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From Dollars to Sustainability: A Reinvigorated Goal for Anesthesiologists

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The inexorable rise in health care costs has brought ever-greater emphasis on cost reduction in all aspects, including anesthesia care. Intraoperative anesthesia-related expenditures comprise upward of 6% of the total hospital cost for an inpatient procedure (*Curr Opin Anaesthesiol* 2012;25:221-5). We describe efforts at Ohio State to reduce both direct and environmental procedural costs while maintaining environmental stewardship.

We initially focused on curbing the use of desflurane. Desflurane's rapid action and its favorable pharmacokinetic profile make it a desirable volatile anesthetic. However, it has both direct costs (it is approximately 10 times more expensive than isoflurane and four times more expensive than sevoflurane) and environmental costs (*BMJ* 2022;377:o1301). The global warming potential (GWP) of desflurane is about 3,700, approximately 10 times greater than sevoflurane and twice that of isoflurane. Even more daunting is the fact

that yearly emissions of inhaled anesthetic agents in CO₂ equivalents are comparable to those emitted from 1 million cars or one coal-fired power plant (*Br J Anaesth* 2010;105:760-6).

Current recommendations to reduce the environmental burden from waste anesthesia gases highlight the importance of avoiding desflurane and nitrous oxide, lowering fresh gas flows, and considering total intravenous anesthesia (TIVA) and regional anesthesia techniques where applicable (*ASA Monitor* 2023;87:24).

Our efforts to reduce desflurane use were initially unsuccessful. Our departmental communications were focused on reducing pharmaceutical costs of desflurane. Despite repeated messaging from 2014 to 2017, our desflurane expenditures continued to rise, reaching their peak in 2017 (Figure 1).

In 2018, we started to include the environmental costs of desflurane, focusing on sustainable anesthesia practice. We first launched an informative Grand *Continued on page 4*



30-Day Mortality Goal Starts with Consistent Nomenclature

Lisbeth Evered, BSc, MSc, PhD Daniel J. Cole, MD, FASA

Brain health is increasingly acknowledged as the most common issue with regard to complications associated with anesthesia and surgery in older individuals. It is well known that increasing age and preoperative cognitive impairment are the leading predictors of cognitive decline in this group, but there

has been little investigation regarding the impact of preoperative cognitive decline on mortality (*Anaesthesia* 2022;77:34-42). While quality of recovery with respect to cognition and function are significant patient-centered outcomes, survival is obviously the primary concern. *Continued on page 6*



'I Think I'm Going to Be Sick!'

Zachary Deutch, MD, FASA
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Who among us has not heard these dreaded words, or something similar? We do our best to avoid the problem, but still we occasionally fail, hand over emesis basins, and watch unfortunate patients heave into them. Perioperative nausea and vomiting (n/v) is both feared and loathed, and is a significant detractor to patient experience and anesthesia-related quality metrics. Further, in certain types of surgery, such as intracranial, facial plastics, and intranasal ENT procedures, the physical act of emesis poses a risk for incisional dehiscence(s), bleeding, and similar morbidity.

Let's turn to our expert this month, Dr. T.J. Gan, a physician-scientist who is well versed in the epidemiology and treatment of all things nausea and vomiting-related. He will provide a refresher and some clinical guidance; hopefully, his experience can assist us in our quest to reduce "n/v" rates to as close to zero as possible.

Dr. Gan, thank you for joining us. Can you describe your current position and responsibilities?
I am currently Professor and Head of the Division of Anesthesiology and *Continued on page 8*



SPECIAL SECTION

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Guest Editor: George Tewfik, MD, MBA, FASA

Your Patient's Brain: 30-Day Mortality and Consistent Nomenclature

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A recent retrospective, population-based cohort study of Medicare patients revealed those with a diagnosed preoperative neurocognitive disorder (NCD) were at significantly increased risk of 30-day mortality, compared with those without a preoperative diagnosis of NCD (HR 1.24 [95% CI 1.23-1.25], $p < 0.0001$) (*Lancet Healthy Longev* 2023;4:e608-17). It is well known that medical record diagnoses of NCDs significantly underestimate its true prevalence, suggesting this may be an underestimate or possibly even an overestimate of true association between NCD and postoperative mortality. As called for in this study, there is increasing pressure to assess the cognition of older individuals prior to surgery to optimize brain health. Unfortunately, the assessment of NCD in perioperative medicine differs significantly from the diagnosis of NCD in the community (as reflected in the low prevalence of NCD from the Medicare data). While this is a significant issue for future discussion, until we speak the same language with regard to nomenclature, criteria, and definitions, it is difficult to interpret the true association between NCD and mortality.

It has been 137 years since the first publication describing the issue of “brain health” following anesthesia and surgery in older individuals (*Br Med J* 1887;2:1199-1200). In his 1887 manuscript, George H. Savage observed cognitive and functional changes after anesthesia, which he reported as “insanity following the use of anaesthetics in operations” (*Br Med J* 1887;2:1199-1200). Over the ensuing decades and up to around the 1960s, there were a few published reports, but in those that did investigate these disorders, they assessed outcomes in accordance with other cognitive and functional disorders associated with aging in the community, including dementia and mild cognitive impairment (MCI) (*Lancet* 1955;269:259-63; *Lancet* 1961;2:887-93). According to the National Institutes of Health (NIH)/National Institute on Aging (NIA) guidelines and the DSM, the diagnosis of dementia (major neurocognitive disorder) and MCI (mild NCD) requires an objective assessment of neuropsychological function, a subjective assessment of memory concern/complaint from the patient or an informant, and an assessment of instrumental activities of daily living (IADLs) (*Anesthesiology* 2018;129:872-9). Given that older individuals in the community are the same individuals as those presenting for anesthesia and surgery, it is obvious that the same criteria for diagnosis should be applied for both disorders in order for us to establish an understanding of how



any perioperative changes fit within the overall cognitive and functional trajectories of an individual.

A number of studies in the intervening decades investigated psychological and psychiatric deterioration, but most were descriptive or anecdotal (*JAMA Neurol* 2023;80:1364-70). As mortality and other complications associated with anesthesia and surgery became less common in the 1980s, clinicians and researchers began to focus on investigating *quality* of survival. Despite a small body of literature addressing this issue (*vide supra*) using criteria aligned with the diagnosis of cognitive and functional decline in the community (dementia and MCI), the field took a turn away from these criteria and embraced criteria for decline that relied solely on objective neuropsychological tests. Indeed, the landmark paper by Shaw et al., identified a difference in the incidence of neuropsychological outcomes between patients having cardiac surgery and those having major surgery for peripheral vascular disease, 79% and 31%, respectively. Although many different terms had been used over the decades to represent these disorders, the terminology and definitions were adapted over the following decade and led to the widespread use of the term “postoperative cognitive dysfunction” (POCD). This term was subsequently the predominant description used in the field, although the criteria for what a deficit consisted of varied widely. This meant that comparisons of studies or meta-analysis techniques could not overcome the significant heterogeneity in many aspects of study design and outcome definitions. Nonetheless, the term POCD has been used until quite recently, albeit with substantial variability in the tests used and

criteria for decline. It should be noted that the criteria for POCD did not include any clinically overt symptoms. They did not include a subjective assessment of the patient, nor did they assess any functional outcomes, which are obviously the most important factors and often the primary reason for undergoing the surgery among those wishing to return to an engaged and social lifestyle.

In contrast, while the terminology, definitions, and criteria for cognitive decline in community-dwelling older adults has not been straightforward either, the criteria have consistently included the clinical impact of any cognitive change, including subjective and functional symptoms. With regard to terminology, the term “dementia” has largely been accepted since Alzheimer’s disease (AD) was first identified in 1906, detailed in a 1911 publication, and applied to any neurodegenerative disease, regardless of etiology, given it is now well described that there are many related dementias of varying pathophysiology (*Eur Arch Psychiatry Clin Neurosci* 1998;248:111-22). Thus, the terminology in common parlance has been consistently “dementia,” but the criteria for diagnosis have evolved. Although there have been differences between a diagnosis of dementia according to the NIH/NIA guidelines, and major NCD defined in the DSM, it is widely accepted that these are generally aligned and represent the same disease. More subtle cognitive impairment has been termed MCI in recent years and aligns with mild NCD in the DSM. Although the criteria for diagnosis evolved with some consistency across disciplines, the terminology was widely debated in previous decades among



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neurologists, psychiatrists, geriatricians, neuropsychologists, and other stakeholders, leading to inconsistent use of these terms. Additionally, it is now acknowledged that there is considerable social stigma associated with the term “dementia,” which led to the development of the Dementia Nomenclature Initiative. This project involves clinicians, researchers, and the public helping to establish a framework around communication of cognitive disorders in older individuals. The framework is intended to separate the clinical presentation of disease from possible underlying pathophysiology by taking into consideration the severity of each of the clinical symptoms as well as relevant biomarker information (*JAMA Neurol* 2023;80:1364-70).

Since around 2010, there has been a steadily growing awareness among clinicians and researchers that an overlap must exist between the individuals in the community being diagnosed with cognitive disorders and the individuals from the community presenting for anesthesia and surgery, since they all come from the same population of people. This awareness, driven in main part by anesthesiology researchers and clinicians, resulted in the formation of the Perioperative Cognition and Delirium Professional Interest Area (PIA) within the Alzheimer’s Association research arm (ISTAART) in 2012, and the ASA Perioperative Brain Health Initiative in 2016, proposed by the author (DC) in 2015. It quickly became evident that having different terminology, criteria, and definitions for cognitive disorders *in the same individuals*, based simply on whether they were surgical patients or community-dwelling, undermined any opportunity to consider and intervene in the overall cognitive and functional trajectory of an individual.

To date, it remains to be elucidated whether the cognitive disorders associated with the perioperative period are independent of dementia and MCI or super-imposed on an already vulnerable

brain with underlying neurodegenerative pathology. Until we speak the same language and classify cognitive disorders in the perioperative period with the same criteria and definitions as cognitive disorders in the community, it is unlikely we will be able to answer this question. To this end, an international, multidisciplinary group of 38 experts, initiated and supported by the Alzheimer's Association Perioperative Cognition and Delirium PIA, published recommendations for the new nomenclature for perioperative neurocognitive disorders (PND) in 2018 following a Delphi process and two in-person meetings (*Anesthesiology* 2018;129:872-9). These recommendations for the clinical diagnosis of PND included criteria and definitions for mild/major NCD observed preoperatively, postoperative delirium (POD) during admission, delayed neurocognitive recovery (dNCR) up to 30 days postoperatively, and postoperative mild/major NCD (postoperative NCD). The major advance of these criteria and definitions was to align with the DSM-5 criteria for mild/major NCD and the aligned NIA/NIH criteria for dementia and MCI. As such, the criteria for PND moved from an assessment of only objective neuropsychological

decline to an assessment in line with the DSM-5 mild/major NCD:

- Objective decline in cognition (mild [MCI] and major [dementia] of differing severity)
- Subjective concern or complaint from the individual or an informant (mild/MCI and major/dementia)
- IADLs (must be maintained for mild/MCI and deteriorated for major/dementia).

The need for change regarding the terminology and criteria in the field of brain health associated with anesthesia and surgery is reflected in the engagement of clinicians and researchers embracing the new nomenclature described in this landmark paper (*Anesthesiology* 2018;129:872-9). Indeed, perioperative neurocognitive disorders and the associated terminology have very quickly become the preferred and predominant terminology in the literature. This demonstrates the acknowledgment by clinicians and researchers in this field of our need to change and align with the criteria for mild NCD (MCI) and major NCD (dementia) in the community. Ultimately, consistent with the new dementia framework, we envisage these criteria will include biomarker data to assist in elucidating the etiology of any observed PND and further

align perioperative neurocognitive disorders with dementia and MCI in the community.

Despite the terminology being widely embraced, for which we commend clinicians and researchers in the field, we now face a further, more difficult hurdle that must be addressed before bringing about change with regard to the criteria and definitions being applied to criteria for PNDs. There are very few publications that have correctly applied the criteria as defined in the nomenclature recommendations. Almost all publications using the new terminology are still using only objective testing to classify decline. Very few publications have included a subjective complaint or an assessment of IADLs, and even fewer have then included these assessments in the criteria for PND classification. Thus, although the new terminology has been embraced, the outcomes being reported are often simply the same criteria as for POCD (objective decline only) and are therefore not aligned with diagnoses of cognitive disorders in the community.

There is no doubt we have moved forward considerably in the past decade with our understanding of the cognitive disorders associated with anesthesia and surgery in older individuals, but there is

still a long way to go. In order to begin to understand where PND exists in the overall cognitive and functional trajectory of an individual, including what defines a "vulnerable brain" and if there is any underlying neurodegenerative pathology in PND sufferers, we must move forward and implement the same criteria for PND that is used for cognitive impairment in the community. The recent nomenclature provides recommendations for the criteria, definitions, and terminology that align with criteria for diagnosis of dementia and MCI in the community and provide an excellent starting point. The overwhelming acceptance of these terms reflects the need for change. However, if we simply use objective criteria to classify decline, we have no understanding of the clinical impact of the disease, and we are simply reporting POCD with a different name. As clinicians and scientists in this field, we are driven by the hope of improving outcomes for older patients, where possible, who are most commonly undertaking surgery to improve their quality of life, reduce pain, be more socially engaged, and remain independent. It is imperative that we align the criteria and definitions for PND with those used for cognitive assessments in the community. ■

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