

## Postoperative Brain Function

### *Toward a Better Understanding and the American Society of Anesthesiologists Perioperative Brain Health Initiative*

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**I**N ANESTHESIOLOGY this month is published an article proposing a common nomenclature for describing postoperative brain function.<sup>1</sup> The article is being simultaneously published in ANESTHESIOLOGY, *Acta Anaesthesiologica Scandinavica*, *Anesthesia & Analgesia*, *British Journal of Anaesthesia*, *Canadian Journal of Anesthesia*, and the *Journal of Alzheimer's Disease*. Two questions arise: Why publish the article, and why copublish it?

Postoperative brain function, and more specifically postoperative brain dysfunction, is a significant clinical problem. From the professional athlete who wants to return quickly to the playing field, to the civil engineer who requests to be clear-headed postoperatively because she has to finish the final design for a major highway bridge that afternoon in time for a deadline, to the older grandparent who wants to resume the activities of daily independent living, we take care of patients whose expectation of anesthesia and surgery is that they return to their home and workplace in better condition than they started (and certainly no worse). Yet we have all seen patients in the immediate postoperative period who are clearly suffering from delirium, other types of cognitive dysfunction, or are “just not the same” according to their family, and the desire for rapid recovery to baseline function is not realized.

The pathophysiology of postoperative cognitive dysfunction remains elusive and is likely multifactorial (e.g., surgical stress, patient comorbidities, baseline brain frailty, and anesthetics and other drugs). Clearly, anesthesia and surgery do



***“Is everyone using the same vocabulary to describe the [same] phenomenon [of postoperative brain (dys) function]?”***

not produce a simple, binary brain state with immediate reversibility and postoperative return to pre-anesthetic function, especially in the vulnerable patient. In adults, postoperative brain dysfunction has been well recognized and studied for decades and is classically thought to occur in two domains: (1) postoperative delirium is an acute confusional state with early onset after surgery and a few days duration and is a disease entity defined by authorities such as the Diagnostic and Statistical Manual of Mental Disorders and the International Classification of Diseases; and (2) postoperative cognitive decline is symptomatically subtle, is more difficult to detect, is defined by research methodology, and has a more prolonged time course (usually weeks to months) than delirium. Older individuals, a rapidly growing surgical population, are particularly susceptible to postoperative brain dysfunction. Delirium occurs in up to 62% of high-risk surgical populations and is associated with significant complications and increased healthcare costs approximating \$150 billion in the United States.<sup>2</sup> Although causative evidence has yet to fully mature, delirium is independently associated with prolonged cognitive decline<sup>3</sup> and even a subsequent diagnosis of dementia.<sup>4</sup>

Despite these considerations and a plethora of publications regarding the integrity of postoperative brain function and descriptions of frequency, severity, characteristics, putative biomarkers, supposed mechanisms, proposed animal models, and the influence of various operations, drugs, and proposed interventions on postoperative brain dysfunction,

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Corresponding article on page 872. Timothy J. Brennan, Ph.D., M.D., served as Handling Editor for this article.

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there still exist discrepancies and disagreements within the community of clinicians and scientists across these domains. Indeed, some may even question the fundamental occurrence of various types of postoperative brain dysfunction.

One possible explanation for such a lack of clarity and consensus is taxonomy. Is everyone using the same vocabulary to describe the same phenomenon? The same organizational constructs? Publications often use the abbreviation POCD. However, this can (and has) been used variably to mean postoperative cognitive dysfunction, postoperative cognitive decline, postoperative cognitive deficit, and postoperative cognitive disorder, as well as perioperative cognitive disorder (and other perioperative variations). Absent a common lexicon, no branch of science, postoperative brain function included, can effectively move forward to a greater understanding of the roots of the problem and develop effective therapeutic targets and strategies.

The aim of the nomenclature work is to encourage use of common terminology and align it with terminology used in cognitive classifications for the general population (American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders, fifth edition). It addresses the problem that there is no standardized definition of postoperative cognitive dysfunction, for either research or clinical purposes. The taxonomy project suggests that *perioperative neurocognitive disorders* be used as an overarching term for cognitive impairment identified in the preoperative or postoperative period. This includes *neurocognitive disorder* (cognitive decline diagnosed preoperatively), *postoperative delirium* (any form of acute event), *delayed neurocognitive recovery* (cognitive decline diagnosed up to 30 days postprocedure), and *postoperative neurocognitive disorder* (cognitive decline diagnosed up to 12 months postprocedure). The nomenclature for impairment or change in cognition that is temporally associated with anesthesia and surgery would be changed from POCD to *delayed neurocognitive recovery* and *mild or major neurocognitive disorders*, depending on timing and magnitude. Use of the specifier "postoperative" is intended only to indicate a temporal relationship, and not a causal linkage, to some aspect of anesthesia or surgery.

These nomenclature recommendations may be useful but are not yet complete. For example, the timing of when postoperative cognitive function should be measured is not clearly defined. The terms "delayed" and "expected" recovery are used imprecisely and are not evidence-based, and the method by which controls should be selected is not defined and is subject to ongoing debate.

The participants in this grand endeavor, to achieve a common basis for description and organization of the terminology and various characterizations of postoperative brain dysfunction, are to be congratulated for their effort. The resulting document represents thoughtful suggestions for taxonomy and organization. These suggestions cannot be considered recommendations or standards, in the same sense that the American Society of Anesthesiologists (ASA) Committee on Standards and Practice Parameters establishes clinical practice recommendations or the International Union of Basic and Clinical Pharmacology (IUPHAR)

promulgates standards of nomenclature and classification of biologic targets for research in pharmacology and related disciplines. The suggestions were put forth by a voluntary coterie of deeply interested individuals, not by cognizant scientific societies, which are often the source for consensus documents and recommendations. It should also be noted that not all initial participants in the effort "signed on" to the final document, signifying the ongoing disparities of opinion in the field and the difficult challenges inherent in any consensus effort. Nevertheless, the suggestions for nomenclature and taxonomy are a well-intentioned and much-needed start and welcome progress to help investigators advance the science in the field of postoperative brain function. The suggestions on organization and taxonomy are not compulsory requirements to be used in future research submissions to ANESTHESIOLOGY (and presumably elsewhere), but the suggestions are published here and elsewhere because they are needed and intended to advance the mission of ANESTHESIOLOGY specifically and perioperative medicine more broadly. Copublication serves to highlight the importance of postoperative brain function to anesthesiology and the broader neuroscience community, and most importantly to the patients for whom we care daily.

The article published in print is designated with a new Table of Contents icon for ANESTHESIOLOGY, signifying that it is a Perioperative Brain Health Initiative–related article. This new icon will be used henceforth to identify those articles with implications for brain health. The Perioperative Brain Health Initiative was a product of the 2015 strategic planning process of the ASA. It has been fully embedded in the revised 3-yr strategic plan (ASA 2020). The initiative is a top priority for 2018 with a special focus on advocacy for research funding to better understand the pathophysiology of delirium. Our specialty has a rich heritage in patient safety, and the goal of this initiative was to address preventable harm, which by some estimates is now the third leading cause of death in the United States<sup>5,6</sup> and identified as a "public health crisis" by many, including the Institute for Healthcare Improvement and the National Patient Safety Foundation ([http://www.npsf.org/page/public\\_health\\_crisis](http://www.npsf.org/page/public_health_crisis); accessed September 10, 2017). Operationally, the Perioperative Brain Health Initiative focuses on postoperative delirium, which is reported to be preventable in 40% of cases.<sup>2</sup> In 2016, ASA convened a summit of representatives from medical and surgical specialties, hospital, consumer and patient organizations, and key federal agencies that led to plans for a low-barrier access program to minimize the impact of preexisting cognitive deficits and optimize the cognitive recovery and perioperative experience for adults 65 yr and older undergoing surgery. The goals are practitioner and geriatric patient resources and recommendations for risk assessment, proactive risk modification, perioperative cognitive protection, and a website and communication campaign.

Postoperative brain function is a compelling patient safety and quality-of-life issue. It is a target of opportunity for those seeking to improve perioperative care and patient outcomes. Anesthesiology is a key stakeholder specialty that has the opportunity to work collaboratively to address this public health

challenge and to improve patient health and perioperative outcomes.

### Competing Interests

Dr. Kharasch is the Editor-in-Chief of ANESTHESIOLOGY and his institution receives salary support from the American Society of Anesthesiologists for this position. Dr. Cole declares no competing interests.

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## ANESTHESIOLOGY REFLECTIONS FROM THE WOOD LIBRARY-MUSEUM

### The Trademarked Red “Elixir of Life,” Hall’s Coca Wine



From the Wood Library-Museum’s Ben Z. Swanson Collection, the obverse (*left*) of this advertising card for Hall’s Coca Wine features Dudley Hardy’s ca.1916 depiction of a lady apparently enjoying the wine as a so-called “Elixir of Life.” As to “What Is It?” (*right*), readers learn from the card’s reverse about the “wonderful feats of endurance” accomplished by native Bolivians and Peruvians after chewing “only a few Coca leaves.” A subsequent anecdote features a knighted professor from the University of Edinburgh who had climbed Ben Voirlich twice “by the aid of coca only.” Touting Hall’s Coca Wine as a nervine and restorative “after illness of any description,” the card highlights the thousand British physicians a day who were prescribing “Hall’s.” To avoid counterfeit coca wines, the public was advised to look for a trademarked red keystone...not displayed on either face of this card! (Copyright © the American Society of Anesthesiologists’ Wood Library-Museum of Anesthesiology.)

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