

New nomenclature of peri-operative cognitive impairments: possible impacts on further practice and research

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Peri-operative neurocognitive disorders (PND) is a new term recommended by an international, multidisciplinary group named as Nomenclature Consensus Working Group including experts from multiple disciplines such as anesthesiology, neurology, geriatrics, psychiatry, neuropsychology, surgery, and psychology. It is a comprehensive term for cognitive impairments identified in the peri-operative period. The recommendation of this new nomenclature has been published in several influential journals simultaneously in November 2018.^[1-6] It is a tremendous change in the field of peri-operative cognitive impairments. Therefore, it is necessary to know the reasons and purposes of this new nomenclature, differences between old and new nomenclatures, and the possible impacts of new nomenclature on clinical and basic researches of peri-operative cognitive impairments in the future.

What are the reasons and purposes of new nomenclature? In the past, cognitive function changes identified after anesthesia and surgery are often named as post-operative delirium (POD) and post-operative cognitive dysfunction (POCD). POCD is generally defined as new cognitive impairments discovered by neuropsychological tests administered before and after anesthesia and surgery, including impairment of memory, ability to combine tasks, psychomotor dexterity, etc.^[7] That is, identification of POCD does not require subjective complaints about cognitive decline from the individual, informant, or clinician and the assessment of activities of daily living (ADLs). Unlike clinical diagnostic criteria of neurocognitive disorders (NCD) in the general population, POCD is more like a research term identified by various neuropsychological tests. For this reason, clinical treatments and research results regarding POCD have not been widely recognized by other medical disciplines. However, diagnostic criteria of new nomenclature PND are aligned

with the clinical diagnostic criteria of NCD such as those already used in the Diagnostic and Statistical Manual of Mental Disorders (Fifth Edition, DSM-5). Thus, this new nomenclature will undoubtedly promote communication with experts from various disciplines and improve the quality of scientific researches.

Regarding the differences between PND and POCD, the most important aspects are the differences in the time frames. Before the new nomenclature, declines in cognitive function after anesthesia and surgery are generally divided into emergence delirium, POD and POCD, based on their times of onset. Emergence delirium commonly occurs in the post-anesthesia care unit; POD occurs 24 to 72 h after anesthesia and surgery; POCD refers to cognitive impairment or decline measured at weeks to months after anesthesia and surgery [Figure 1A].^[8]

After the new nomenclature, the term PND is recommended to describe both the pre-existing cognitive impairments before surgery and cognitive declines occurred within 12 months following anesthesia and surgery. The term POCD is no longer used in clinical practice. According to the onset times and magnitudes of cognitive impairments or changes, PND can be divided into: (1) pre-operative NCD, which refers to the cognitive impairment determined by objective assessment at baseline, can be characterized as mild NCD or major NCD; (2) POD, which occurs within 7 days after anesthesia and surgery or before discharge, has diagnostic criteria which are consistent with DSM-5; (3) delayed neurocognitive recovery (DNR), which refers to cognitive decline that is diagnosed up to 30 days after anesthesia and surgery; and (4) post-operative neurocognitive disorder (NCD post-operatively), which refers to the cognitive decline that persists or is diagnosed up to 12 months after anesthesia

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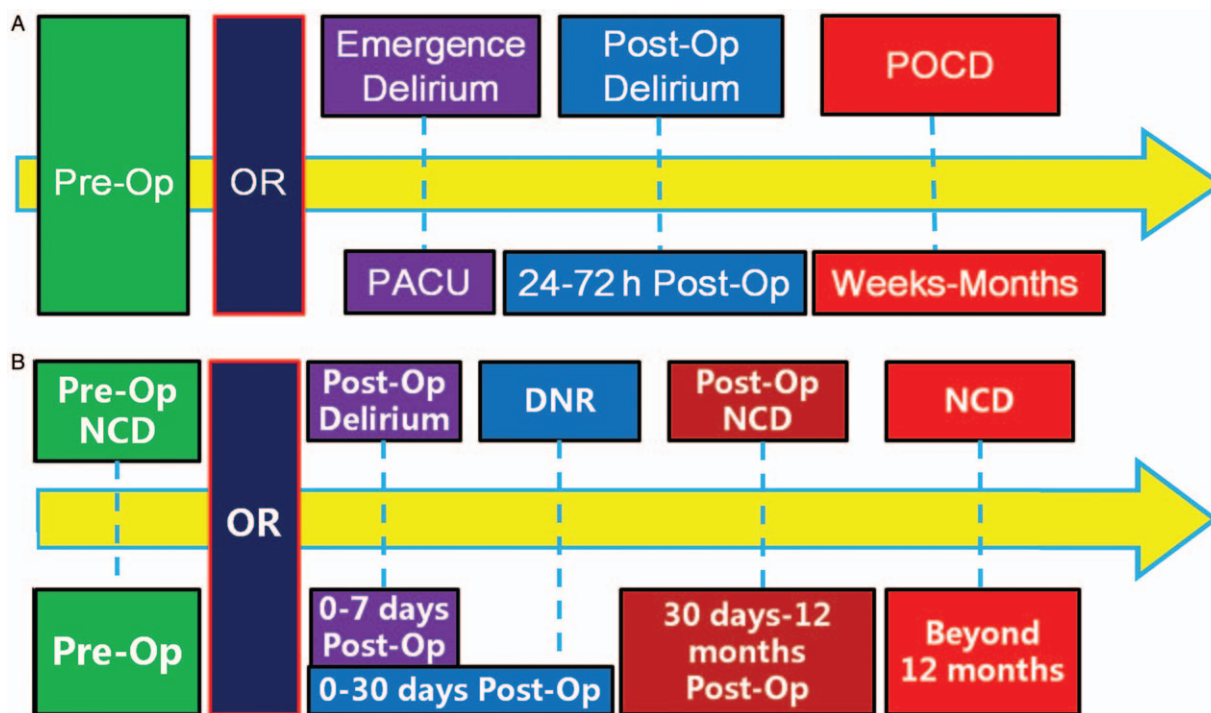


Figure 1: The differences in time frames between old (A) and new (B) nomenclatures of peri-operative cognitive impairments. DNR: Delayed neurocognitive recovery; NCD: Neurocognitive disorders; OR: Operating room; PACU: Post-anesthesia care unit; PND: Peri-operative neurocognitive disorders; POD: Post-operative delirium; POCD: Post-operative cognitive dysfunction; Post-Op: Post-operatively; Pre-Op: Pre-operatively.

and surgery, can be characterized as mild or major NCD post-operatively [Figure 1B].

Pre-operative NCD refers to the pre-existing cognitive impairment and is frequently observed in elderly individuals and can be divided into mild and major NCD according to the severity of symptoms. It is reported that among peoples aged 70 years or older, 14% to 48% suffer from mild cognitive impairment and an additional 10% suffer from major cognitive impairment.^[9] Part of these individuals may inevitably need anesthesia and surgery. Obviously, pre-existing NCD in these patients cannot be directly related to the imminent anesthesia and surgery.

Regarding POD, before the new nomenclature, delirium occurred in the post-operative period can be divided into emergence delirium and POD, based on the times of onset. Furthermore, it only requires observing between days 1 and 3 post-operatively.^[8] After the new nomenclature; however, it needs to observe POD occurred in hospital up to 1 week after surgery or until discharge (whichever occurs first) and the term “emergence delirium” is no longer used. In the old nomenclature, there is actually confusion between emergence delirium and POD. Thus, POD should not be diagnosed separately from emergence delirium, though any lucid interval after emergence delirium should be noted.^[1] Importantly, moreover, POD should meet diagnostic criteria of the DSM-5. In the DSM-5, diagnostic criteria of delirium include a fluctuating disturbance in attention, awareness, and cognition that develops over a short period. In addition, the disturbances are not better explained by a pre-existing NCD and do not occur in a severely reduced level of arousal.

After the new nomenclature, it is recommended that the term POCD should be changed into DNR or mild/major NCD, based on the onset times and magnitudes.^[1-6] According to the onset times, the decline in cognitive function occurred in up to 30 days after surgery will be considered as DNR, while the decline in cognitive function occurred from 30 days to 12 months after procedure can be diagnosed as mild or major NCD post-operatively.

DNR is a new term recommended by the Peri-operative Cognition Nomenclature Working Group. It is technically possible to align the cognition decline occurred after discharge but before complete recovery with NCD classification, but clinical relevance of this classification would be unclear. Thus, it is recommended to use a different term, DNR, in this time window (up to 30 days after surgery). The temporal specifier “post-operative” should accompany with NCD just as other specifiers in the DSM-5, such as traumatic brain injury or substance abuse. NCD is further qualified as being mild or major according to the severities of cognition declines. Mild NCD and major NCD are roughly equivalent to the National Institute on Aging/Alzheimer’s Association (NIA/AA) terms mild cognitive impairment and dementia, respectively.

The main differences between POCD and NCD are that POCD does not require a cognitive concern, while severity of NCD is assessed by capacity of ADLs.^[1-6] A cognitive concern is the cognitive complains provided by the individual, informant, or clinician, which are rarely sought in the research into POCD. However, subjective report from the participant informant or clinician is essential for diagnosing PND. The magnitudes of NCD can be classified into mild and

major NCD by assessment of ADLs with an appropriate tool to measure subtle changes in daily function.

After new nomenclature, thus, advice for clinical researches are as followed. (1) Neuropsychological test battery should be performed pre-operatively, 7 days post-operatively (or before discharge), 30 days post-operatively, and 12 months post-operatively. (2) Telephone interviews can be conducted to reduce the missed follow-up rate if neuropsychological test battery cannot be performed (telephone interview for cognitive status-modified). (3) For diagnosis of PND, assessment of ADLs should be added.^[1-6] (4) Mini-mental state examination can be used as the pre-operative screening for cognitive impairments, but cannot be used alone as an evaluation test for PND. (5) Z-scores can be used to judge whether PND occurs. (6) There is no recommendation regarding the specific neuropsychological tests or the number of tests required in a battery for objective testing in the DSM-5 or the NIA-AA criteria.

That is, clinical researches on peri-operative cognitive impairments will be more complicated in the days to come. First, the follow-up periods will be extended from original 3 days, 7 days, and 30 days post-operatively to 7 days (or before discharge), 30 days and 12 months post-operatively or even longer. Second, the follow-up of patients includes not only the objective testing, but also the assessment of ALDs and cognitive concern provided by participant informant or clinician. However, the specific neuropsychological tests and the number of tests required in a battery for objective testing remain to be resolved.

After the new nomenclature, moreover, it is suggested that POCD should be replaced by PND either when applying for research projects or when publishing papers. However, the animal models and experimental methods of peri-operative cognitive impairments used in basic researches are still carried out without any modification.

In summary, the old nomenclature POCD is more like a research area than a disease term. As POCD study is isolated from cognitive impairment researches in the general population and other medical disciplines, it cannot be widely recognized by other medical disciplines. With the recommendation and introduction of new term PND, which is aligned with diagnostic criteria of NCD in the DSM-5, peri-operative cognitive impairment has become a clinical state. However, it must clearly be recognized that clinical research regarding PND will be more difficult

because of needing a prolonged follow-up visit, additional assessments of ADLs, and cognitive concern both before and after anesthesia and surgery. Furthermore, incidence of PND will probably decrease due to the stricter diagnostic criteria.

Conflicts of interest

None.

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