



Postoperative Delirium in Older Adults: Best Practice Statement from the American Geriatrics Society

The American Geriatrics Society Expert Panel on Postoperative Delirium in Older Adults

Postoperative delirium is recognized as the most common surgical complication in older adults,^{1,2} occurring in 5% to 50% of older patients after an operation.³⁻⁵ With more than one-third of all inpatient operations in the United States being performed on patients 65 years or older,⁶ it is imperative that clinicians caring for surgical patients understand optimal delirium care.

Delirium is a serious complication for older adults because an episode of delirium can initiate a cascade of deleterious clinical events, including other major postoperative complications, prolonged hospitalization, loss of functional independence, reduced cognitive function, and death.⁷⁻¹² The annual cost of delirium in the United States is estimated to be \$150 billion.¹³ Delirium is particularly compelling as a quality improvement target, because it is preventable in up to 40% of patients^{14,15}; therefore, it is an ideal candidate for preventive interventions targeted to improve the outcomes of older adults in the perioperative setting.¹⁶

Delirium diagnosis and treatment are essential components of optimal surgical care of older adults,¹⁷ yet the topic of delirium is under-represented in surgical teaching.¹⁸ Delirium is an acute decline in cognitive function and attention and represents acute brain failure. To date, health care professionals are familiar with managing organ dysfunction in organs such as the kidneys and lungs in the perioperative setting, but are less

familiar with caring for brain dysfunction despite its increasing clinical impact. The purpose of this postoperative delirium in older adults best practices guideline is to equip the health care professional caring for older adults in the perioperative setting with a set of evidence-based recommendation statements regarding the optimal care of older adults with delirium. The specific topics addressed are listed in [Table 1](#). This best practices document accompanies a postoperative clinical practice guideline simultaneously published by the same group.¹⁹

POSTOPERATIVE DELIRIUM EXPERT PANEL

The postoperative delirium in older adults guideline project was initiated by selecting an interdisciplinary, multi-specialty 23-member panel. The panel was chosen by the American Geriatrics Society's Geriatrics-for-Specialists Initiative (AGS-GSI) council with additional input from the panel co-chairs, with the goal of selecting participants with special interest and expertise in postoperative delirium. Represented disciplines included the fields of geriatric medicine, general surgery, anesthesiology, emergency medicine, geriatric surgery, gynecology, hospital medicine, critical care medicine, neurology, neurosurgery, nursing, obstetrics and gynecology, orthopaedic surgery, ophthalmology, otolaryngology, palliative care, pharmacy, psychiatry, physical medicine and rehabilitation, thoracic surgery, urology, and vascular surgery. Additional ex officio panel members included a representative from the National Committee for Quality Assurance (NCQA), a quality measures expert, and a caregiver representative. The following panel members served on the writing group for this best practices statement: Stacie Deiner, MD; Donna Fick, PhD, RN, FGSA, FAAN; Lisa Hutchison, PharmD; Sharon Inouye, MD, MPH; Mark Katlic, MD; Maura Kennedy, MD, MPH; Eyal Kimchi, MD, PhD; Melissa Mattison, MD; Sanjay Mohanty, MD; Karin Neufeld, MD, MPH; and Thomas Robinson, MD, MS.

Conflicts of interest were disclosed initially and updated 3 times during guideline development. Disclosures were reviewed by the entire panel and potential conflicts resolved by the co-chairs ([Appendix 1](#)).

Members of the American Geriatrics Society Postoperative Delirium in Older Adults Panel are listed in [Appendix 1](#).

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LITERATURE REVIEW

The methods for postoperative delirium risk factors, screening (case finding), and diagnosis (Table 1, topics I to III) were distinct from the other aims, because these topics were thoroughly addressed in recent high-quality guideline statements and systematic reviews on which the recommendation statements in these sections were based.^{4,20-22} In addition, these topics were considered outside the scope of the main literature search, which focused on prevention and treatment of delirium in the perioperative setting. Key citations were included in the section summaries. Sections were drafted by panel groups and then refined with the committee co-chairs. Subsequently, full consensus of the panel was achieved for all recommendation statements and summary sections.

The methods for the literature search for the aims addressing the pharmacologic and nonpharmacologic interventions for the prevention or treatment of postoperative delirium in older adults (Table 1, topics IV to X) included comprehensive searches, targeted searches, and focused searches. A more detailed description of the search methods is found in the accompanying clinical guideline document available online at GeriatricsCareOnline.org.¹⁹ Comprehensive searches (1988 to December 2013) in PubMed, Embase, and CINAHL used the search terms *delirium*, *organic brain syndrome*, and *acute confusion* and resulted in a total of 6,504 articles. Additional, alternative terms included for the prevention and treatment of delirium were the words *prevention*, *management*, *treatment*, *intervention*, *therapy*, *therapeutic*, and *drug therapy*. Two additional targeted searches using the US Library of National Medicine PubMed Special Queries on Comparative Effectiveness Research and PubMed Clinical Queries were also conducted. Finally, the ClinicalTrials.gov registry was searched to identify trials that have not been published. Search terms used were the drugs *quetiapine*, *dexmedetomidine*, *melatonin*, *rivastigmine*, *haloperidol*, *gabapentin*, *olanzapine*, *donepezil*, *risperidone*, as well as the terms *analgesia*, *delirium*, and *confusion*.

To limit the scope of these initial searches to pharmacologic and nonpharmacologic interventions for the prevention or treatment of postoperative delirium, excluded topics were delirium pathophysiology, etiology, biomarkers, risk factors, predisposing factors, predictive models, prognostic methods or tools, assessment, nonadult populations (eg, pediatric), alcohol or substance abuse withdrawal, psychosis (eg, schizophrenia), dementia (eg, Alzheimer disease), traumatic brain injury, brain surgery, terminal illness, or acute stroke. To limit the scope to the hospital inpatient setting, emergency department, ambulatory, or outpatient settings, the community,

Table 1. Postoperative Delirium Best Practices Outline

I.	Postoperative delirium risk factors
II.	Delirium diagnosis
III.	Delirium screening
IV.	Intraoperative measures to prevent delirium
V.	Medications as risk factors for postoperative delirium
VI.	Pharmacologic prevention of postoperative delirium
VII.	Nonpharmacologic prevention and treatment of postoperative delirium
VIII.	Medical evaluation of postoperative delirium
IX.	Pharmacologic treatment of postoperative delirium

postacute or long-term care (nursing homes), and hospice settings were excluded. Only observational studies or randomized clinical trials were included.

To select the final included studies, the 2 co-chairs screened all of the abstracts found by the search. Consensus of the study co-chairs was used to choose the final studies for inclusion, which were then reviewed and approved by panel members. Evidence tables and quality ratings were completed for each selected article. Working groups of the panel then developed evidence-based recommendation statements over a 10-month period through 2 in-person meetings, ongoing subgroup communication, and 3 full-panel conference calls.

EVIDENCE-BASED RECOMMENDATION STATEMENTS

Recommendation statements were structured as recommended by the Institute of Medicine guideline development advisory publication.²³ The full panel participated in evolving the recommendation statement drafts as described. The best practices statements underwent peer review by both surgical and nonsurgical experts in geriatric medicine and surgery. Additional peer review was provided by 29 surgical and nonsurgical organizations with special interest and expertise in the treatment and prevention of postoperative delirium (Appendix 2A, online only). The recommendation statements are meant for all health care professionals caring for older adults in the perioperative setting.

In all cases, these guidelines are not intended to supersede clinical judgment or individual patient choices or values. Ultimately, clinical decision-making must always be customized to the individual situation.

I. POSTOPERATIVE DELIRIUM RISK FACTORS

Recommendations

- Health care professionals caring for surgical patients should perform a preoperative assessment of delirium risk factors, including age greater than 65 years, chronic

Table 2. Risk Factors for Postoperative Delirium

Age greater than 65 y
Cognitive impairment
Severe illness or comorbidity burden
Hearing or vision impairment
Current hip fracture
Presence of infection
Inadequately controlled pain
Depression
Alcohol use
Sleep deprivation or disturbance
Renal insufficiency
Anemia
Hypoxia or hypercarbia
Poor nutrition
Dehydration
Electrolyte abnormalities (hyper- or hyponatremia)
Poor functional status
Immobilization or limited mobility
Polypharmacy and use of psychotropic medications (benzodiazepines, anticholinergics, antihistamines, antipsychotics)
Risk of urinary retention or constipation
Presence of urinary catheter
Aortic procedures

Adapted from: Chow WB, Rosenthal RA, Merkow RP, et al. Optimal preoperative assessment of the geriatric surgical patient: a best practices guideline from the American College of Surgeons National Surgical Quality Improvement Program and the American Geriatrics Society. *J Am Coll Surg* 2012;215:453–466.

cognitive decline or dementia, poor vision or hearing, severe illness, and presence of infection.

The risk of developing delirium after surgery is best described as a relationship between a physiologic stressor and predisposing patient risk factors.²⁴ In the context of surgery, the physiologic stressor is determined mainly by the extent of the operation.

Risk factors for postoperative delirium are well established. The National Institute for Health and Care Excellence (NICE) issued a delirium clinical guideline that highlighted 5 major risk factors for delirium (reported with odds ratios [OR]): age greater than 65 years (OR 3.03; 95% CI 1.19 to 7.71), chronic cognitive decline or dementia (OR 6.30; 95% CI 2.89 to 13.74), poor vision (OR 1.70; 95% CI 1.01 to 2.85) or hearing, severe illness (OR 3.49; 95% CI 1.48 to 8.23), and the presence of infection (OR 2.96; 95% CI 1.42 to 6.16).²⁰ Another systematic review focusing on delirium after noncardiac operations identified the following risk factors for development of postoperative delirium: increased age, cognitive impairment, visual or sensory impairment, functional dependence, self-reported excess alcohol use, and specific laboratory or electrolyte abnormalities.⁴ An original study deriving a delirium prediction rule after elective surgery identified 7 important factors (reported with adjusted

odds ratios): age greater than 70 years (OR 3.3; 95% CI 1.9 to 5.9), poor cognitive status (OR 4.2; 95% CI 2.4 to 7.3), poor functional status (OR 2.5; 95% CI 1.2 to 5.2), self-reported alcohol abuse (OR 3.3; 95% CI 1.4 to 8.3), markedly abnormal preoperative serum sodium, potassium, or glucose level (OR 3.4; 1.3 to 8.7), noncardiac thoracic surgery (OR 3.5; 95% CI 1.6 to 7.4), and aortic aneurysm surgery (OR 8.3; 95% CI 3.6 to 19.4).²⁵ Table 2 contains a list of postoperative delirium risk factors. Patients with 2 or more risk factors should be considered at greater risk than patients with zero or 1 risk factor. In general, the risk for delirium is greater in the emergency setting in comparison with the elective setting.

II. DELIRIUM DIAGNOSIS

Recommendations

- Health care professionals caring for postsurgical patients should be trained to recognize and document signs and symptoms associated with delirium, including hypoactive presentations.
- Health care professionals should assess and clearly document preoperative cognitive function in older adults at risk of postoperative delirium.
- Health care professionals competent in diagnosing delirium should perform a full clinical assessment in any patient suspected of having symptoms of delirium, found positive on a delirium screening test, or having an acute cognitive change on repeated cognitive testing. Recognized criteria such as the Diagnostic and Statistical Manual of Mental Disorders (DSM), ICD-10, or Confusion Assessment Method diagnostic algorithm, or use of a delirium diagnostic instrument should inform the diagnosis.

The diagnosis of delirium is derived from history-taking (including from informants), examination, and review of medical records, laboratory, and radiologic findings. The hallmark of delirium is acute cognitive change from baseline.²⁶ Common symptoms of delirium are listed in Table 3. In elective surgery, patients should have preoperative cognitive testing in order to document their baseline.^{27,28} (Appendix 2B, online only, contains a list of cognitive screening tools).

Clinical suspicion must be high in order to detect delirium in patients after surgery.²⁹ Inattention is the cardinal symptom of delirium, and use of a brief cognitive test is required for accurate diagnosis. The hypoactive delirium subtype is easily overlooked and yet may be associated with the poorest outcomes.^{30,31} All medical personnel need familiarity with the signs and symptoms of delirium.¹⁹ A formal delirium diagnosis tool (such as

Table 3. Symptoms Associated with Delirium

1. Change in level of arousal: drowsiness or decreased arousal* or increased arousal with hypervigilance
2. Delayed awakening from anesthesia*
3. Abrupt change in cognitive function (worsening confusion over hours or days), including problems with attention, difficulty concentrating, new memory problems, new disorientation
4. Difficulty tracking conversations and following instructions
5. Thinking and speech that is more disorganized, difficult to follow, slow,* or rapid
6. Quick-changing emotions, easy irritability, tearfulness, uncharacteristic refusals to engage with postoperative care
7. Expression of new paranoid thoughts or delusions (ie, fixed false beliefs)
8. New perceptual disturbances (eg, illusions, hallucinations)
9. Motor changes such as slowed or decreased movements,* purposeless fidgeting or restlessness, new difficulties in maintaining posture such as sitting or standing*
10. Sleep/wake cycle changes such as sleeping during the day* and/or awake and active at night
11. Decreased appetite*
12. New incontinence of urine or stool*
13. Fluctuating symptoms and/or level of arousal over the course of minutes to hours

*Hypoactive symptoms.

the DSM, ICD-10, or Confusion Assessment Method diagnostic algorithm (Appendix 2C, online only, is a list of delirium diagnosis tools)) used by a competent health care professional should be used to make the diagnosis of delirium (Table 4).

III. DELIRIUM SCREENING

Recommendations

- When screening a patient for delirium, a health care professional trained in the assessment of delirium should use a validated delirium screening instrument for optimal delirium detection.
- The health care team may consider instituting daily postoperative screening of older patients for development of delirium in order to initiate delirium treatment as early as possible.

Numerous studies have demonstrated that nurses and physicians do not accurately diagnosis delirium on the basis of their bedside evaluation, including in the ICU³²⁻³⁴ and medical and surgical wards.^{35,36} Screening tools, or brief instruments for use by nonspecialist bedside personnel, for detection of delirium are numerous (Appendix 2D, online only). These diagnostic tests vary significantly and depend on the patient population in which they are used. Accordingly, evidence finds that when screening a patient for delirium, health care professionals should be trained in and use a screening instrument that has been validated against a reference standard (Table 5).

There are no randomized controlled trials examining routine delirium screening in hospitalized patients.²¹ Risks of routine delirium screening include misdiagnosis, costs and risks of evaluation, and inappropriate treatment such as with antipsychotic medications. The potential

benefits of delirium screening include earlier diagnosis and implementation of appropriate delirium treatment. In one low-quality study, delays in delirium treatment in the ICU were associated with increased mortality.³⁷ Current guidelines and systematic reviews offer differing recommendations on delirium screening, with some published guidelines recommending delirium screening,^{22,38} and a recent systematic review concluding the evidence was insufficient to make a recommendation²¹ (Table 6).

IV. INTRAOPERATIVE MEASURES TO PREVENT DELIRIUM

Although many intraoperative factors have been evaluated for their impact on postoperative delirium, few topics have been studied with the rigor to allow an evidence-based recommendation. Previously published topics on which there is not adequate information to make a recommendation include specific anesthesia agents, general vs regional anesthetics, systemic arterial pressure monitoring, intraoperative blood transfusion, and use of dexamethasone or statin medications.

Recommendation

- The anesthesia practitioner may use processed electroencephalographic monitors of anesthetic depth during intravenous sedation or general anesthesia of older patients to reduce postoperative delirium.

Processed electroencephalographic monitoring is one topic with a few studies of adequate quality to form a recommendation. The premise is that providing a lighter depth of anesthesia (thereby administering fewer or lower doses of anesthesia medications) will reduce postoperative delirium in comparison with deeper sedation. In one small, randomized controlled trial that compared

Table 4. Common Diagnostic Systems for Delirium

Diagnostic and Statistical Manual, 5 th Edition, ⁹⁵ must meet all A – E	Confusion Assessment Method Algorithm, ^{*,96} must meet I, II, and either III or IV
<p>A. Disturbance in attention (ie, reduced ability to direct, focus, sustain, and shift attention) and awareness (reduced orientation to the environment).</p> <p>B. The disturbance develops over a short period of time (usually hours to a few days), represents an acute change from baseline attention and awareness, and tends to fluctuate in severity during the course of a day.</p> <p>C. An additional disturbance in cognition (eg, memory deficit, disorientation, language, visuospatial ability, or perception).</p> <p>D. The disturbances in criteria A and C are not better explained by a pre-existing, established, or evolving neurocognitive disorder and do not occur in the context of a severely reduced level of arousal such as coma.</p> <p>E. There is evidence from the history, physical examination, or laboratory findings that the disturbance is a direct physiological consequence of another medical condition, substance intoxication or withdrawal (ie, due to a drug of abuse or to a medication), or exposure to a toxin, or is due to multiple etiologies.</p>	<p>I. Acute change and fluctuating course</p> <p>a. Evidence of an acute change in mental status from the patient's mental status prior to hospitalization, and</p> <p>b. Evidence that abnormal behavior fluctuates during the day (ie, tends to come and go or increase and decrease in severity).</p> <p>II. Inattention</p> <p>Evidence of difficulty focusing attention, eg, being easily distractible, or having difficulty keeping track of what is being said.</p> <p>III. Disorganized thinking</p> <p>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.</p> <p>IV. Altered level of consciousness</p> <p>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.)</p>

*Confusion Assessment Method. ©1988, 2003, Hospital Elder Life Program. All rights reserved.

Adapted from: Inouye SK et al. Clarifying confusion: the confusion assessment method. A new method for detection of delirium. *Ann Intern Med* 1990; 113: 941–948. (From: Hospital Elder Life Program, LLC© 2003, with permission.)

postoperative delirium between light and deep sedation in hip fracture patients, deep sedation was associated with increased rates of postoperative delirium.³⁹ This finding is consistent with a nonrandomized, retrospective observation.⁴⁰ Two additional trials^{41,42} in patients undergoing general anesthesia have shown that the rates of postoperative delirium were lower in patients whose anesthesiologists were randomized to use the Bispectral Index (BIS) data to guide anesthesia compared with those who received routine care with no BIS data. Serious concerns regarding the a priori use of light anesthesia include intraoperative recall, patient movement at a critical portion of the surgery, and excessive sympathetic stimulation leading to hypertension and tachycardia.

Table 5. Validated Delirium Screening Instruments

General delirium screening instruments
Confusion Assessment Method (CAM)* - short form ⁹⁶
Delirium Symptom Interview (DSI) ⁹⁷
Nursing Delirium Screening Scale (NuDESC) ⁹⁸
Intensive care unit screening instruments
Confusion Assessment Method for the Intensive Care Unit (CAM-ICU) ⁹⁹
Intensive Care Delirium Screening Checklist (ICDSC) ¹⁰⁰

*CAM is used by many as a screening tool (short form) and as a diagnostic instrument (long form plus the algorithm). Increased reliability is demonstrated when used by trained evaluators using cognitive screening tests rather than as a screening tool informed only by routine patient care.¹⁰¹

V. MEDICATIONS AS RISK FACTORS FOR POSTOPERATIVE DELIRIUM

Recommendation

- Prescribing health care providers should avoid medications that induce delirium postoperatively in older adults to prevent delirium.

Anticholinergic medications, sedative-hypnotics, and meperidine contribute considerably to risk of postoperative delirium in older adults.^{1,43-45} The medication itself, or medications within these classes, have been shown to more than double the odds of an older patient developing delirium.^{1,43-45} Diphenhydramine increases the odds ratio of developing delirium to 2.3 (95% CI 1.4 to 3.6) in older adults.⁴³ Meperidine was associated with delirium in adults older than 50 years with an odds ratio of 2.7 (95% CI 1.3 to 5.5), and benzodiazepines had an increased odds of 3.0 (95% CI 1.3 to 6.8).¹ Clinical guidelines to improve the safety of medication use in older adults recommend avoidance of agents prone to increasing the risk or severity of delirium⁴⁶ (Table 7).

The use of multiple medications (5 or more) has been associated with an increased risk of delirium, likely due to the psychoactive properties of 1 or more of the agents in the patient's regimen.²⁴

Because specific needs for any of these medications may outweigh potential risks, the approach must be customized and requires individual patient evaluation.

Table 6. Guideline Recommendations on Routine Delirium Screening

Guideline/publication	Recommendation/conclusion
VA Evidence-based Synthesis Program Reports –“Delirium: Screening, Prevention, and Diagnosis - A Systematic Review of the Evidence” ²¹	Concludes that evidence is insufficient to recommend for or against delirium screening among all hospitalized or intensive care patients. Large randomized trials evaluating the impact of delirium screening on outcomes is needed.
National Institute for Health and Clinical Excellence (NICE) guideline on “Diagnosis, prevention, and management of delirium” ³⁸	Recommends delirium assessment at presentation for all people at risk of delirium and subsequently at least daily for all people admitted to hospital or long-term care.
Society of Critical Care Medicine – “Clinical practice guidelines for the management of pain, agitation, and delirium in adult patients in the intensive care unit” ²²	Recommends routine monitoring for delirium in adult intensive care patients.

For example, if a patient has a history of alcohol abuse or benzodiazepine dependence, then treatment with benzodiazepines is warranted even though the medication would typically be avoided.

VI. PHARMACOLOGIC PREVENTION OF POSTOPERATIVE DELIRIUM

Recommendations

- A health care professional trained in regional anesthetic injection may consider providing regional anesthetic at the time of surgery and postoperatively to improve pain control and prevent delirium in older adults.
- Health care professionals should optimize postoperative pain control, preferably with nonopioid pain medications, to minimize pain in older adults to prevent delirium.
- There is insufficient evidence to recommend for or against the use of antipsychotic medications prophylactically in older surgical patients to prevent delirium.
- In older adults not currently taking cholinesterase inhibitors, the prescribing practitioner should not newly

prescribe cholinesterase inhibitors perioperatively to older adults to prevent or treat delirium.

Insufficient analgesia postoperatively contributes to delirium.⁴⁷⁻⁴⁹ Postoperative pain control is important to minimize the rate of delirium.⁴⁷⁻⁴⁹ Some evidence suggests that nonopioid alternatives minimize delirium in comparison with opioid-only pain regimens.^{50,51} The use of regional anesthesia has been found to reduce delirium in 2 studies.^{52,53}

Prescribing antipsychotic medications to prevent delirium in postoperative patients has limited, inconsistent, and contradictory support in the literature. Five studies found decreased incidence of delirium with prophylactic antipsychotics,⁵⁴⁻⁵⁷ and 3 did not.⁵⁸⁻⁶⁰ Potential harms of this class of medication are considerable; therefore, antipsychotics are not recommended to prevent delirium.⁶¹⁻⁶⁵

Prophylactic administration of newly prescribed cholinesterase inhibitors are not effective in reducing postoperative delirium⁶⁶⁻⁶⁸ and may cause increased harm (including mortality).⁶⁹

Table 7. Commonly Used Medications Used in the Perioperative Setting That May Induce Postoperative Delirium⁴⁶

Drug class or drug	Examples
Drugs with anticholinergic properties	Tricyclic antidepressants: amitriptyline, doxepin, imipramine Antihistamines: cyproheptadine, diphenhydramine, hydroxyzine Antimuscarinics: oxybutynin, tolterodine Antispasmodics: hyoscyamine, scopolamine First-generation antipsychotics: chlorpromazine, thioridazine H ₂ -receptor antagonists: cimetidine, ranitidine Skeletal muscle relaxants: cyclobenzaprine, tizanidine Antiemetics: promethazine Olanzapine Paroxetine
Corticosteroids	Methylprednisolone Prednisone
Meperidine	Meperidine
Sedative hypnotics	Benzodiazepines: alprazolam, diazepam, lorazepam, midazolam Sedative-hypnotics: zolpidem, zaleplon
Polypharmacy	Starting ≥ 5 new medications increases risk of delirium.

Table 8. Format and Process to Make Delirium Education Successful

1. Initial sessions ranging from 1 hour to several half-day sessions
2. Ongoing “refresher” follow-up sessions with one-on-one interactions, support, and tailored feedback
3. Case studies or live videos with small group discussion to illustrate delirium presentation and management
4. Inclusion of both written (pocket cards, tip sheets, assessment tools) and oral content
5. Engaging leadership and providing protected time for attendance
6. Providing continuing education units and holding sessions in locations convenient to the learner
7. Considering interdisciplinary learning approach with other health care professionals
8. Using unit champions and peer support

VII. NONPHARMACOLOGIC PREVENTION AND TREATMENT OF POSTOPERATIVE DELIRIUM

Recommendations

- Health care systems and hospitals should implement formal educational programs with ongoing (at least quarterly) formal and/or informal refresher sessions for health care professionals on delirium in at-risk older surgical adults to improve understanding of the epidemiology, assessment, prevention, and treatment of delirium.
- Health care systems and hospitals should implement multi-component nonpharmacologic intervention programs delivered by an interdisciplinary team for the entire hospitalization in at-risk older adults undergoing surgery to prevent delirium.
- Health care professionals should consider multi-component interventions implemented by an interdisciplinary team in older adults diagnosed with postoperative delirium to improve clinical outcomes.
- There is insufficient evidence to recommend for or against hospitals creating, and health care professionals using, specialized hospital units for the inpatient care of older adults with postoperative delirium to improve clinical outcomes.

Several studies have shown that delirium education is an essential part of the prevention and treatment of postoperative delirium in older adults. Educational content should be focused on recognition of delirium, screening tools, outcomes, risk factors, and nonpharmacologic and pharmacologic approaches for prevention and management. Education is most effective when combined with reinforcement and booster sessions, peer support, one-to-one interactions, and feedback sessions (Table 8).

At least 10 moderate to high quality studies have documented the effectiveness of nonpharmacologic

Table 9. Behavioral and Nonpharmacologic Strategies for Prevention of Delirium

1. Sensory enhancement (ensuring glasses, hearing aids, or listening amplifiers)
2. Mobility enhancement (ambulating at least twice per day if possible)
3. Cognitive orientation and therapeutic activities (tailored to the individual)
4. Pain control with scheduled acetaminophen if appropriate
5. Cognitive stimulation (if possible, tailored to the individual's interests and mental status)
6. Simple communication standards and approaches to prevent the escalation of behaviors
7. Nutritional and fluid repletion enhancement
8. Sleep enhancement (daytime sleep hygiene, relaxation, non-pharmacologic sleep protocol, and nighttime routine)
9. Medication review and appropriate medication management
10. Daily rounding by an interdisciplinary team to reinforce the interventions

Strategies should usually include these core elements but this list is not all inclusive.^{5,14}

approaches for delirium prevention, as outlined in Table 9. These interventions, implemented and monitored by an interdisciplinary team, successfully reduced the incidence of delirium about 30% to 40% in previous studies.^{14,70-77}

Although the evidence is weaker for management of delirium, 7 of 13 studies of low to moderate quality demonstrated benefit for nonpharmacologic approaches.^{73,75,78-81} The strategies are similar to those for prevention but also include strategies for de-escalation of agitation, education of nurses and physicians, and proactive geriatric consultation.

Finally, there was insufficient evidence to make recommendations about specialized delirium units. Only 6 heterogeneous, nonrandomized studies existed with high risk of bias.

VIII. MEDICAL EVALUATION OF POSTOPERATIVE DELIRIUM

Recommendation

- The health care professional should perform a medical evaluation, make medication and/or environmental adjustments, and order appropriate diagnostic tests and clinical consultations after an older adult has been diagnosed with postoperative delirium to identify and manage underlying contributors to delirium.

Delirium is usually the result of a physiologic stressor (eg, an operation) and predisposing patient risk factors.^{3,16} Postoperative precipitants may include medications (see section V), infection, electrolyte abnormalities, and environmental causes.^{3,82,83} Other postoperative complications

Table 10. Precipitating Factors for Postoperative Delirium and Recommended Evaluation^{3,82,83}

Precipitant	Evaluation considerations
Environmental factors	
Inadequately controlled pain	Physical examination
Sleep disturbance	Review of medical records, including nursing notes
Use of physical restraints	
Use of bladder catheterization	
Poor vision and/or hearing	
Infection	
Urosepsis	Physical examination
Pneumonia	Urinalysis and white blood cell count
Line sepsis	Chest radiograph
Bacteremia	Blood, sputum, and urine cultures
Surgical site infection	Imaging of surgical site if indicated
Delirium-inducing medications (see Table 7 for specific medications)	Medication reconciliation
Metabolic derangement	
Hypoxia	Vital signs, including pulse oximetry
Acidosis	Laboratory evaluation, including:
Electrolyte derangement	Electrolytes, creatinine, blood urea nitrogen
Hypoglycemia	Blood gas analysis
Dehydration	Serum glucose
Acute blood loss anemia	Serum hematocrit
Hypotension/shock	
Substance withdrawal	
Alcohol	Physical examination
Benzodiazepines	Social history
Illicit drugs	Preadmission medication reconciliation

such as myocardial infarction or pulmonary embolus may initially present as delirium in older adults. Four multicomponent interventional studies examined the evaluation and treatment of precipitating cause(s) of delirium.^{38,78,84,85} These studies reported decreases in delirium duration and severity, delirium at hospital discharge, and length of stay, and improved postoperative cognitive function. It is not possible to conclude which component(s) of these diverse multicomponent interventions were responsible for the favorable outcomes.

Although the overall quality of evidence is low, because of the clinical importance of identifying and treating the underlying cause of a patient's delirium, health care professionals are strongly advised to perform a medical evaluation, make medication and/or environmental adjustments, and order appropriate diagnostic tests to identify and manage underlying delirium contributors (Table 10). Neuroimaging is typically limited to patients with recent falls or head trauma, use of anticoagulation, focal neurologic signs, or fever without other explanation.³

IX. PHARMACOLOGIC TREATMENT OF POSTOPERATIVE DELIRIUM

Recommendations

- The prescribing practitioner may use antipsychotics at the lowest effective dose for the shortest possible duration to treat patients who are severely agitated or distressed, and are threatening substantial harm to self and/or others. In all cases, treatment with antipsychotics should be used only if behavioral interventions have failed or are not possible, and ongoing use should be evaluated daily with in-person examination of patients.
- The prescribing practitioner should not prescribe antipsychotic or benzodiazepine medications for the treatment of older adults with postoperative delirium who are not agitated and threatening substantial harm to self or others.
- The prescribing practitioner should not use benzodiazepines as a first-line treatment of the agitated postoperative delirious patient who is threatening substantial harm to self and/or others to treat postoperative

delirium except when benzodiazepines are specifically indicated (including, but not limited to, treatment of alcohol or benzodiazepine withdrawal). Treatment with benzodiazepines should be at the lowest effective dose for the shortest possible duration, and should be used only if behavioral measures have failed or are not possible and ongoing use should be evaluated daily with in-person examination of the patient.

The evidence for pharmacologic treatment of postoperative delirium with antipsychotic medications is difficult to interpret because of the heterogeneity in the drugs studied, dosages administered, patient populations, and outcomes examined.⁸⁶⁻⁸⁸ The potential benefit of antipsychotics is decreased delirium severity, although results of clinical trials are not consistent. The potential harms associated with antipsychotic medication are numerous.^{61-65,89} There is no evidence of benefit from treatment of antipsychotics in patients without agitation. The use of antipsychotics should be reserved for short-term management of acute agitation in the setting of possible substantial harm, ie, for treatment of postoperative delirium in older surgical patients with behavior such as agitation that substantially threatens the patient's safety or the safety of others.

No current evidence supports the routine use of benzodiazepines in the treatment of delirium. There is substantial evidence that benzodiazepines promote delirium.⁹⁰ However, benzodiazepines remain the recommended treatment of alcohol withdrawal.⁹¹

IMPLEMENTATION

Developing a set of national guidelines for postoperative delirium care is the first step in the translational discovery-to-delivery cycle. This translational cycle is considered inefficient and expensive.⁹²⁻⁹⁴ New, emerging "implementation science" may help in speeding the translational cycle by understanding the barriers and facilitators of implementing evidence-based knowledge such as the current guideline on postoperative delirium care into the real world of health care practice. Therefore, it is important to translate the current guideline set into locally sensitive implementation tools that can be easily adapted by local quality improvement offices within each health care system.

CONCLUSIONS

Successful postoperative management of delirium for older adults requires knowledge of approaches for screening, diagnosis, risk factor assessment, and nonpharmacologic and pharmacologic interventions aimed at preventing and treating delirium. The recommendation statements within provide a framework to allow hospital

systems and health care professionals to implement actionable, evidence-based measures to address the highly morbid problem of delirium in perioperative patients.

APPENDIX 1

EXPERT PANEL MEMBERS

Co-Chairs: Sharon K Inouye, MD, MPH, Aging Brain Center, Institute for Aging Research, Hebrew Senior Life and Harvard Medical School, Boston, MA; Thomas Robinson, MD, MS, FACS, University of Colorado School of Medicine, Aurora, CO.

Panel Members: Caroline Blum, MD, MS, New York University School of Medicine, New York, NY; Jan Busby-Whitehead, MD, CMD, AGSF, Center for Aging and Health, University of North Carolina School of Medicine, Chapel Hill, NC; Malaz Boustani, MD, MPH, Indiana University School of Medicine, Indianapolis, IN; Ara Chalian, MD, Hospitals of University of Pennsylvania, Philadelphia, PA; Stacie Deiner, MD, Mount Sinai Hospital, New York, NY; Donna Fick, PhD, RN, FGSA, FAAN, School of Nursing and College of Medicine, Pennsylvania State University, University Park, PA; Lisa Hutchison, PharmD, University of Arkansas for Medical Sciences, Little Rock, AR; Jason Johanning, MD, FACS, University of Nebraska Medical Center, Omaha, NE; Mark Katlic, MD, FACS, Sinai Hospital, Baltimore, MD; James Kempton, Yale University and West Haven VA, New Haven, CT; Maura Kennedy, MD, MPH, Beth Israel Deaconess Medical Center, Boston, MA; Eyal Kimchi, MD, Massachusetts General Hospital, Boston, MA; Cliff Ko, MD, University of California Los Angeles, Los Angeles, CA; Jacqueline Leung, MD, MPH, University of California San Francisco, San Francisco, CA; Melissa Mattison, Harvard University and Beth Israel Deaconess Medical School, Boston, MA; Sanjay Mohanty, MD, American College of Surgeons, Chicago, IL; Arvind Nana, MD, JPS Health, Fort Worth, TX; Dale Needham, MD, PhD, Johns Hopkins University, Baltimore, MD; Karin Neufeld, MD, MPH, Johns Hopkins Hospital, Baltimore, MD; Holly Richter, PhD, MD, University of Alabama at Birmingham, Birmingham, AL.

Disclosure Information for Panel Members:

Drs Blum, Boustani, Chalian, Inouye, Katlic, Kempton, Kennedy, Kimchi, Ko, Mattison, Mohanty, and Nana indicated no conflicts of interest. Dr Busby-Whitehead indicated her spouse is a paid consultant for Ironwood Pharma, and her spouse is also a consultant and has received a grant from Ono Pharma: Fecal Incontinence and Irritable Bowel Syndrome. Dr Deiner and spouse have received grants from the NIH, ADRC, and

AGS Foundation for Anesthesia Education and Research; Dr Deiner's spouse has received grants from Brookdale, and is on the speaker's panel for Baxter. Both Dr Deiner and spouse receive product support from Covidien and Aspect. Dr Fick is a paid consultant for SLACK Inc. as Editor of the *Journal of Gerontological Nursing*. Dr Fick has current R01 funding from the NIH and from the National Institute of Nursing Research. Ms Giovannetti is employed by the National Committee for Quality Assurance (NCQA), which conducts health care quality research, develops health care quality measures, publishes health care quality data, and distributes health care quality products (eg, Accreditation, Certification). Dr Hutchison received grants from MedEd Portal/Josiah Macy Foundation IPE Award, and Dr Hutchison and spouse hold shares in Cardinal Health and Care Fusion. Dr Johanning received a royalty on Isolation Station from Harloff Corporation. Dr Mattison is a paid consultant for Practical Reviews in Hospital Medicine and is an UpToDate Contributor. Dr Leung and her husband receive funding from the NIH. Dr Leung's husband is the co-founder of Mynosys Inc. Dr Needham is Chair of the Early Mobility Committee for the upcoming Society of Critical Care Medicine Clinical Practice Guideline for pain, agitation, delirium, early mobility, and sleep. Dr Neufeld is participating on a grant from ORNIM medical manufacturing that is funding a portion of her salary. Dr Richter is a paid consultant for and has received a research grant from Pelvalon. She also has received royalties from UpToDate. Dr Robinson has received research grants from Medtronic, Inc., Karl Storz Endoscopy America, and Covidien. Nancy Lundebjerg had no conflicts of interest to disclose. Gina Rocco and Jirong Yue have no conflicts of interest to disclose. Sneha Patil has commercial interest in Oracle.

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APPENDIX 2

A. Peer Review Organizations

The following organizations with special interest and expertise in the treatment and prevention of postoperative delirium provided peer review of a preliminary draft of this guideline: Academy of Geriatric Emergency Medicine, Alzheimer's Association, American Academy of Family Physicians, American Academy of Hospice and Palliative Medicine, American Academy of Neurology, American Academy of Physical Medicine and Rehabilitation, American Association of Critical Care Nurses, American Case Management Association, American College of Chest Physicians, American College of Emergency Physicians, American College of Physicians, American College of Surgeons, American Delirium Society, American Medical Directors Association, American Physical Therapy Association, American Society of Colon and Rectal Surgeons, American Society of Consultant Pharmacists, American Society of Health System Pharmacists, American Thoracic Society, American Urogynecologic Society, Association of Academic Physiatrists, Gerontological Advance Practice Nursing Association, National Association of Social Workers, Society for Advancement of Geriatric Anesthesia, Society for Social Work Leadership in Health Care, Society of Critical Care Medicine, Society of American Gastrointestinal and Endoscopic Surgery, Society of Gynecologic Surgeons, and Society of Hospital Medicine.

B. Cognitive Screening Tools

Abbreviated Mental Test (AMT): includes 10-item, 6-item, and 4-item versions
 Blessed Dementia Rating Scale
 Clinical Dementia Rating (CDR)
 Clock Drawing Test
 Comprehensive Geriatric Assessment
 Controlled Oral Word Association (COWA) or other tests of verbal fluency (words beginning with "F," "A," "S")
 Days of the week backward
 Digit Cancellation Test
 Digit Span - forward and backward
 Mini-Cog
 Months of the year backward
 Montreal Cognitive Test (MoCA)
 Short Orientation Memory Concentration Test (SOMC)
 Short Portable Mental Status Questionnaire (SPMSQ)
 Trailmaking Test A
 Trailmaking Test B
 Vigilance "A" Test (VAT)

The Mini-Mental State Exam (MMSE) has previously been used, but is not currently recommended since it requires a licensing agreement and per use fee.

C. Delirium Diagnostic Tools (Recommended for use by experts/trained evaluators; generally too lengthy to serve as screening tools)

Confusion Assessment Method (CAM)*
 Delirium Rating Scale Revised 1998 (DRS-98R)
 Memorial Delirium Assessment Scale (MDAS)

*CAM is used by many as a screening tool (short form) and as a diagnostic instrument (long form plus the algorithm). Increased reliability is demonstrated when used by trained evaluators using cognitive screening tests rather than as a screening tool informed only by routine patient care.¹

D. Delirium Screening Tools (Instruments that are quick to use and designed for the nonexpert)

4AT
 Bedside Confusion Scale
 Clinical Assessment of Confusion (CAC)
 Clinical Global Impressions – Delirium (CGI-D)
 Cognitive Test for Delirium (CTD)
 Confusion Assessment Method (CAM)* short form
 Confusion Assessment Method–ICU version (CAM-ICU)[†]
 Confusion Rating Scale (CRS)
 Delirium Index
 Delirium-O-Meter (DOM)
 Delirium Observation Screening (DOS)
 Delirium Symptom Interview (DSI)
 Delirium Diagnostic Test- Provisional (DDT-Pro)
 Intensive Care Delirium Screening Checklist (ICDSC)[‡]
 NEECHAM Confusion Scale
 Nursing Delirium Screening Scale (Nu-DESC)
 Single Question in Delirium (SQiD)

*CAM is used by many as a screening tool (short form) and as a diagnostic instrument (long form plus the algorithm). Increased reliability is demonstrated when used by trained evaluators using cognitive screening tests rather than as a screening tool informed only by routine patient care.¹

[†]CAM-ICU and ICDSC have demonstrated high sensitivity and specificity in critically ill patients; even though they were developed as screening tools, they often are used as part of diagnostic evaluation in the ICU setting, particularly in critically ill, mechanically ventilated patients.²⁻⁴

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