating the guideline is provided.

Clarity of presentation
15. The recommendations are specific and unambiguous.
16. The different options for management of the condition or health issue are clearly presented.
17. Key recommendations are easily identifiable.

Applicability
18. The guideline describes facilitators and barriers to its application.
19. The guideline provides advice and/or tools on how the recommendations can be put into practice.
20. The potential resource implications of applying the recommendations have been considered.
21. The guideline presents monitoring and/or auditing criteria.

Editorial independence
22. The views of the funding body have not influenced the content of the guideline.
23. Competing interests of guideline development group members have been recorded and addressed.

AGREE = Appraisal of Guidelines Research and Evaluation.

Qaseem A, Snow V, Owens DK, Shekelle P, Clinical Guidelines Committee of the American College of Physicians. The Development of Clinical Practice Guidelines and Guidance Statements of the American College of Physicians: Summary of Methods. Ann Intern Med. 2010;153:194-199. doi: 10.7326/0003-4819-153-3-201008030-00010

Appendix F

Practitioner Feedback Questionnaire

Demographic Data:

- Anesthesia provider title
  - Anesthesiologist
  - Certified Registered Nurse Anesthetist
- Years of experience
  - 0 – 5 years
  - 6 – 10 years
  - 11 – 20 years
  - > 20 years

Practitioner Feedback Questionnaire

For each item, please check off the box that most adequately reflects your opinion.

1. Are you responsible for the care of patients for whom this draft guideline report is relevant? This may include the referral, diagnosis, treatment, or follow-up of patients.	Yes ☐	No ☐	Unsure ☐
If you answered "*No*" or "*Unsure*", there is no need to answer or return this questionnaire. If you answered "*Yes*", please answer the questions below and return to **[enter expected destination of surveys]**.			
	Strongly agree	Neither agree or disagree	Strongly disagree
2. The rationale for developing a guideline is clear.	☐	☐	☐
3. There is a need for a guideline on this topic.	☐	☐	☐
4. The literature search is relevant and complete (e.g., no key evidence was missed nor any included that should not have been) in this draft guideline.	☐	☐	☐
5. I agree with the methodology used to summarize the evidence included in this draft guideline.	☐	☐	☐
6. The results of the evidence described in this draft guideline are interpreted according to my understanding of the evidence.	☐	☐	☐
7. The draft recommendations in this report are clear.	☐	☐	☐
8. I agree with the draft recommendations as stated.	☐	☐	☐
9. The draft recommendations are suitable for the patients for whom they are intended.	☐	☐	☐
10. The draft recommendations are too rigid to apply to individual patients.	☐	☐	☐
11. When applied, the draft recommendations will produce more benefits for patients than harms.	☐	☐	☐
12. The draft guideline presents options that will be acceptable to patients.	☐	☐	☐
13. To apply the draft recommendations will require reorganization of services/care in my practice setting.	☐	☐	☐
14. To apply the draft guideline recommendations will be technically challenging.	☐	☐	☐
15. The draft guideline recommendations are too expensive to apply.	☐	☐	☐
16. The draft guideline recommendations are likely to be supported by a	☐	☐	☐

majority of my colleagues.			
17. If I follow the draft guideline recommendations, the expected effects on patient outcomes will be obvious.	☐	☐	☐
18. The draft guideline recommendations reflect a more effective approach for improving patient outcomes than is current usual practice. (If they are the same as current practice, please tick NA). *NA* ☐	☐	☐	☐
19. When applied, the draft guideline recommendations will result in better use of resources than current usual practice. (If they are the same as current practice, please tick NA). *NA* ☐	☐	☐	☐
20. I would feel comfortable if my patients received the care recommended in the draft guideline.	☐	☐	☐
21. This draft guideline should be approved as a practice guideline.	☐	☐	☐
22. If this draft guideline were to be approved as a practice guideline, I would use it in my own practice.	☐	☐	☐
23. If this draft guideline were to be approved as a practice guideline, I would apply the recommendations to my patients.	☐	☐	☐

Source: Adapted from: Brouwers, M.C., Graham, I.D., Hanna, S.E., Cameron, D.A., & Browman, G.P. (2004). Clinicians' assessments of practice guidelines in oncology: The CAPGO survey**.** *International Journal of Technology Assessment in Health Care, 20*(4), 421-6.

Appendix G

AGREE II Tool: Scoring of Each Domain

Domain 1: Scope and Purpose

	Item 1	Item 2	Item 3	**Total**
Appraiser 1	6	6	6	**18**
Appraiser 2	6	7	7	**20**
Total	**12**	**13**	**13**	**38**

Maximum possible score = 7(strongly agree) x 3(items) x 2(appraisers) = 42
Minimum possible score = 1(strongly disagree) x 3(items) x 2(appraisers) = 6

$\frac{\text{Obtained score – Minimum possible score}}{\text{Maximum possible score – Minimum possible score}} = \frac{38 - 6}{42 - 6} \times 100 = \frac{32}{36} \times 100 = \mathbf{88.9\%}$

Domain 2: Stakeholder Involvement

	Item 4	Item 5	Item 6	**Total**
Appraiser 1	6	6	7	**19**
Appraiser 2	2	2	7	**11**
Total	**8**	**8**	**14**	**30**

Maximum possible score = 7(strongly agree) x 3(items) x 2(appraisers) = 42
Minimum possible score = 1(strongly disagree) x 3(items) x 2(appraisers) = 6

$\frac{\text{Obtained Score – Minimum possible score}}{\text{Maximum possible score – Minimum possible score}} = \frac{30 - 6}{42 - 6} \times 100 = \frac{24}{36} \times 100 = \mathbf{66.7\%}$

Domain 3: Rigor of Development

	Item 7	Item 8	Item 9	Item 10	Item 11	Item 12	Item 13	Item 14	**Total**
Appraiser 1	6	6	6	6	7	7	6	6	**50**
Appraiser 2	5	6	6	5	6	3	1	7	**39**
Total	**11**	**12**	**12**	**11**	**13**	**10**	**7**	**13**	**89**

Maximum possible score = 7(strongly agree) x 8(items) x 2(appraisers) = 112
Minimum possible score = 1(strongly disagree) x 8(items) x 2(appraisers) = 16

$\frac{\text{Obtained Score – Minimum possible score}}{} = \frac{89 - 16}{} \times 100 = \frac{73}{} \times 100 = \mathbf{76.0\%}$

Maximum possible score – Minimum possible score 112 – 16 96

Domain 4: Clarity of Presentation

	Item 15	Item 16	Item 17	**Total**
Appraiser 1	6	7	6	**19**
Appraiser 2	6	7	7	**20**
Total	**12**	**14**	**13**	**39**

Maximum possible score = 7(strongly agree) x 3(items) x 2(appraisers) = 42
Minimum possible score = 1(strongly disagree) x 3(items) x 2(appraisers) = 6

Obtained Score – Minimum possible score = 39 – 6 x 100 = 33 x 100 = **91.7%**
Maximum possible score – Minimum possible score 42 – 6 36

Domain 5: Applicability

	Item 18	Item 19	Item 20	Item 21	**Total**
Appraiser 1	6	7	6	6	**25**
Appraiser 2	7	1	1	7	**16**
Total	**13**	**8**	**7**	**13**	**41**

Maximum possible score = 7(strongly agree) x 4(items) x 2(appraisers) = 56
Minimum possible score = 1(strongly disagree) x 4(items) x 2(appraisers) = 8

Obtained Score – Minimum possible score = 41 – 8 x 100 = 33 x 100 = **68.8%**
Maximum possible score – Minimum possible score 56 – 8 48

Domain 6: Editorial Independence

	Item 22	Item 23	**Total**
Appraiser 1	7	6	**13**
Appraiser 2	6	Missing data*	**-**
Total	**13**	**-**	**13**

*Missing data – Appraiser 2 omitted from scored percentage.

Maximum possible score = 7(strongly agree) x 2(items) x 1(appraisers) = 14
Minimum possible score = 1(strongly disagree) x 2(items) x 1(appraisers) = 2

Obtained Score – Minimum possible score = 13 – 2 x 100 = 11 x 100 = **91.7%**
Maximum possible score – Minimum possible score 14 – 2 12

Appendix H

Practitioner Feedback Survey Results

Table 1

Provider Responses to Each Item of the Practitioner Feedback Survey

Item #	PFS 1	PFS 2	PFS 3	PFS 4	PFS 5	PFS 6	PFS 7	PFS 8	PFS 9	PFS 10	PFS 11	PFS 12	PFS 13	PFS 14	PFS 15	**Mode**
2	3	3	3	3	3	3	3	3		3	3	2	3	3	3	**3**
3	3	3	3	3	3	3	3	3		3	3	1	3	3	3	**3**
4	3	3	3	2	3	3	3	3	3	2	1	2	3	3	3	**3**
5	3	3	3	3	3	3	3	3	3	3	3	2	3	3	3	**3**
6	3	3	3	3	3	3	3	3	3	3	3	2	3	3	3	**3**
7	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	**3**
8	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	**3**
9	3	3	3	2	3	3	3	3	3	3	3	3	3	3	3	**3**
10	1	1	3	2	2	2	2	1	1	2	1	2	1	1	1	**1**
11	3	3	3	3	3	3	3	3	3		3	2	3	2	3	**3**
12	3	3	3	2	3	3	3	1	3	3	3	2	3	3	3	**3**
13	1	2	3	2	3	2	2	1	3	2	3	1	2	3	3	**2**
14	1	1	3	1	2	2	2	1	2	2	1	1	2	2	2	**2**
15	1	2	3	1	1	2	1	2	1	1	1	1	2	2	2	**1**
16	3	3	3	2	3	3	1	3	2	3	3	2	2	2	3	**3**
17	2	2	3	2	2	3	1	3	2	3	3	2	2	3	3	**2**
18	3	3	3	3	3	3	3	1	3	3	3		2	3	3	**3**
19	3	3	3	2	2	3	1	1	3	3	3		2	3	3	**3**
20	3	3	3	3	3	3	3	3	3	3	3	3	2	3	3	**3**
21	3	3	3	2	3	3	3	3	3	3	3	1	2	3	3	**3**
22	3	3	3	2	3	3	3	3	3	3	3	2	2	3	3	**3**
23	3	3	3	2	3	3	3	3	3	3	3	2	2	3	3	**3**

1 = Strongly Disagree
2 = Neither Agree or Disagree
3 = Strongly Agree
Blank cells = no response from provider
PFS = Practitioner Feedback Survey

Table 2

Percentage of Response per Item

Item #	Strongly Disagree (%)	Neither Agree or Disagree (%)	Strongly Agree (%)
2	0	7	93
3	7	0	93
4	7	20	73
5	0	7	93
6	0	7	93
7	0	0	100
8	0	0	100
9	0	7	93
10	53	40	7
11	0	14	86
12	7	13	80
13	20	40	40
14	40	53	7
15	53	40	7
16	7	33	60
17	7	47	47
18	7	7	86
19	14	21	64
20	0	7	93
21	7	13	80
22	0	20	80
23	0	20	80