



Assessing Potentially Modifiable Factors Associated with the Development of Postoperative Delirium

Jeanna D. Blitz, MD, FASA Katie J. Schenning, MD, MPH, MCR Catherine Price, PhD, ABPP/CN Daniel J. Cole, MD, FASA

Brain health is inextricably linked with overall physical health. Evidence for the mind-body connection and the bi-directional relationship between them continues to emerge. The past decade has also seen the emergence of a focus on multifactorial quality and outcomes metrics within the health care space, where achieving or improving such metrics often requires a multipronged approach/intervention.

“The development of delirium may result in a prolonged length of hospitalization, discharge to a non-home location, and a worse long-term health trajectory; however, approximately 40% of cases of delirium are preventable with the implementation of preoperative screening and optimization interventions that address physical, cognitive, psychological, and social factors.”

Postoperative delirium is a common and important example of a multifactorial adverse outcome with significant ramifications for both the patient and the hospital (*Anesth Analg* 2018;127:1406-13). The development of delirium may result in a prolonged length of hospitalization, discharge to a non-home location, and a worse long-term health trajectory;

however, approximately 40% of cases of delirium are preventable with the implementation of preoperative screening and optimization interventions that address physical, cognitive, psychological, and social factors (*Anesthesiol Clin* 2015;33:505-16). Yet, many patients present in the preoperative period with previously unrecognized medical, physical, and/or psychological conditions that increase their risk of postoperative delirium. Successful delirium prevention and reduction initiatives, therefore, will require a holistic approach.

Because delirium prevention interventions can be time and resource intense, screening protocols facilitate our ability to direct interventions toward patients most likely to benefit. Not all older adult patients require any or all interventions, and a patient-specific approach based on their individualized risk profile is likely to be best.

Potentially modifiable factors associated with the development of postoperative delirium exist across a wide spectrum of domains (*Anesth Analg* 2011;112:1202-11; *JAMA* 1994;271:134-9) (Table).

The screening tools that we select will depend upon the design and aim of our intervention.

Cognition

To design an insightful intervention for cognitively vulnerable patients, anesthesiologists need to know how to generally assess cognition. Publications discuss seven common cognitive screenings previously used in preoperative settings, with administration time ranging from one to 10 minutes (*Perioper Care Oper Room Manag* 2020;19:100089). These tests included clock drawing (to command and copy conditions), the Mini-Cog®, Mini-Mental State Exam, months backwards, Short Blessed Test, and the short orientation memory concentration test, Telephone Interview for Cognitive Status, and Time & Change (*Arch Clin Neuropsychol* 1996;11:193-205; *J Am Geriatr Soc* 2003;51:1451-4; *J Psychiatr Res* 1975;12:189-98; *Neuropsychologia* 2002;40:435-45; *Am J Psychiatry* 1983;140:734-9; *Dement Geriatr Cogn*

Disord 2016;42:42-9; *Neuropsychiatry, Neuropsychology and Behavioral Neurology* 1993;6:103-10; *J Gerontol A Biol Sci Med Sci* 1998;53:M281-6). Of these, tests with some element of clock drawing are the most reported in the perioperative literature (*Anesth Analg* 2019;129:830-8; *Explor Med* 2021;2:110-21; *Anesthesiology* 2017;127:765-74; *Anesth Analg* 2016;123:186-92). This is likely due to its long history as a rapid cognitive screener (particularly for dementias), a wide variety of scoring options, and the stimulus value a patient's drawing provides for rapid recognition of cognitive impairment (*Anesthesiology* 2017;127:765-74; *Arch Clin Neuropsychol* 1993;8:405-15). However, the test is associated with interrater reliability difficulties and requires training (*Anesth Analg* 2019;128:e61-4; *Dement Geriatr Cogn Disord* 2011;31:179-87).

There are different approaches for interventions. Some publications include preoperative cognitive and physical health exercises (*JAMA Surg* 2021;156:148-56; *Int J Behav Nutr Phys Act* 2018;15:63; *Behav Neurol* 2020;2020:7807856). Other potential care adjustments include immediate perioperative period avoidance of relative hypotension, use of age-adjusted MAC, and EEG-based brain monitoring to titrate anesthetic depth (*Anesth Analg* 2018;127:1406-13).

Pain

Increased risk of poor pain control in the acute postoperative period may be identified using the Pain Catastrophizing Scale (*Curr Anesthesiol Rep* 2020;10:28-34). Use of multimodal analgesia and early engagement with the pain management team may also improve pain control.

Mobility, functional capacity, and medical comorbidities

Immobility, poor functional status, poor hearing or vision, anemia, electrolyte abnormalities, and renal insufficiency all increase risk of postoperative delirium. Achieving preoperative optimization of the patient's medical conditions may mean targeting different therapeutic thresholds than in the nonsurgical arena. While a he-



Jeanna D. Blitz, MD, FASA

President, Society for Perioperative Assessment and Quality Improvement, Associate Professor of Anesthesiology, Duke University School of Medicine, Medical Director, PASS Clinic and POET Programs, and Director, Perioperative Medicine Fellowship, Department of Anesthesiology, Duke University, Durham, North Carolina.



Katie J. Schenning, MD, MPH, MCR

Executive Group Member, ASA Perioperative Brain Health Initiative, Associate Professor, Department of Anesthesiology and Perioperative Medicine, and Assistant Medical Director, Perioperative Medicine Clinic, Oregon Health & Science University, Portland, Oregon.



Catherine Price, PhD, ABPP/CN

Associate Professor, Paul Satz Term Professor, and Director, Perioperative Cognitive Anesthesia Network Program for ADRD, University of Florida, Gainesville, Florida.



Daniel J. Cole, MD, FASA

President, Anesthesia Patient Safety Foundation, Professor of Clinical Anesthesiology, and Vice Chair for Professional and Business Development, Department of Anesthesiology and Perioperative Medicine, David Geffen School of Medicine at UCLA, Los Angeles, California.

moglobin A1c of 8.5 or mild anemia may not be alarming in the nonsurgical arena, the stress of surgery is real, and poorly controlled comorbidities such as diabetes, anemia, and tobacco use lead to worse postoperative outcomes, including delirium. Low gait speed, poor performance on chair sit-to-stand testing, and scores <25 on the Duke Activity Status Index questionnaire all reflect an opportunity for preoperative exercise training. Exercise is associated with enhanced cerebral blood flow and potential improvements in cognitive function – particularly in patients with mild cognitive impairment or dementia (*Behav Neurol* 2020;2020:7807856).

Continued on next page

Your Patient's Brain: Postoperative Delirium*Continued from previous page***Mental health-related factors**

Although the current literature is mixed regarding the presence of anxiety or depression as an independent predictor of delirium, there is certainly evidence of the importance of assessing the patient's psychological state preoperatively concerning overall perioperative outcomes and recovery (*Anesth Analg* 2011;112:1202-11). The screening tool(s) selected will depend upon the design of the intervention, which may range from patient-specific education, relaxation-based techniques, music medicine, or even cognitive behavioral therapy. One of the most readily available screening tools is the Patient Health Questionnaire (PHQ) for depression. Its value lies in its widespread use so that trends over time can be observed and tracked in the patient's record, from their visit with the primary care provider and other specialists over time. It may also be collected during the surgeon's visit as part of the patient-reported outcomes measure bundle. By contrast, the Generalized Anxiety Disorder (GAD-7) score is used to identify high levels of preoperative anxiety. Like the PHQ, the GAD-7 is in widespread use and may already have been assessed on your patients by providers outside of the preoperative arena; thus, we may want to leverage this

opportunity to track changes in anxiety levels over time. A score of >10 on either tool is deemed a positive finding. Both the PHQ and GAD-7 are common elements within the electronic health record, which improves the ease of adding them to the preoperative clinic assessment workflow. Preoperative interventions that have been demonstrated to add value include patient-specific information about what to expect in the perioperative period, music medicine, relaxation-based techniques such as mindfulness and deep breathing, and cognitive behavioral therapy (*Cochrane Database Syst Rev* 2016;2016:CD00864). Alcohol use should be reduced preoperatively to reduce the risk of postoperative delirium. A common approach is to aim to reduce alcohol intake by 50% before surgery – for example, reducing daily alcohol intake from four drinks to two may be sufficient to improve perioperative outcomes (*Br J Anaesth* 2009;102:297-306). In cases of a significant alcohol use disorder, a combination of pharmacotherapy and behavioral support is most effective (*Front Psychol* 2019;10:34).

Polypharmacy and psychotropic medication use

Confirmation of a complete and accurate medication list is a critical component of the pre-anesthesia evaluation for all patients. The query of a prescription drug monitoring program database may be

valuable to identify chronic use of medications associated with a high risk of postoperative delirium such as benzodiazepines or opioids – medications that older adult patients may not be forthcoming about using. This may result in postoperative withdrawal that mimics delirium (*Anesth Analg* 2011;112:1202-11). The goal of identifying potentially inappropriate medications (including over the counter) is to support the patient with weaning their use preoperatively. Often, medication weaning is done in a step-wise fashion, using a validated deprescribing framework. First, determine what the patient is taking and how this medication fits into their larger health goals. Engage the patient in the weaning process by sharing the reason and potential benefits. Identify the most important medication to wean. It is recommended to only wean one medication at a time. Focus on the highest-risk medication, which is usually benzodiazepines. Reduce the dose by 50% every two to four weeks. In patients on daily high doses of benzodiazepines, consider an initial reduction of 25% and instruct the patient and family to monitor for symptoms of withdrawal.

Malnutrition

A four-fold increase in the risk of postoperative delirium is noted in patients with malnutrition (*JAMA* 1994;271:134-9). Screening tools validated for the

perioperative period and feasible for use in the preoperative clinic include the malnutrition screening tool, the geriatric nutritional risk index (GNRI), and the preoperative nutrition score (PONS). The common factors included in these screening tools are body mass index, recent weight loss, or a reduction in food intake. Serum albumin level is included in the GNRI and PONS tools. A common and effective preoperative intervention is oral protein supplementation. The goal is to intake 1.5g/kg/day of protein to achieve anabolism. Oral protein supplementation may be combined with immune-modulating nutritional supplements for at least five to seven days preoperatively (*Anesth Analg* 2018;126:1883-95).

Anesthesiologists have several screening tools in their toolbox for delirium prevention. As our patient types become more complex, particularly with our growing population of older adults with neurodegenerative disorders and comorbidities, delirium rates will likely exponentially increase over the next few years (*Anesth Analg* 2018;127:1406-13). Applying evidence-based and psychometric research within the perioperative setting should allow us to tailor individual care for improved impact on postoperative patient well-being. ■

Disclosure: Dr. Schenning is a grant recipient of the National Institute on Aging.

Table: Potentially Modifiable Factors Associated With the Development of Postoperative Delirium

Domain	Risk Factors	Commonly Used Screening Tools	Proposed Intervention
Cognition	Cognitive impairment	Mini-Cog® (<i>J Am Geriatr Soc</i> 2003; 51:1451-4), clock drawing to command-and-copy; Mini-Mental State Exam (<i>J Psychiatr Res</i> 1975;12:189-98), months backwards (<i>J Psychiatr Res</i> 1975;12:189-98), animal fluency	Brain and physical exercises. Avoidance of hypotension and hypothermia, use of age-adjusted MAC and EEG-based brain monitoring intraoperatively
Pain	Poor pain control	Pain Catastrophizing Scale	Multimodal pain plan, proactive pain management consult
Mental Health	Depression and anxiety	Patient Health Questionnaire (PHQ), Generalized Anxiety Disorder (GAD), Hospital Anxiety and Depression Screen (HADS), Distress Thermometer	Music medicine, relaxation-based techniques, cognitive behavioral therapy
Social Behaviors	Alcohol use, misuse	Social history, AUDIT-C	Reduce daily alcohol intake by 50% (4 to 2 drinks/day), behavioral and pharmacotherapy
Functional Status	Immobility, poor functional capacity	Duke Activity Status Index (DASI), Activities of Daily Living (ADLs), Gait speed testing, chair sit to stand	Preoperative exercise regimen, including aerobic and resistance training
Nutrition	Malnutrition	MST, GNRI, PONS	Oral protein supplementation 1.5g/kg/day, Immunonutrition
Medication-related	Polypharmacy, use of deliriogenic medications (benzodiazepines, sleeping aids, antihistamines, skeletal muscle relaxants, gabapentinoids, opioids)	Prescription drug monitoring program, review and reconciliation of medication list	25%-50% dose reduction over 2-4 weeks prior to surgery