Cogitare Enfermagem

ORIGINAL ARTICLE

New perspective on post-ICU syndrome: global assessment of functionality after intensive care

HIGHLIGHTS

1. The patient's critical moment: the first 30 days after discharge from the ICU.
2. Significant worsening of functionality and frailty after hospital discharge.
3. No significant variation in perceived quality of life.
4. Cognition, anxiety, and depression: no notable changes after hospital discharge.

Amanda Christina Kozesinski-Nakatani[1]
Álvaro Réa-Neto[2]
Kamila Janiscki[1]
Taher Tiba[1]
Maria Nesryn Tiba[1]
Beatriz Lottermann Konzen[1]
Auristela Duarte de Lima Moser[1]

ABSTRACT

Objective: To identify the variation in functionality of critically ill patients three months after discharge from the Intensive Care Unit. **Method:** This is a prospective cohort of 103 patients admitted to the ICU of a hospital in Southern Brazil between February and July 2024. Functionality, quality of life, anxiety, depression, cognition and frailty were assessed at four points in time: admission, discharge, 30 days, and 90 days after discharge. Data was analyzed by frequency, percentage, mean, standard deviation, median, and interquartile range. **Results:** At 90 days, 52 patients remained in the cohort, with a mean age of 63 years and 66% male. Functionality worsened at 30 days when compared to admission (p=0.004) and frailty increased in the same period (p<0.001). **Conclusion:** The most critical period occurs 30 days after discharge, with worsening functionality and increased frailty, highlighting the need for continuous monitoring and care transition strategies with post-ICU follow-up.

DESCRIPTORS: Intensive Care Units; Critical Care; Patient Discharge; Functional Status; Quality of Life.

HOW TO REFERENCE THIS ARTICLE:
Kozesinski-Nakatani AC, Réa-Neto Á, Janiscki K, Tiba T, Tiba MN, Konzen BL, et al. New perspective on post-ICU syndrome: global assessment of functionality after intensive care. Cogitare Enferm [Internet]. 2025 [cited "insert year, month and day"];30:e96375en. Available from: https://doi.org/10.1590/ce.v30i0.96375en

[1]Pontifícia Universidade Católica do Paraná, Curitiba, PR, Brasil.
[2]Centro de Estudos e de Pesquisas em Terapia Intensiva, Curitiba, PR, Brasil.

INTRODUCTION

Patients admitted to the Intensive Care Unit (ICU) face an extremely high risk of developing Post-Intensive Care Syndrome (PICS)[1-2]. PICS encompasses the emergence or worsening of multidimensional deficits in physical, cognitive, and mental health, resulting from a critical illness and persisting beyond hospital discharge[1-3]. This syndrome encompasses a variety of symptoms that can compromise the ability to carry out daily activities, affect the Quality of Life (QoL), and impact the functionality of ICU survivors[4-5]. In addition, post-ICU disabilities are associated with frequent readmissions and the burden on family caregivers[1,5-6].

Prevalent symptoms include persistent muscle weakness, debilitating fatigue, difficulties with memory, concentration, and decision-making, as well as emotional problems, including anxiety and depression[7-9]. These symptoms can last for prolonged periods, posing a substantial challenge to full recovery[8].

Persistent cognitive impairment, emerging as a relevant complication of severe illnesses, has proven to be common and, in many cases, disabling[10]. The cohort study 'Bringing to Light the Risk Factors and Incidence of Neuropsychological Dysfunction in Intensive Care Unit Survivors' showed that 77% and 74% of patients reported pain symptoms at three and twelve months, respectively, with 59% and 62% reporting that pain symptoms interfered with daily life during those periods[11].

When assessing long-term cognitive dysfunction, an American study showed an association between the duration of hospital delirium and worse global cognitive functioning at three and 12 months after discharge[12]. In addition to the occurrence of delirium, the following risk factors for the development of PICS have also been identified: advanced age, female sex, a history of mental disorders, greater severity of the critical illness, and negative experiences during ICU stay[4,8,13].

To better assess patient functionality, the World Health Organization (WHO) developed the World Health Organization Disability Assessment Schedule (WHODAS 2.0), a standardized instrument for measuring health functionality[14]. It is used to assess activity limitations and social participation restrictions, covering six functional domains: understanding and communication, mobility, self-care, interaction with other people, activities of daily living (such as domestic responsibilities, leisure, work, and school), and participation in community and social activities. The tool can be applied in various clinical and population contexts and is useful for understanding the impact of health conditions on the functionality of individuals and guiding rehabilitation interventions and health policies[14-15].

Recognizing the complexity of Post Intensive Care Syndrome is crucial to improving the quality of life of survivors and minimizing the long-term impact of physical and psychological complications resulting from ICU stays. Thus, the use of instruments that assess not only clinical recovery, but also the physical, cognitive, and psychosocial functionality of patients after ICU discharge becomes essential[11,16-18].

The primary objective of the study was to identify the variation in functionality of critically ill patients three months after discharge from the ICU. The secondary objectives were to describe the epidemiological characteristics of the patients on admission to the ICU and to evaluate the variation in the quality of life, cognition, anxiety, and depression assessed on admission to the ICU, on discharge, and at 30 and 90 days after discharge.

METHOD

A prospective cohort study was carried out from February 5 to July 18, 2024, in five ICUs of the Santa Casa Hospital in Curitiba, Paraná, Brazil.

All patients who met the inclusion criteria were consecutively included: ≥18 years old at ICU admission and expected to stay ≥48 hours in the ICU. The exclusion criteria were: patients admitted for elective surgery, presence of underlying disease with worse functional performance and estimated survival of less than 12 months, previous hospitalization in a ward of 10 days or more, or previous hospitalization in an ICU in the last 90 days, transfers from other institutions and patients without telephone numbers available to make follow-up telephone contacts. The most frequently observed exclusion criteria were: survival < 12 months, patients admitted for elective surgery and previous ICU stays of less than 90 days.

The first stage of data collection involves collecting clinical, epidemiological, and care data during the patient's stay in the ICU, such as sex; age; source of hospitalization costs; reason for hospitalization; type of hospitalization; comorbidities; Glasgow Coma Scale (GCS) on admission; use of Vasoactive Drugs (VAD) on admission; use of Mechanical Ventilation (MV) on admission; APACHE II; length of ICU stay; use of MV and need for Renal Replacement Therapy (RRT) during hospitalization. These data were collected from electronic hospital records and from the care data flow filled in daily by the doctors at the participating units.

PICS was evaluated in person at the time of the patient's admission and discharge from the ICU. Subsequently, contact was made by telephone 30 and 90 days after discharge from the ICU. To assess various domains of the patient's health, the scales applied to the patients at these four different times (immediately before ICU admission, at ICU discharge, 30 and 90 days after ICU discharge) were:

- Functionality by WHODAS 2.0-12;
- Quality of life by WHOQOL-Bref score;
- Frailty by the Clinical Frailty Scale;
- Cognition by the Pfeiffer Short Portable Mental Status Questionnaire (SPMSQ);
- Symptoms of anxiety and depression using the Hospital Anxiety and Depression Scale (HADS).

Functionality was assessed using the 12-item WHODAS 2.0, an instrument developed by the WHO based on the International Classification of Functioning, Disability and Health. The scale covers six domains: cognition, mobility, self-care, interpersonal relationships, life activities, and social participation. Each item is scored from 1 to 5, totaling scores ranging from 12 to 60, with higher values indicating a greater degree of disability. The abbreviated version was translated, adapted, and validated for Brazil and the data was analyzed by the simple sum of the scores, according to the guidelines of the WHO manual[19-20].

Quality of life was measured using the WHOQOL-Bref, made up of 26 items divided into four domains: physical, psychological, social relationships, and environment. The answers are given on a five-point Likert scale and the scores are transformed into a scale from zero to 100, with higher values representing a better perception of quality

of life. The Brazilian version was validated and the analysis followed the average of the items in each domain, as recommended by the WHO[21].

Anxiety and depression symptoms were assessed using the HADS Scale, made up of 14 items divided equally between the anxiety (HADS-A) and depression (HADS-D) domains. Each item has a score from zero to three, with the final score for each subscale ranging from zero to 21. The Portuguese version was validated and the data was analyzed both as continuous variables and categorized according to the cut-off points suggested in the original scale: 0-7 (normal), 8-10 (borderline), and ≥11 (probable case)[22-23].

Clinical frailty was assessed using the Clinical Frailty Scale (CFS), an instrument that allows individuals to be classified between levels 1 (very robust) and 9 (terminally ill), based on clinical judgment of functional aspects, comorbidities, and cognition. The cross-culturally adapted version for Brazil was used, and the analysis considered the scale as an ordinal variable[24].

Cognition was assessed using Pfeiffer's Short Portable Mental Status Questionnaire (SPMSQ), made up of 10 items related to temporal and spatial orientation, short-term memory, and simple calculations. The final score corresponds to the number of errors made, with cognitive impairment classified as absent (0-2 errors), mild (3-4), moderate (5-7) or severe (8-10). The Brazilian version was used and the scores were treated as ordinal variables and, where appropriate, categorized according to the degree of cognitive impairment[25].

The data obtained from the electronic medical records and collected through interviews with the participants was recorded on the REDCap® electronic data collection form. All the data obtained was kept confidential by the researchers, guaranteeing the anonymity of all sensitive and identifiable data.

Data were analyzed by absolute frequency and percentage, quantitative variables by mean, standard deviation, median and interquartile range. The WHODAS score, discrete variables, were compared between the four evaluation moments (admission to the ICU, discharge from the ICU, 30 days after discharge from the ICU, and 90 days after discharge from the ICU), using the Friedman non-parametric test followed by a paired post hoc comparison with Bonferroni corrections. The level of statistical significance adopted was 5% and the data was analyzed using IBM SPSS statistical software, version 29.0 (SPSS Inc., Chicago, IL, USA). Missing data was not imputed.

The study followed all the rules of Resolution No. 466/12 of the National Health Council (NHS) regarding research with human beings and began after the approval of this research project by the Research Ethics Committee (REC), with approval opinion: No. 6.493.269, on November 7, 2023.

RESULTS

From February 5 to July 18, 2024, 454 patients were evaluated and 103 patients were included. The flowchart describing the sampling process is shown in Figure 1.

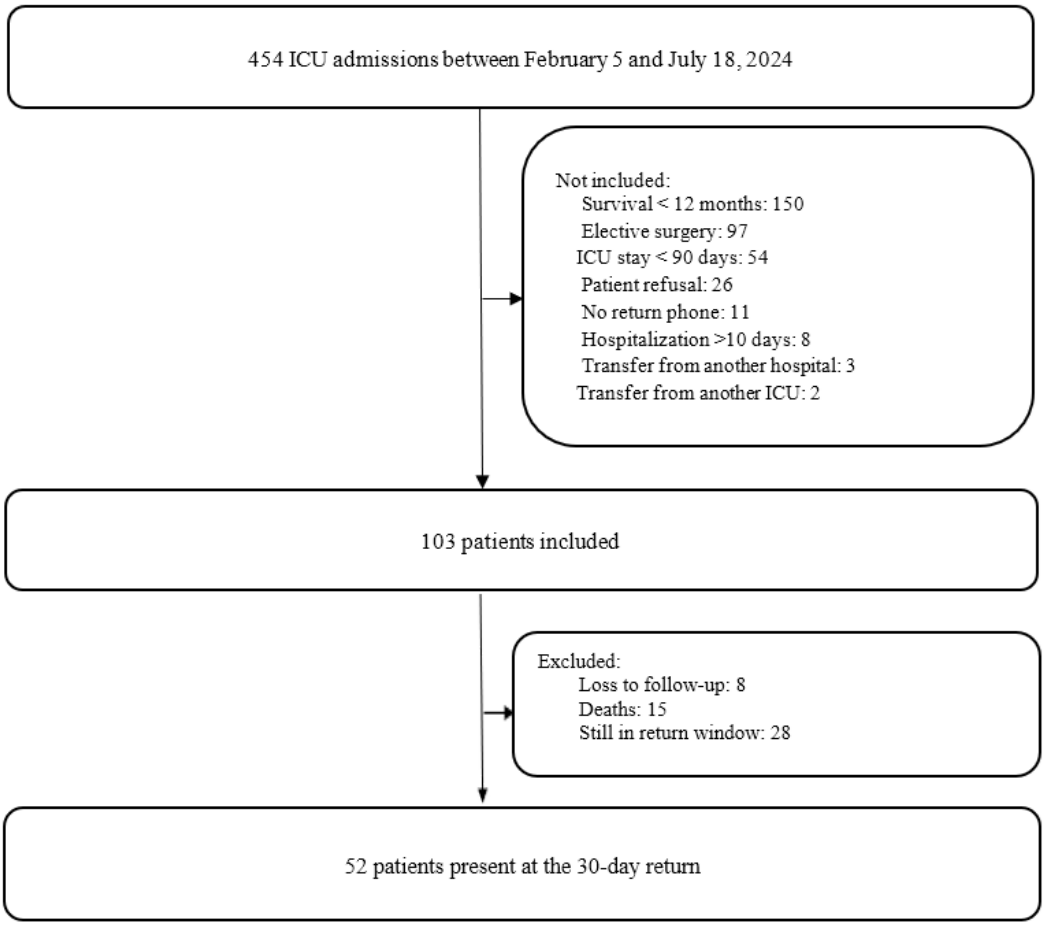

Figure 1. Sampling flow diagram. Curitiba (PR), Brazil, 2024
Source: Prepared by the authors (2024).

The average age of the patients was 63.9 years and the majority (68 patients) were male (66%). The main source of funding for admissions was the Unified Health System (UHS) with 79.6% of the sample (n = 82) and the most frequent type of admission was clinical (69.9% / n=72). The main cause of ICU admission was cardiac (65% / n= 67), followed by respiratory (9.7% / n= 10). The most common comorbidities were systemic hypertension (69.9% / n = 72), diabetes mellitus (37.9% / n = 39), and previous heart attacks (22.3% / n = 23). This data can be seen in Table 1.

The average APACHE of the patients included was 11.2 and the average length of stay was 3.8 days, with a median of two days. When the outcome was assessed, 98 patients were discharged from the ICU and five died. The epidemiological and clinical characteristics at admission and ICU outcome of the 103 patients sampled are shown in Table 1.

The total WHODAS 2.0 score - a 12-item version for assessing functionality - was compared between the following times: ICU admission, ICU discharge, 30 days after ICU discharge and 90 days after ICU discharge. There was a significant difference in the functionality score between the four moments, with the score 30 days after discharge being significantly higher (worse) than that on admission to the ICU (p=0.025), and that 90 days after (p=0.021). These data are shown in Table 2. Therefore, when assessed at four different times, it can be seen that the patient's most critical period is 30 days after discharge from the ICU, with an average WHODAS of 30.3.

Table 1. Description of ICU admission characteristics, procedures performed, length of stay, and outcome. Curitiba (PR), Brazil, 2024

(continued)

Variable	Classification	Results (n=103)
Age		63.9 ± 14.2; 65 (56 - 74)
Sex	Male	68 (66)
	Female	35 (34)
Source of funding	UHS	82 (79.6)
	No UHS	21 (20.4)
Reason for hospitalization	Neurological	8 (7.8)
	Respiratory	10 (9.7)
	Cardiac	67 (65)
	Abdominal	8 (7.8)
	Renal/Metabolic	8 (7.8)
	Hematologic	2 (1.9)
Type of hospitalization	Emergency surgical	31 (30.1)
	Clinical	72 (69.9)
Glasgow Coma Scale on ICU admission		13.7 ± 3.3; 15 (15 - 15)
Vasoactive drug on ICU admission	No	79 (76.7)
	Yes	24 (23.3)
Mechanical ventilation on ICU admission	No	93 (90.3)
	Yes	10 (9.7)
Diabetes Mellitus	No	64 (62.1)
	Sim	39 (37.9)
Systemic Arterial Hypertension	No	31 (30.1)
	Yes	72 (69.9)
Dyslipidemia	No	82 (79.6)
	Yes	21 (20.4)
Ischemic Stroke	No	99 (96.1)
	Yes	4 (3.9)
Acute Myocardial Infarction	No	80 (77.7)
	Yes	23 (22.3)
Chronic Obstructive Pulmonary Disease	No	98 (95.1)
	Yes	5 (4.9)
Heart Failure	No	87 (84.5)
	Yes	16 (15.5)
Chronic Kidney Disease	No	90 (87.4)
	Yes	13 (12.6)
Alcoholism	No	100 (97.1)
	Yes	3 (2.9)
Smoking	No	88 (85.4)
	Yes	15 (14.6)
APACHE II of the first 24 hours in the ICU		11.2 ± 6,5; 10 (7 - 14)

Table 1. Description of ICU admission characteristics, procedures performed, length of stay, and outcome. Curitiba (PR), Brazil, 2024

(conclusion)

Variable	Classification	Results (n=103)
Use of mechanical ventilation during hospitalization	No	92 (89.3)
	Yes	11 (10.7)
Use of renal replacement therapy during hospitalization	No	99 (96.1)
	Yes	4 (3.9)
Length of stay		3.8 ± 4.7; 2 (2 - 4)
ICU outcome	Discharge	98 (95.1)
	Death	5 (4.9)

Caption: Qualitative variables are described by absolute frequency (percentage) and quantitative variables are described by mean ± standard deviation; and median (interquartile range). APACHE II (Acute Physiology and Chronic Health Evaluation).
Source: Prepared by the authors (2024).

In the evaluation three months after discharge from the ICU, although the patient's functionality was worse than at discharge from the ICU (mean WHODAS of 24.1 compared to 22.8), it showed a slight improvement when compared to 30 days later. The result of this comparison of the score between the four moments is shown in Table 2.

Table 2. Comparison of the WHODAS score between the following moments: ICU admission, ICU discharge, 30 days after discharge, and 90 days after discharge. Curitiba (PR), Brazil, 2024

Variable	Moment	n valid	Mean ± standard deviation; median (interquartile range)	Overall	Two-way comparison p-value¬
WHODAS 2.0 12 items	ICU admission	52	22.8 ± 19.2; 14.6 (6.2 – 35.4)	0.009	Adm. vs. Discharge: 1 Adm. vs. 30d: 0,025 Adm. vs. 90d:1 Discharge vs. 30d: 0.150 Discharge vs. 90d: 1 30d vs. 90d: 0.021
	Discharge from ICU	52	23.5 ± 17.3; 20.8 (10.4 – 32.8)		
	30 days after discharge	52	30.3 ± 18.6; 27.1 (22.9 – 39.6)		
	90 days after discharge	52	24.1 ± 20.6; 18.8 (7.3 – 34.4)		

Caption: * Significance of Freadman's non-parametric test. ¬ Significance of the post hoc test with p-value adjusted by Bonferroni.
Source: Prepared by the authors (2024).

When comparing the quality of life, cognition, anxiety, depression, and frailty on admission to the ICU, on discharge from the ICU, 30 days, and 90 days after discharge, no statistically significant difference was observed. However, when the clinical frailty scale (CFS) was evaluated, it was noted that patients showed worse frailty 30 days after ICU discharge when compared to admission ($p<0.001$). These data can be seen in Tables 3 and 4 respectively.

Table 3. Comparison of SPMSQ scores and the hospital anxiety and depression score between: ICU admission, ICU discharge, 30 days after discharge, and 90 days after discharge. Curitiba (PR), Brazil, 2024

Variable		Moment				Overall	p-value of the two-by-two comparison
		Adm.	Discharge	30d	90d		
SPMSQ n (%)	Cognition preserved	42(80)	40(80)	45(90)	46(90)	0.106	Adm. Vs Discharge: 0.820 Adm. Vs 30d : 0.471 Adm. Vs 90d : 0.471 Discharge Vs 30d : 0.342 Discharge Vs 90d: 0.342 30d Vs 90d : 1
	Mild disability	8(20)	10(20)	7(10)	5(10)		
	Moderate disability	2(0)	2(0)	0(0)	1(0)		
	Severe disability	0(0)	0(0)	0(0)	0(0)		
Anxiety score n (%)	Impossible	35(70)	33(60)	36(70)	41(80)	0.32	Adm. Vs Discharge: 0.970 Adm. Vs 30d : 0.939 Adm. Vs 90d : 0.305 Discharge Vs 30d : 0.909 Discharge Vs 90d: 0.288 30d Vs 90d : 0.342
	Possible	9(20)	15(30)	8(20)	10(20)		
	Probable	8(20)	4(10)	8(20)	1(0)		
Depression score n (%)	Impossible	44(80)	48(90)	44(80)	43(80)	0.35	Adm. Vs Discharge: 0.569 Adm. Vs 30d : 0.909 Adm. Vs 90d : 0.879 Discharge Vs 30d : 0.494 Discharge Vs 90d: 0.471 30d Vs 90d : 0.970
	Possible	5(10)	2(0)	4(10)	6(10)		
	Probable	3(10)	2(0)	4(10)	3(10)		

Caption: *Significance of Freadman's non-parametric test. ¬ Significance of the post hoc test with p-value adjusted by Bonferroni.
Source: Prepared by the authors (2024).

Table 4. Comparison of WHOQOL-brief scores and clinical frailty scale between the following moments: ICU admission, ICU discharge, 30 days after discharge, and 90 days after discharge. Curitiba (PR), Brazil, 2024

Variable	Moment	n	Mean ± standard deviation; median (interquartile range)	Overall	Two-way comparison p-value¬
WHOQOL – General	ICU admission	52	14.5±1.914.5(13.2-15.6)	0,301	Adm. Vs Discharge: 0.732 Adm. Vs 30d: 0.172 Adm. Vs 90d: 0.909 Discharge Vs 30d: 0.087 Discharge Vs 90d: 0.819 30d Vs 90d: 0.139
	Discharge from ICU		14.6±1.714.8(14-15.5)		
	30 days after discharge		14.1±1.914.2(12.8-15.3)		
	90 days after discharge		14.5±2.114.8(12.9-15.8)		
Frailty	ICU admission	52	3.3±1.53(2-4)	<0.001	Adm. Vs Discharge: 0.425 Adm. Vs 30d : <0.001 Adm. Vs 90d : 0.044 Discharge Vs 30d : 0.003 Discharge Vs 90d: 0.224 30d Vs 90d : 0.087
	Discharge from ICU		3.5±1.43(3-4)		
	30 days after discharge		4±1.24(3-5)		
	90 days after discharge		3.8±1.64(3-4.5)		

Caption: * Significance of Freadman's non-parametric test. ¬ Significance of the post hoc test with p-value adjusted by Bonferroni. Source: Prepared by the authors (2024).

DISCUSSION

This study aimed to prospectively and longitudinally assess the physical, cognitive, emotional, and functional outcomes of intensive care survivors at multiple points after discharge from the ICU. The choice of validated instruments applicable to the Brazilian reality allowed for a broad and standardized approach, covering essential dimensions of the post-intensive care syndrome.

A Dutch study, which observed 2,345 post-ICU patients, revealed that among patients admitted for medical conditions (n=649, 28%), emergency surgery (284, 12%) and elective surgery (1412, 60%), 58%, 64% and 43%, respectively, experienced new physical, cognitive and/or mental problems after discharge[26]. These data reinforce that although the ICU experience causes a significant deterioration in functionality, patients with emergency admissions are the most affected.

A systematic review of 89 publications identified 60 risk factors for the development of PICS, with approximately half being patient-related and the other half ICU-related[4]. In these studies, patients with a higher severity of illness on admission, as indicated by higher APACHE II scores, tended to have worse functional outcomes. Risk factors such as age, female sex, previous comorbidities, severity of illness, negative ICU experience, and delirium were significantly associated with physical, mental, and/or cognitive impairments[4]. Strategies to reduce these risks include interfering with ICU-related factors, emphasizing the importance of targeted interventions, and continuous monitoring to improve the recovery of post-ICU patients[8,17,27].

The results of 52 participants who completed the WHODAS 2.0 questionnaire at four different times - admission to the ICU, discharge from the ICU, 30 days after discharge, and 90 days after discharge - provide a detailed insight into the trajectory of functional recovery and showed a significant variation in functionality over time. A 2023 study showed that recovery of physical and mental functionality can take more than a year after ICU discharge, with similar peaks of worsening observed between one and three months after discharge28. This critical period is consistent with the findings of this study, in which the functionality score 30 days after discharge was significantly worse, compared to admission to the ICU, discharge from the ICU, and 90 days after discharge. This period of 30 days post-discharge represents a time of functional worsening, with an average WHODAS of 30.3, indicating greater difficulty in carrying out daily activities and social participation. This worsening may be associated with the impact of the critical conditions that led to hospitalization and the still incomplete recovery at this early post-discharge stage.

However, the data also suggests an improvement in functionality at 90 days after discharge. This recovery, although modest, indicates that patients' functionality tends to improve over time, as they move away from the critical episode that necessitated ICU admission. Progressive functional recovery can be attributed to ongoing care, rehabilitation, and gradual adaptation to existing limitations.

This information is in line with other articles showing that patients' functionality improves progressively over time. The aforementioned Dutch cohort found that at three months, patients often face a significant drop in physical quality of life, while at 12 months, there is an improvement that can reach near pre-morbid levels, although complete recovery is not guaranteed[26]. The ALTOS study found that fatigue is still present in a significant percentage (66% of patients) at 12 months after discharge, but

gradual improvement can be seen compared to six months (70% of patients), with 41% reporting clinically important improvement[29].

These findings highlight the importance of monitoring and supporting patients' recovery after discharge from the ICU, especially in the first month, which proved to be the most delicate period. The use of WHODAS 2.0 as an assessment tool makes it possible to identify changes in functionality and target interventions to improve the quality of life of ICU survivors. Although the documents reviewed do not directly discuss the use of WHODAS, they emphasize the importance of follow-up to improve patients' overall functionality after discharge from the ICU[30].

This study sought to assess the functionality of patients after discharge from the ICU, but it should be noted that the post-ICU syndrome is characterized by new or increased impairments of physical, cognitive and/or psychological functions that persist after the hospital stay[31]. The main cognitive functions affected in patients with PICS include attention, mental processing speed, memory, and executive function. In addition, depression, anxiety, and Post-Traumatic Stress Disorder (PTSD) are common manifestations of psychiatric PICS. All of these factors impair participation in rehabilitation, resulting in poor functional outcomes[32].

The WHOQOL-Bref questionnaire, using the psychological domain, indicated a tendency for the psychological state to worsen in the period close to 30 days after hospital discharge, followed by a recovery over time. This pattern suggests a transitory impact on patients' mental health, possibly influenced by factors such as adaptation to the post-hospitalization routine and the support available during this period. This can be explained by the fact that, due to the initial physical incapacity, patients may become mentally ill, manifesting depression, but as they improve physically, they tend to have an improvement in emotional symptoms[33].

Functional recovery after ICU discharge is therefore a significant challenge, and continuity of care and adequate rehabilitation are essential to minimize functional limitations and promote patients' full recovery. A study that focused on early intervention and follow-up of post-ICU patients showed that proactive measures can reduce the duration and severity of functional and cognitive deficits[34].

This study has some limitations. The relatively small sample size may compromise the generalizability of the findings. In addition, the sample may not adequately reflect the diversity of critically ill patients, particularly with regard to socioeconomic conditions and access to rehabilitation resources. The reliance on self-assessment instruments, such as WHODAS 2.0 and WHOQOL-Bref, also represents a limitation, since these methods are subject to response bias and variations in patients' individual perception of their functionality and quality of life. It should be noted that during hospitalization, some patients may overestimate their state of health prior to admission to the ICU, which could alter the results obtained on admission.

Another relevant limitation is the difficulty in isolating the factors that influence functional recovery, such as pre-existing comorbidities, social support, adherence to rehabilitation programs, and specific interventions received during hospitalization and post-discharge. In addition, the lack of longer follow-up prevents a complete assessment of patients' functional and psychological progress, considering that some may show significant improvements after 12 months. Future studies should include more extensive follow-up to gain a detailed understanding of recovery. Despite these limitations, the study offers relevant contributions to clinical practice, reinforcing the importance of systematic functional monitoring of post-ICU patients.

CONCLUSION

The functional recovery of critically ill patients after discharge from the ICU is a complex and prolonged process, often marked by initial worsening followed by gradual recovery. This study showed that although there was a significant worsening in patients' functionality in the first 30 days after discharge, there was evidence of improvement at 90 days. The same occurred when the clinical frailty score was assessed. In the 90-day follow-up period, there was no significant variation in the general perception of quality of life, cognition, anxiety, and depression.

The results highlight the need for studies with a follow-up of more than 90 days to understand functional evolution and the possible late manifestation of cognitive and psychosocial deficits. The identification of a critical period between 30 and 90 days after discharge highlights the importance of targeted interventions, such as multidisciplinary rehabilitation programs and structured psychological support. The use of standardized instruments, such as WHODAS 2.0, can help stratify functional risk and individualize the care plan.

This study contributes to intensive care medicine by reinforcing the importance of post-discharge care, promoting continuity of care, and comprehensive rehabilitation for critically ill survivors. It also provides support for the development of public policies aimed at the rehabilitation and reintegration of these patients, with a potentially positive impact on quality of life and the reduction of social and economic burdens associated with prolonged functional dependence.

ACKNOWLEDGMENTS

This study received financial support from a funding agency. The research was partly funded by the National Council for Scientific and Technological Development (CNPq), under Call number 068/2022, for the project: "Predictors of disability resulting from ICU stay". We acknowledge that the support of this institution made this work possible.

REFERENCES

1. Bryant SE, McNabb K. Postintensive Care Syndrome. Crit Care Nurs Clin North Am [Internet]. 2019 [cited 2024 Jul 28];31(4):507-16. Available from: https://doi.org/10.1016/j.cnc.2019.07.006

2. Yuan C, Timmins F, Thompson DR. Post-intensive care syndrome: a concept analysis. Int J Nurs Stud [Internet]. 2021 [cited 2024 Jul 29];114:103814. Available from: https://doi.org/10.1016/j.ijnurstu.2020.103814

3. Kang J, Jeong YJ, Hong J. The effect of postintensive care syndrome on the quality of life of intensive care unit survivors: a secondary analysis. Aust Crit Care [Internet]. 2021 [cited 2024 Jul 28];34(3):246-53. Available from: https://doi.org/10.1016/j.aucc.2020.08.006

4. Lee M, Kang J, Jeong YJ. Risk factors for post-intensive care syndrome: a systematic review and meta-analysis. Aust Crit Care [Internet]. 2020 [cited 2024 Jul 28];33(3):287-94. Available from: https://doi.org/10.1016/j.aucc.2019.10.004

5. Tejero-Aranguren J, Martin RGM, Poyatos-Aguilera ME, Morales-Galindo I, Cobos-Vargas A, Colmenero M. Incidence and risk factors for postintensive care syndrome in a cohort of critically ill patients. Rev Bras Ter Intensiva [Internet]. 2022 [cited 2024 Jul 28];34(3):380-5. Available from: https://doi.org/10.5935/0103-507X.20220224-en

6. Pintado MC, Villa P, Luján J, Trascasa M, Molina R, González-García N, et al. Mortality and functional status at one-year of follow-up in elderly patients with prolonged ICU stay. Med Intensiva [Internet]. 2016 [cited 2024 Jul 29];40(5):289-97. Available from: https://doi.org/10.1016/j.medine.2015.08.006

7. Herridge MS, Cheung AM, Tansey CM, Matte-Martyn A, Diaz-Granados N, Al-Saidi F, et al. One-year outcomes in survivors of the acute respiratory distress syndrome. N Engl J Med [Internet]. 2003 [cited 2024 Jul 29];348(8):683-93. Available from: https://doi.org/10.1056/NEJMoa022450

8. Rengel KF, Hayhurst CJ, Pandharipande PP, Hughes CG. Long-term cognitive and functional impairments after critical illness. Anesth Analg [Internet]. 2019 [cited 2024 Jul 30];128(4):772-80. Available from: https://doi.org/10.1213/ANE.0000000000004066

9. Wilson ME, Barwise A, Heise KJ, Loftsgard TO, Dziadzko M, Cheville A, et al. Long-term return to functional baseline after mechanical ventilation in the ICU. Crit Care Med [Internet]. 2018 [cited 2024 Jul 29];46(4):562-9. Available from: https://doi.org/10.1097/CCM.0000000000002927

10. Sakusic A, Rabinstein AA. Cognitive outcomes after critical illness. Curr Opin Crit Care [Internet]. 2018 [cited 2024 Jul 29];24(5):410-4. Available from: https://doi.org/10.1097/MCC.0000000000000527

11. Hayhurst CJ, Jackson JC, Archer KR, Thompson JL, Chandrasekhar R, Hughes CG. Pain and its long-term interference of daily life after critical illness. Anesth Analg [Internet]. 2018 [cited 2024 Jul 30];127(3):690-7. Available from: https://doi.org/10.1213/ANE.0000000000003358

12. Pandharipande PP, Girard TD, Jackson JC, Morandi A, Thompson JL, Pun BT, et al. Long-term cognitive impairment after critical illness. N Engl J Med [Internet]. 2013 [cited 2024 Jul 30];369(14):1306-16. Available from: https://doi.org/10.1056/NEJMoa1301372

13. Ferrante LE, Pisani MA, Murphy TE, Gahbauer EA, Leo-Summers LS, Gill TM. Factors associated with functional recovery among older Intensive Care Unit survivors. Am J Respir Crit Care Med [Internet]. 2016 [cited 2024 Jul 31];194(3):299-307. Available from: https://doi.org/10.1164/rccm.201506-1256OC

14. Ustün TB, Chatterji S, Kostanjsek N, Rehm J, Kennedy C, Epping-Jordan J, et al. Developing the World Health Organization disability assessment schedule 2.0. Bull World Health Organ [Internet]. 2010 [cited 2024 Jul 30];88(11):815-23. Available from: https://doi.org/10.2471/BLT.09.067231

15. Higgins AM, Serpa Neto A, Bailey M, Barrett J, Bellomo R, Cooper DJ, et al. The psychometric properties and minimal clinically important difference for disability assessment using WHODAS 2.0 in critically ill patients. Crit Care Resusc [Internet]. 2023 [cited 2024 Jul 31];23(1):103-12. Available from: https://doi.org/10.51893/2021.1.OA10

16. Hashem MD, Nallagangula A, Nalamalapu S, Nunna K, Nausran U, Robinson KA, et al. Patient outcomes after critical illness: a systematic review of qualitative studies following hospital discharge. Crit Care [Internet]. 2016 [cited 2024 Jul 31];20:345. Available from: https://doi.org/10.1186/s13054-016-1516-x

17. Cabrini L, Landoni G, Antonelli M, Bellomo R, Colombo S, Negro A, et al. Critical care in the near future: patient-centered, beyond space and time boundaries. Minerva Anestesiol [Internet]. 2015 Oct 16 [cited 2024 Jul 31];26474269. Available from: https://pubmed.ncbi.nlm.nih.gov/26474269/

18. da Silveira LTY, da Silva JM, Tanaka C, Fu C. Decline in functional status after intensive care unit discharge is associated with ICU readmission: a prospective cohort study. Physiotherapy [Internet]. 2019 [cited 2024 Aug 1];105(3):321-7. Available from: https://doi.org/10.1016/j.physio.2018.07.010

19. Üstün TB, Kostanjsek N, Chatterji S, Rehm J, editors. Avaliação de saúde e deficiência: manual do WHO Disability Assessment Schedule (WHODAS 2.0) [Internet]. Osterbrock C, Santos MT, Adery R, translators. Uberaba: Universidade Federal do Triângulo Mineiro; 2015 [cited 2024 Aug 1]. 154 p. Available from: https://biblioteca.sophia.com.br/5362/index.asp?codigo_sophia=19480

20. Üstün TB, Kostanjsek N, Chatterji S, Rehm J; World Health Organization, editors. Measuring health and disability: manual for WHO Disability Assessment Schedule WHODAS 2.0 [Internet]. Geneva: World Health Organization; 2010 [cited 2024 Aug 1]. 88 p. Available from: https://www.who.int/publications/i/item/measuring-health-and-disability-manual-for-who-disability-assessment-schedule-(-whodas-2.0)

21. Fleck MPA, Louzada S, Xavier M, Chachamovich E, Vieira G, Santos L, et al. Aplicação da versão em português do instrumento abreviado de avaliação da qualidade de vida "WHOQOL-bref". Rev Saúde Pública [Internet]. 2000 [cited 2024 Aug 1];34(2):178-83. Available from: https://doi.org/10.1590/S0034-89102000000200012

22. Botega NJ, Bio MR, Zomignani MA, Garcia Júnior C, Pereira WA. Transtornos do humor em enfermaria de clínica médica e validação da escala de medida (HAD) de ansiedade e depressão. Rev Saúde Pública [Internet]. 1995 [cited 2024 Aug 1];29(5):359-63. Available from: https://doi.org/10.1590/S0034-89101995000500004

23. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. Acta Psychiatr Scand [Internet]. 1983 [cited 2024 Aug 1];67(6):361-70. Available from: https://doi.org/10.1111/j.1600-0447.1983.tb09716.x

24. Fabrício-Wehbe SCC, Schiaveto FV, Vendrusculo TRP, Haas VJ, Dantas RAS, Rodrigues RAP. Cross-cultural adaptation and validity of the "Edmonton Frail Scale – EFS" in a brazilian elderly sample. Rev Latino-Am Enfermagem [Internet]. 2009 [cited 2024 Aug 1];17(6):1043-9. Available from: https://doi.org/10.1590/S0104-11692009000600018

25. Almeida OP. Mini-exame do estado mental e o diagnóstico de demência no Brasil. Arq Neuro-psiquiatr [Internet]. 1998 [cited 2024 Aug 1];56(3B):605-12. Available from: https://doi.org/10.1590/S0004-282X1998000400014

26. Geense WW, Zegers M, Peters MAA, Ewalds E, Simons KS, Vermeulen H, et al. new physical, mental, and cognitive problems 1 year after ICU admission: a prospective multicenter study. Am J Respir Crit Care Med [Internet]. 2021 [cited 2024 Aug 1];203(12):1512-21. Available from: https://doi.org/10.1164/rccm.202009-3381OC

27. Mulkey MA, Beacham P, McCormick MA, Everhart DE, Khan B. Minimizing Post-Intensive Care Syndrome to Improve Outcomes for Intensive Care Unit Survivors. Crit Care Nurse [Internet]. 2022 [cited 2024 Aug 2];42(4):68-73. Available from: https://doi.org/10.4037/ccn2022374

28. Hiser SL, Fatima A, Ali M, Needham DM. Post-intensive care syndrome (PICS): recent updates. J Intensive Care [Internet]. 2023 [cited 2024 Aug 2];11:23. Available from: https://doi.org/10.1186/s40560-023-00670-7

29. Neufeld KJ, Leoutsakos JMS, Yan H, Lin S, Zabinski JS, Dinglas VD, et al. fatigue symptoms during the first year following ARDS. Chest [Internet]. 2020 [cited 2024 Aug 2];158(3):999-1007. Available from: https://doi.org/10.1016/j.chest.2020.03.059

30. Pant U, Vyas K, Meghani S, Park T, Norris CM, Papathanassoglou E. Screening tools for post-intensive care syndrome and post-traumatic symptoms in intensive care unit survivors: a scoping review. Aust Crit Care [Internet]. 2023 [cited 2024 Aug 3];36(5):863-71. Available from: https://doi.org/10.1016/j.aucc.2022.09.007

31. Rosa RG, Teixeira C, Piva S, Morandi A. Anticipating ICU discharge and long-term follow-up. Curr Opin Crit Care [Internet]. 2024 [cited 2024 Aug 2];30(2):157-64. Available from: https://doi.org/10.1097/MCC.0000000000001136

32. Ahmad MH, Teo SP. Post-intensive Care Syndrome. Ann Geriatr Med Res [Internet]. 2021 [cited 2024 Aug 3];25(2):72-8. Available from: https://doi.org/10.4235/agmr.21.0048

33. Jackson JC, Pandharipande PP, Girard TD, Brummel NE, Thompson JL, Hughes CG, et al. Depression, post-traumatic stress disorder, and functional disability in survivors of critical illness in the BRAIN-ICU study: a longitudinal cohort study. Lancet Respir Med [Internet]. 2014 [cited 2024 Aug 4];2(5):369-79. Available from: https://doi.org/10.1016/S2213-2600(14)70051-7

34. Renner C, Jeitziner MM, Albert M, Brinkmann S, Diserens K, Dzialowski I, et al. Guideline on multimodal rehabilitation for patients with post-intensive care syndrome. Crit Care [Internet]. 2023 [cited 2024 Aug 4];27:301. Available from: https://doi.org/10.1186/s13054-023-04569-5

Received: 02/08/2024
Approved: 07/04/2025
Associate editor: Dra. Luciana de Alcantara Nogueira

Corresponding author:
Amanda Christina Kozesinski Nakatani
Pontifícia Universidade Católica do Paraná
Praça Rui Barbosa, 694 – Centro – Curitiba – PR – Brasil
E-mail: akozesinski@gmail.com

Role of Authors:
Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work - **Kozesinski-Nakatani AC, Réa-Neto Á, Moser ADL.** Drafting the work or revising it critically for important intellectual content - **Kozesinski-Nakatani AC, Réa-Neto Á, Janiscki K, Tiba T, Tiba MN, Konzen BL, Moser ADL.** Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved - **Kozesinski-Nakatani AC, Réa-Neto Á, Moser ADL.** All authors approved the final version of the text.

Conflicts of interest:
The authors have no conflicts of interest to declare.

ISSN 2176-9133