LITERATURE REVIEW

Rehabilitation Assessment of Post Intensive Care Syndrome

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ABSTRACT

The awareness of symptoms experienced after intensive care seems to have been extensively studied since the pandemic wave in 2019. The persistence or new occurrence of symptoms after intensive care is diagnosed as post-intensive care syndrome (PICS). The syndrome encloses multiple system disorders and therefore requires thorough utilization of assessment tools, which unfortunately have no standard clinical practice guidelines. Several subdomains that are crucial for assessment include physical, cognitive, and mental functions. Other aspects to be observed include quality of life, physical examination, and functional tests, particularly those related to reduced cardiorespiratory endurance. This review aimed to highlight the most notable list of tools to be used in the outpatient assessment setting of PICS. The feasibility was also tested in a recent workshop session for physical medicine and rehabilitation specialists, and it was possible to accomplish this in 30 min. Until a consensus is reached on the PICS assessment, it is strongly suggested that practitioners exercise these tools and use them in daily practice.

Keywords: Assessment tools, Post Intensive Care Syndrome, Quality of life, Rehabilitation

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INTRODUCTION

As we live through the pandemic, more patients seem to have experienced staying in the intensive care unit (ICU).[1,2] With the recent medical advances, mortality of critical illness in the ICU has declined throughout the years, however this has brought another aspect to be overlooked, that is the wellbeing of ICU survivors.[3] Many of the ICU survivors reported difficulty to return to normal daily activities due to physical and cognitive impairments, some of which also mentioned mental health problems after ICU discharge, and eventually affects their quality of life.[3,4] All these impairments are collectively diagnosed as post-intensive care syndrome (PICS), whereas recent studies had shown how PICS could also affect caregiver and family members, this current study would focus the review specifically the PICS patients.[5] The physical medicine and rehabilitation field have played important role in managing ICU patients and reducing the length of stay by preventing further deconditioning.[5,6] In the case of PICS rehabilitation, up until today, it is still debatable whether a brief outpatient setting is sufficient to tackle the multitude of problems identified in PICS patients.[7–9] Therefore this review is aimed to highlight suggestions towards establishing a PICS rehabilitation outpatient clinic which could be directly applicable to a daily practice setting.

PICS Rehabilitation

PICS is defined as a collective manifestation of several health domains, namely physical impairments, cognitive impairments, and mental health problems, that occur during or after ICU stay, and could possibly persists beyond discharge from the ICU.[2,3] There are also a rising number of studies showing how quality of life (QoL) reduces in PICS subjects depending on their onset.[4,10] Ultimately this would create a significant impact towards productivity, and studies had shown unemployment after PICS.[9,10] Several etiologies have been identified, such as interventional, environmental, and psychological factors, owing to the treatments done inside ICU, such as mechanical ventilation, numerous intravenous lines, limited mobility, unfamiliar environment and sounds, also tremendous stressful situation.[2,9,11] The challenge of rehabilitation would be how to achieve productivity in an allotted time after the patient has been discharged from ICU and are targeted to return to work.[4,12–14] However, it should be well known that formulating rehabilitation goals for PICS patient would be challenging if these specific domains are not addressed initially.[14]

Physical impairments generally occur in 30% of PICS survivor and are identified 3-6 months after ICU admission.[2,10] Studies had shown that 6-minute walk test outcomes are reduced below the normal level at a significant rate.[3,15] On the other hand, 33% of patients experience

partial dependence for their activities of daily living (ADL) following their critical illness after 12 months.[12] Prolonged ICU stay is identical with prolonged immobilization, in which catabolism would dominate and finally resulting in ICU-acquired weakness (ICU-AW) occurring in approximately 30-50% of ICU patients.[12,16] Generally, the weakness comprises of slower gait speed, and weaker handgrip strength, which in overall would affect their quality of life.[4]

Cognitive impairments were also often reported, accruing up to 40% of ICU survivors, and could persist until 1 year for some patients.[3,12] Common cognitive sub-domains affected are the attention, concentration, memory, processing speed, and executive function.[3,17] Surely each of the above problems should be addressed and intervened separately, however the real challenge is to identify each of these sub-domains, which could take longer time of assessment, and inaccurate assessment would lead to unachieved rehabilitation target.[17] Cognitive impairment could usually be identified before and during critical illness, as risk factors towards cognitive decline includes delirium, and shock.[3,17] Additionally, during ICU stay, invasive mechanical ventilation, sepsis, and acute respiratory distress syndrome would also lead to cognitive decline owing to prolonged hypoxia and inadequate brain perfusion.[3]

Psychological domain is also known to affect PICS patients.[2,12] Despite the aforementioned stressful environment, PTSD still appear less common as compared to anxiety and depression in PICS patients.[3,12] Studies had shown that at 12-14 months after intensive care, anxiety are generally more prevalent, and even it could coexist with depression.[3,12] Previous mental problems would also be a predisposing factor prior to ICU admission, on top of the stressful experience throughout the ICU stay.[9,18]

Assessment Tests

Knowing the proportion of each domain would be essential in setting an accurate and achievable goal for each PICS patient.[5,7] Prior studies have shown that using a PICS-specific questionnaire is an effective strategy for screening the affected domains in each patient.[19] As of now, the PICS questionnaire is available only in English, while the Indonesian version is still in the process of translation.

i. PICS Questionnaire

The PICS questionnaire consisted of 18 statements regarding symptoms on a 4 point Likert scale, with 0 as never occured, and 3 as always felt.[19] Participants were expected to grade these symptoms whether it's a new appearance, or worsening of prior symptoms. More importantly, the PICS questionnaire can stratify the severity of PICS domains, namely physical, mental, and cognitive domains.[19] The sensitivity of the PICS questionnaire in identifying these domains has greatly boosted its utilization in daily practice and made it possible to screen outpatients.

ii. Physical Function

The timed up and go test (TUG) is very popular in screening neurologic patients for both balance and coordination.[20,21] This test only requires a standard chair, a cone, and a stopwatch, as the subject is requested to stand up, walk a forward stride of 3 m, and return to their seat with the whole timing measured in

seconds.[20] Recent studies also accommodate gait speed in TUG, which differs between the first stride and returning stride, owing to the fact that turning requires good overall brain-muscle coordination to succeed.[22] Overall, the TUG may seem simple to perform, but in the light of PICS screening, the test boasts high functionality to screen physical and cognitive parameters. It is not surprising that TUG has often been studied, and obtained a cut-off value of 12.8 seconds to show low physical performance in PICS.[5] Although the TUG also could screen executive functioning, there are no official reports of this utilization. Some studies modified the TUG to also require subjects hold a cup of water in both hands to assess decision making, executive function, balance, and coordination.[22]

iii. Cognitive Function

It is a common practice to perform outpatient screening of cognitive function.[9,18] Two of the most commonly utilized questionnaires are the Mini Mental State Examination (MMSE) and the Montreal Cognitive Assessment (MoCA), both of which could be used to stratify cognitive function in PICS.[5,23] Between the two tests, a study by Ciesielka had shown that MMSE might have limitations between gender, ethnicity, and age, whereas MoCA does not. Their meta-analysis concluded that MoCA is more sensitive than MMSE to identify Mild Cognitive Impairment in geriatric subjects.[23] Among the subdomains that could be measured, executive functioning seemed to be most affected by cognitive interventions compared to language, orientation, memory, and visuospatial ability.[17,24] Despite the obvious cognitive decline observed, studies on therapeutic cognitive intervention on PICS are still scarce.[3,17] For Indonesian daily practice, several publications have shown superiority in MoCA, accruing to the fact that the Indonesian version has already been released and utilized in prior studies.[25] Across the results, it was shown that global cognitive function had the most observable improvement after cognitive intervention in PICS subjects. Despite its inconclusive findings in providing improvement, the global cognitive function score could be assessed by both MoCA and MMSE despite slight variations.[14,16]

iv. Mental Function

In the light of assessing mental function, addressing both anxiety and depression are the key requirement to be utilized in PICS assessment.[2,6] Numerous studies had administered Hospital Anxiety and Depression Scale (HADS), Impact of Event Scale-Revised (IES-R), and Patient Health Questionnaire-9 (PHQ-9), all of which could be used in many instances of medical research.[5] Among these commonly used scales, HADS seem to be superior and sensitive in assessing both anxiety and depression in PICS.[3,5] This self-test questionnaire comprises of 14 questions alternating between anxiety and depression subdomain, and subjects are required to respond in a score on a scale of 3 to 0.[9] Higher values warrant higher severity, therefore the maximum score for each subdomain is 21, with a cut-off of 0-7 being normal, 8-10 is mild, 11-15 considered as moderate, and finally 16-21 classified as severe.[9] Additionally, the self-administered nature of this questionnaire makes it easy to administer during both inpatient and outpatient setting. Studies administering the HADS seem to be sensitive in screening mental health problems for PICS,

accounting up to 47% in a post burn, and 30% in prolonged ventilator, however only one study showed higher proportion of depression, whereas most studies only highlighted the presence of depression or anxiety combined.[3,9]

v. Health Related Quality of Life

Although the subdomains of PICS do not include health related quality of life (HRQoL), prior meta-analysis had effectively displayed how early rehabilitation could provide better HRQoL in PICS.[16] Despite the modest number of samples, the results are consistent that better HRQoL are seen with intervention, accruing the utilization of both EuroQoL-5 Dimension (EQ-5D), Short Form 36 (SF36), or other questionnaires used in each center.[16] Although most questionnaires on HRQoL are self-administered, the EQ-5D has been famous for its simplicity and brief time required, thus it's more suitable to be utilized in PICS as the assessment involves numerous questionnaires.[4,16] There are two versions of EQ-5D used, namely the 5 Level (EQ-5D-5L) and 3 Level (EQ-5D-3L), accruing for the number of statements that are placed in order of severity and could better illustrate the patients' current condition, higher statements have better health state as compared to the lowest one.[26] Five dimensions are described in each subdomain, in which the subject is required to tick one box that best describes their condition today for the appropriate subdomain, namely mobility, self-care, usual activities, pain/discomfort, and anxiety/depression.[26] After answering these, patient will be faced with EQ visual analogue scale (EQ VAS), where they should draw a cross through a linear vertical scale numbered 0-100, with 100 as the best health condition, and 0 being worst.[26] Although there is a method to combine all the values into a single index value, each of these data could be gathered and presented to show improvements for each patient, like what has been done by prior studies in PICS.[5,6] Both EQ-5D-5L and EQ-5D-3L have both been translated to Bahasa Indonesia, thus could be seamlessly used during daily practice.[27]

vi. Functional Testing

Due to the nature of rehabilitation medicine, functional testing is an integral part of a comprehensive physical and rehabilitation practice which is hard to be detached.[5,6,15] Appropriate functional testing for PICS mostly revolves around the assessment of cardiorespiratory endurance, and musculoskeletal strength.[5,15] In the above set of tests, TUG had been done and could give a gross impression on musculoskeletal strength, balance, and coordination, however the test is still unable to illustrate cardiorespiratory endurance.[2,5] The gold standard of cardiorespiratory endurance functional testing remains to be cardiopulmonary exercise testing with gas exchange (CPET), however this could not be performed regularly, and field testing seemed to be more appropriate as it would better emphasize walking ability, as well as build patients' confidence.[2,5,6] The six-minute walk test (6MWT) has been effectively used in the cardiovascular field, and it has good correlation with the CPET for heart failure patients with chief complaint of fatigue, thus are comparable to PICS subjects.[15,28,29] This test requires patient to walk a linear distance of 30 meter before turning back and forth in a 6-minute duration, accounting the total distance travelled as the output.[29] Subsequentially, at times when the

6MWT could not be performed due to patient's inability to walk 10 meters without stopping, then the Short Physical Performance Battery (SPPB) could still be administered.[30] The SPPB total score had shown good correlation to 6MWT and have been considered an effective adjunct to 6MWT in describing a patients' overall level of physical function.[30] The SPPB comprises of three physical tests representing distinct subdomains: the first being balance test using a tandem-gait stance; following it is the four-meter gait speed test that requires the patient to walk a 6-meter linear track and measure time required to travel the middle 4 meter; and finally for muscle strength is to measure the time required to perform five times sit-to-stand test.[30] During the pandemic era, sit to stand test has been a great tool to be performed in a teleconsultation setting, it is however, still unable to replace the vastly used 6MWT.[31] All in all, performing both 6MWT and SPPB seem to be feasible when performed in a daily practice setting, thus should be exercised effectively in handling PICS.[5]

Outpatient Setting

Despite some studies had shown the presence of outpatient PICS clinic, there are still no clear guideline as to which tools that must be used in an outpatient PICS assessment.[3,4,9] Some studies had shown the results of consensus between experts, revealing that many assessment instruments can be used if it could cover the subdomains of physical, cognitive, mental, and quality of life.[6,8] Recent findings revealed the importance of addressing the mental health problems of PICS patients' family members, enclosing the PICS continuum.[6,32] All these studies then encourage the establishment of a concrete brief assessment in an outpatient clinic, with variations based on each center.[8]

During the recent annual scientific meeting of the Indonesian Physical Medicine and Rehabilitation Association, a cardiorespiratory workshop session attempted to construct a brief outpatient assessment of PICS in rehabilitation clinics. The assessment itself is expected to be done in 30 minutes, its components include two main parts: the first being self-assessment tools, namely the PICS questionnaire, HADS, EQ-5D-3L; followed by doctor's physical assessments such as MoCA Ina, TUG; and finally functional tests SPPB and 6 MWT, as illustrated in Table 1.[5,8] Additional physical assessment based on the underlying disease should also be done, especially respiratory and musculoskeletal organs, and other organs based on current presenting symptoms. Indonesian version of the integrated tools is accessible in the supplementary material.[8] More studies should be done to evaluate the integrated tools' efficacy, and accuracy to be used for evaluation during follow-up sessions.[5,7]

Table 1. Outpatient Tools Illustration for PICS Assessment

No	Assessment	Domains Assessed	Target
1	History taking	Subjective on Physical / Cognitive / Mental	post intensive care complaints and focus
2	PICSQ	Physical / Cognitive / Mental	Obtain which domain is affected
3	Physical Examination	Physical	General assessment and focused exam on respi, or neuro and musculoskeletal
	Specific functional tests		
4	Timed up and go (TUG) / Handgrip	Physical	Physical assessment of general coordination and handgrip strength
5	Montreal Cognitive Assessment Indonesian version (MoCA-INA)	Cognitive	Self-Assessment of cognitive function and classify subdomains affected
6	Hospital Anxiety and Depression Scale (HADS)	Mental	Self-Assessment of and grade severity of anxiety and depression
7	EQ-5D-5L	Quality of Life	Self-Assessment of quality of life after PICS
	Advanced Functional Test		
8	Short Physical Performance Battery (SPPB)	Physical	Physical Assessment of balance, gait speed, and brief muscle endurance
9	Six Minute Walk Test (6MWT)	Physical	Physical assessment of cardiorespiratory endurance in six minute

CONCLUSION

PICS has been considered an important diagnosis in the continuum of intensive care rehabilitation.[2] More studies have shown the importance of assessing the subdomains of PICS, namely physical, cognitive, and mental disorders, all of which could be first identified by using a specific PICS questionnaire.[19] Each of the subdomains should then be more thoroughly described by using assessment tools; recommended selections include TUG for physical, MoCA for cognitive, HADS for mental health, and EQ-5D for quality of life. Additionally, functional tests such as the SPPB and 6 MWT could be performed to better illustrate the overall function in PICS subjects, signifying the role of both musculoskeletal and cardiorespiratory function.[5] Through the nature of each PICS assessment tool, selecting appropriate instruments will make it possible to perform all these assessments in a single outpatient visit.[8,9] Therefore, PICS assessment in an outpatient

setting is greatly encouraged for a comprehensive rehabilitation experience.

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