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Delirium History and Preoperative Mild Neurocognitive Disorder: An Opportunity for Multidisciplinary Patient-Centered Care

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Manuscript Preparation E
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Patient: Male, 75
Final Diagnosis: Mild neurocognitive disorder
Symptoms: Apathy • irritability • reduced concentration worsening visual disturbances
Medication: —
Clinical Procedure: Preoperative workup
Specialty: Anesthesiology

Objective: Challenging differential diagnosis

Background: Delirium is a well-established clinical phenomenon that remains largely underdiagnosed. In light of its association with diminished postoperative outcomes, recent efforts involve implementing preventive strategies and fostering early detection. This report highlights how multidisciplinary interventions can inform risk for delirium and the challenges that accompany identifying at-risk patients.

Case Report: A 75-year-old male with a history of postoperative cognitive complications including delirium and mild cognitive impairment. He was attending an outpatient preoperative anesthesia clearance assessment prior to a planned removal for a left frontoethmoidal sinus mucocele. As part of clinical care, an in-house neuropsychologist completed a neurobehavioral exam to assess current cognitive status and guide perioperative cognitive care recommendations. Findings were consistent with mild neurocognitive disorder.

Conclusions: Given the patient's history and current status, he was listed as a high delirium risk. The team provided information on delirium and delirium risk factors, encouraged the patient to speak to his surgeon and also a geriatric specialist to assist with decision making. Due to their concern about delirium, the patient and his caregiver opted to postpone the left frontoethmoidal sinus mucocele removal.

MeSH Keywords: Cognition Disorders • Delirium • Patient-Centered Care

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Background

The Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5) defines delirium as a disturbance in attention and awareness that develops over a short period, represents an acute change from baseline, fluctuates throughout the course of a day, and can involve disturbances in other cognitive domains that is distinct from neurocognitive disorders [1]. Delirium risk factors include advancing age, pre-existing central nervous system vulnerabilities (low general cognition), frailty, past history of delirium, immobilization, recent surgeries, history of bone fractures, infections, hypoalbuminemia, abnormal sodium, dehydration, excess volume resuscitation, severe illness, alcohol use, polypharmacy, and depression [2–4]. Despite being a common postoperative phenomenon, delirium remains mostly unrecognized, partly as a result of limitations in a clinician's ability to discern "acute changes" in mental status from a patient's baseline characteristics [2]. Delirium associates with prolonged recovery, hospital readmission, future institutionalization, and increased mortality [5,6].

The American College of Surgeons and the American Geriatric Society recommend routine assessment of delirium risk factors in older patients considering surgery [7]. In the preoperative context, prompt identification of cognitive and medical vulnerabilities should assist with identifying factors contributing to reversible dementia (e.g., polypharmacy, anticholinergic use, vitamin B deficiency, and frailty) [7]. Importantly, information on cognitive status can guide pre-and post-operative cognitive care recommendations to the perioperative care team, geriatricians, and primary care physicians. Specific to delirium, a neurobehavioral examination also provides baseline data for quantifying pre-to post-operative behavioral and cognitive changes. Early recognition of cognitive impairment should also guide intraoperative and postoperative monitoring to mitigate delirium-related morbidities.

For this report, we present a patient seen within the context of a multidisciplinary presurgical anesthesia clinical setting. The case report expands on existing literature by highlighting how multidisciplinary assessment with neuropsychology is achievable within the outpatient setting and can provide physicians and patients with resources necessary to make informed medical decisions. It also illustrates professional challenges associated with identifying a patient at increased risk for delirium. Written patient consent was obtained for this publication before submission.

Case Report

Mr. M, a 75-year-old, right-handed, Caucasian, male had a history of left frontoethmoidal sinus mucocele and worsening visual disturbances. He was scheduled for a preoperative workup to assess his risk for major adverse perioperative events. Medical history includes coronary artery disease, diabetes mellitus, hypertension, chronic obstructive pulmonary disease, familial chondrocalcinosis, chronic pain, sleep apnea treated with continuous positive airway pressure (CPAP) with intermittent use, renal insufficiency, cognitive dysfunction, and major depression. Mr. M and his caregiver reported prolonged aggression and combativeness following 3 prior surgeries from 1996, 1999, and 2004. An additional episode of postoperative altered mental state occurred in 2009 after emerging from sedation for a bronchoscopy. All episodes resulted in hospital admissions lasting from one to three weeks. The most recent hospitalization in 2016 prompted a postoperative outpatient neuropsychology evaluation, which showed signs of (non-amnestic) mild cognitive impairment. Medications at time of evaluation included aspirin (325 mg), amlodipine (5 mg), atorvastatin (40 mg), labetalol (100 mg), furosemide (40 mg), montelukast (10 mg), darifenacin (7.5 mg), dutasteride (0.5 mg), ropinirole (4 mg), modafinil (100 mg), oxycodone (40 mg), hydrocodone (10–25 mg), trazadone (40 mg), diazepam (5 mg), and sertraline (50 mg). His anticholinergic load [8] showed high risk for anticholinergic toxicity. A comprehensive metabolic panel was notable for abnormally high urea nitrogen (24 mg/dL) and glucose (112 mg/dL) levels. Sodium, potassium, chloride, carbon dioxide, creatinine, BUN/creatinine ratio, calcium, albumin, total protein, albumin/globulin ratio, total bilirubin, and alkaline phosphate levels were within expected ranges. Family history was positive for a complicated reaction to anesthesia (mother) not associated with malignant hyperthermia.

As part of the preoperative interview with the anesthesia staff member, Mr. M completed a routine frailty-cognitive screener, which included a frailty test [9], clock drawing test [10], and a 3-word memory task [11]. This assessment showed frailty and Mr. M ambulated using an electric wheelchair, reported low physical activity, and described feeling tired most of them time. Staff cognitive screening suggested executive dysfunction. Mr. M's medical history combined with his current cognitive screening performance prompted a consult with the in-house neuropsychology team for a more extensive patient and caregiver interview and a neurobehavioral examination. The goal of this examination was to rule out the presence of a major neurocognitive disorder, gaining insight into his current cognitive strengths/weaknesses, help assess risk for delirium, and provide input on perioperative cognitive care considerations for his anesthesia, surgery, and his primary care providers. Table 1 shows neurobehavioral exam domains and measures.

Consistent with the initial screener, the neurobehavioral exam revealed further evidence of executive dysfunction including social disinhibition, non-linear discourse, diminished frustration tolerance, and behavioral impulsivity. With respect to the

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Table 1. Components of the PeCAN[1] neurobehavioral examination.

Domain	Instrument
Patient and Caregiver Interviews	Completed by Neuropsychologist
Premorbid Functioning/Reading Abilities	Wide Range Achievement Test – Reading Subtest Barona Demographic Estimate of Premorbid IQ
Global Cognitive Functioning	Mini-Mental State Exam (MMSE) Clock Drawing to Command and Copy (from screening)
Attention	Wechsler Adult Intelligence Test, 3rd edition (WAIS-III) Digit Span (WAIS-III) Forward Span Boston Revision Mental Control Subtest – Months Forward
Working Memory/Inhibitory Functioning	WAIS-III Digit Span Backward Span Letter Fluency (Letter F) Boston Revision Mental Control Subtest – Months Backwards MMSE sub-item: WORLD spelled backwards
Language	Semantic Fluency (Animal) Test of Reception of Grammar (TROG), selected items MMMSE subitems (repetition, comprehension, writing)
Visuoconstruction	Clock Drawing to Command and Copy MMSE Intersecting Pentagons
Learning and Memory	Hopkins Verbal Learning Test-Revised (HVLT-R) MMSE Orientation Items MMSE 3-word Recall (from screening)
Psychological	Mood Likert Scale Pain Assessment
Functional Status	Instrumental and Basic Activities of Daily Living (completed by caregiver)

Components of Perioperative Cognitive Anesthesia Network[1] administered to Mr. M.

previous testing, Mr. M exhibited significant reductions in measures of attention, mental manipulation, and initiation. Auditory comprehension, learning, memory, and orientation were within the average range. He continued to maintain functional independence (i.e., managing his finances and dispense his medications), but reported increased reliance on compensatory strategies (e.g., writing notes) and caregivers to complete tasks. Behaviorally, his caregiver described him as increasingly irritable and apathetic. Active medication consumption, as well as endocrine, renal, respiratory, and cardiac functioning were considered during case conceptualization. Based on his age, history of delirium, medical status, and cognitive profile, a licensed neuropsychologist assigned a diagnosis of mild neurocognitive disorder using DSM-5 [1] criteria. Mr. M's history of vascular, respiratory, and renal insufficiencies, as well as current consumption of anticholinergic medications, influence his cognitive functioning. He was listed as high risk for postoperative cognitive complications.

During a patient-caregiver-team feedback session, Mr. M learned that general anesthesia was the only choice for anesthetic management given the location of the mucocele and the extent of surgery required. The neuropsychology team educated Mr. M and his caregiver about delirium, his risk for delirium, and instructed Mr. M's caregiver on how to check for delirium with the Confusion Assessment Measure-ICU (CAM-ICU) [12]. For preoperative cognitive optimization, the neuropsychology team encouraged Mr. M to increase his CPAP compliance, pursue behavioral interventions for mood symptoms, and schedule a consult with a geriatric specialist to streamline his medications for polypharmacy and high anticholinergic burden. The anesthesia team additionally recommended increased participation in physical activity and dietary modification to increase functional reserve. Due to Mr. M's history of chondrocalcinosis, the intraoperative team was given specific instructions for positioning (e.g., placed patient in a Trendelenburg position, allow left armrest on his side, etc.). Results and recommendations were documented in the medical record and shared with other providers. After a discussion with his caregiver and the team, Mr. M decided to postpone the procedure. He stated that he did not wish to repeat another episode of prolonged hospitalization or risk further cognitive decline.

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Discussion

Approximately 13% of community-dwelling adults with cognitive impairment develop delirium [13]. In the perioperative context, the incidence of delirium among older adults with cognitive impairment increases to up to 66% [14], and comorbid delirium and memory and executive functions deficits leads to increased utilization of emergency/rehabilitation services and prolonged hospitalization above and beyond delirium or dementia alone [13]. As such, identifying the presence of cognitive impairment in older adults presenting for elective surgery assists calculating the cost/benefit ratio of a procedure. Failure to assess preoperative cognitive impairment may misrepresent patients' risk for delirium and represents a roadblock to early detection of delirium [15]. Identifying cognitive impairment in older adults could guide intraoperative and postoperative care. In adults with dementia, interventions tailored to specific risk factors (e.g., disorientation, sleep deprivation, dehydration, immobility) may reduce the number and duration of delirium episodes [16].

In this case report, Mr. M's performance did not warrant a dementia diagnosis. The neurobehavioral exam revealed cognitive and behavioral decline with respect to his previous neuropsychological assessment in 2016. The neurobehavioral examination identified potential targets for behavioral and medical interventions (e.g., intermittent compliance with CPAP machine and dietary recommendations, frailty, high risk of anticholinergic toxicity, and limited response to pharmacotherapy for mood symptoms) that, if addressed before surgery, could maximize postoperative outcomes.

Mild neurocognitive disorder or mild cognitive impairment (MCI) is an intermediate stage between normal cognition and dementia; wherein adults may exhibit cognitive insufficiencies on objective testing in the context of preserved functional independence (e.g., pay bills, manage medications, prepare meals) [17]. In the perioperative context, MCI has been associated with alterations in inflammatory processes and increased risk for delirium [18]. Identifying MCI before surgery may, therefore, help to reduce postoperative delirium rates. MCI can present with single and multi-domain weaknesses (e.g., amnestic, non-amnestic, mixed) [19]. Mr. M exhibited more executive dysfunction and some of his scores were 1 to 1.5 standard deviations lower at our testing relative to previous reported testing. At the time of our evaluation, he was oriented and showed intact comprehension. Changes in comprehension and orientation after surgery would flag for further consultation and may indicate a delirium process rather than preexisting cognitive impairment.

Despite the well-documented relationship between preoperative cognition and postoperative outcomes, cognitive assessment is not a routine part of the preoperative evaluation. Our tertiary care preoperative clinic includes a two-phase cognitive screening. Phase one requires preoperative medical professionals to complete a 3-minute frailty-cognitive screener for all patients age >64. Patients who evidence signs of frailty and cognitive vulnerabilities on the screening tool are referred for phase 2, which involves a more extensive neurobehavioral examination that is administered and interpreted by neuropsychologists trained in dementia, postoperative cognitive decline, and delirium. Subsequently, recommendations are developed and disseminated to the patient and the anesthesia and referring physicians and documented in the patient's medical record. Additionally, the inpatient and surgical teams as well as other allied professionals (e.g., geriatric specialists), are alerted and encouraged to monitor and/or consult in the case in order to mitigate delirium-related morbidity.

The neurobehavioral examination offers an opportunity to acquire additional information on biopsychosocial risk factors as well as caregiver involvement and support. Active patient participation in clinical decision-making is consistent with the effort to improve quality of care and in line with the Institute of Medicine's desire to provide care that is consistent with the patient's preferences and needs [20,21]. Evidence suggests that clinical recommendations that are consistent with the patient's values yield improved outcomes and increased compliance (e.g., engagement in health-related behaviors, medication adherence) [22,23]. Promoting patient-centered care is also in the spirit of the Hippocratic Oath and consistent with a clinician's ethical obligation to promote a patient's autonomy [24]. For Mr. M, our routine frailty-cognitive screener, coupled with the neurobehavioral examination, fostered dialogue between the patient, his caregiver, and clinicians. Importantly, our multidisciplinary and tiered assessment ultimately gave Mr. M and his caregiver an opportunity to make an informed medical decision.

A clinical trial evaluating the cost-effectiveness of the neurobehavioral examination is needed. Moreover, future researchers may wish to determine whether the neurobehavioral examinations serve as an intervention for patients with cognitive vulnerabilities, presenting for a preoperative workup.

Conclusions

Partnerships with neuropsychology professionals could improve hospital resources by identifying patients who are at high risk for postoperative cognitive complications, which will inform perioperative expectations and assist in postoperative planning.

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Department and Institution where work was done

Work Completed at The Preoperative Anesthesia Center by the Perioperative Cognitive and Anesthesia Network Team, University of Florida, Gainesville, USA

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Conflict of interest

None.

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