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Editorial

Cognitive Impairments and Physical Frailty: Two Sides of the Same Coin?

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Frailty, like other geriatric syndromes, is featured by its susceptibility to adverse clinical outcomes and is usually co-existing with various clinical conditions.[1,2] Frailty is considered as the intermediate state between healthy and unhealthy aging and its potential reversibility has gained extensive research attentions to prevent related adverse outcomes.[3,4] However, frailty is not just frailty alone.[5] Previous studies have indicated that frailty was associated with cardiometabolic risk, musculoskeletal conditions, neuropsychiatric conditions, and many others.[6-8] Subtypes of frailty have been reported that mobility components of frailty were closely related to the progression of frailty, multimorbidity and cognitive declines over time.[9,10] The emphasis of functional ability in the late life highlighted the clinical significance of frailty, but frailty is a condition of multiple clinical implications. Most previous frailty intervention programs targeted on the physical performance and frailty status transition, but the potential of frailty intervention in improving other age-related conditions remained less clear.

In hospital settings, frail older patients with acute conditions were usually complicated with multimorbidity, polypharmacy, cognitive impairment or delirium, depressive symptoms, and many other clinical conditions. It has been reported that post-acute care substantially improved the functional performance of frail older patients in various dimensions, including cognitive performance and depressive symptoms.[11-13] However, frailty in the community settings was more focused on physical domains and detailed assessments for cognitive performance were less likely to be done. Growing evidence has clearly shown the association between physical frailty and cognitive impairment, in global cognitive function or its sub-domains. Handajani, et al., have reported the associations between physical frailty and cognitive impairment in a community-based study, including domains of verbal fluency, delayed recall and global cognitive performance.[14] These findings were in line with the previous report from Taiwan that frailty was associated with impairment of global cognitive performance, as well as non-memory subdomains.[15] Characteristically, in pre-frailty status, impairments in language and executive function were the most significant domains. The findings suggested a sequential relationship in the development of frailty and cognitive impairment as people age. It has been reported that executive function was the earliest age-related cognitive declines that may start at the mid-life to the young old population.[16] However, handgrip strength also

demonstrated a declining trend since the mid-life, but not gait speed. Therefore, gradual decrease of handgrip strength may go along with the occurrence of declining executive function and may share some common etiological factors, which has been suggested from the neuroimaging studies.[17,18]

The co-existence of physical and cognitive impairment in the old age has been proposed as "cognitive frailty", "motoric cognitive risk syndrome" and "physio-cognitive decline syndrome" and the major difference of these nomenclatural entities were their operational definitions.[19] Although the operational definitions differed, all these definitions were associated with adverse outcomes in epidemiological studies. However, the prevalence and the public health impacts varied when different operational definitions were applied. Modifications of cognitive frailty have been proposed to focus on the reversibility of cognitive frailty, but no well-designed randomized trials have been done to support the modification of diagnostic criteria.[20]

Recently, the specific neuroimaging biosignature of the physio-cognitive decline syndrome has been identified and a newly identified neurocircuit linking these lesions.[20] The identification of neuroimaging biosignature suggested a potential underlying path-etiological mechanism that deserves further investigations for clarification. Moreover, the reversibility of the co-existing impairments in physical and cognitive performance, however defined, was rarely explored despite the strong epidemiological associations with adverse clinical outcomes. Recently, Liang et al., reported that multidomain intervention program consisting of physical exercise, cognitive training, nutritional counseling, and health education from chronic condition management significantly improved physical and cognitive performance through a clustered randomized trial.[21] Based on these discoveries, the operational definition of physio-cognitive decline syndrome may be a more optimal option to identify at-risk population in the communities and to provide appropriate interventions. The previous study used the dual-task gait speed performance to train at-risk people and showed improved in cognitive performance, as well as the increase in gray matter of cerebrum.[22] The inspiring results suggested that the reversibility was not only in phenotypic presentations, but also in morphological and molecular levels. Although the dual-task gait performance has shown its benefits in improving cognitive performance, intensity of physical exercise should be enhanced to ensure the efficacy in preventing physical frailty and sarcopenia. The success of FINGER study was dependent on the intensity, and frequency of physical exercise that has changed the lifestyle of participants during the study period.[23]

The foundation of traditional frailty management included nutrition and exercise programs, but the associations between frailty and cognitive impairment should also be included in designing the intervention programs. Hence, adding the Mediterranean diet and multi-component exercise to the frailty management programs was of critical importance to manage both conditions for healthy aging. Since the cognitive impairments related to pre-frailty were language, and delayed recalls, it may be easily overlooked in the usual community programs because of the difficulties in performing assessments. Further work is needed to design a cognitive performance battery covering both memory and non-memory domains to assess appropriate persons at risk for age-related physio-cognitive declines. Currently, the National Center for Geriatrics and Gerontology–Functional Assessment Tool (NCGG-FAT), and the Montreal Cognitive Assessment (MoCA) were two potential candidates,[21,24] but both instruments were time-consuming and needing some professional training.

Disability and dementia are not developed separately in the life course. They shared common risk factors and adverse outcomes, and the development may also overlap to some extent. A recent meta-analysis indicated that physical exercise among older adults with physical frailty also improved cognitive function and mental flexibility.[25] Hence, we should consider frailty and cognitive impairment as two sides of the same coin and develop appropriate strategies as the fundamental component for healthy longevity.

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