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Functional and psychological features immediately after discharge from an intensive care unit: prospective cohort study

Aspectos funcionais e psicológicos imediatamente após alta da unidade de terapia intensiva: coorte prospectiva

ABSTRACT

Objective: To assess the functional and psychological features of patients immediately after discharge from the intensive care unit.

Methods: Prospective cohort study. Questionnaires and scales assessing the degree of dependence and functional capacity (modified Barthel and Karnofsky scales) and psychological problems (Hospital Anxiety and Depression Scale), in addition to the Epworth Sleepiness Scale, were administered during interviews conducted over the first week after intensive care unit discharge, to all survivors who had been admitted to this service from August to November 2012 and had remained longer than 72 hours.

Results: The degree of dependence as measured by the modified Barthel scale increased after intensive care unit discharge compared with the data before admission (57 ± 30 versus 47 ± 36 ; $p < 0.001$) in all 79 participants. This impairment was homogeneous among

all the categories in the modified Barthel scale ($p < 0.001$) in the 64 participants who were independent or partially dependent (Karnofsky score > 40) before admission. The impairment affected the categories of personal hygiene ($p = 0.01$) and stair climbing ($p = 0.04$) only in the 15 participants who were highly dependent (Karnofsky score ≤ 40) before admission. Assessment of the psychological changes identified mood disorders (anxiety and/or depression) in 31% of the sample, whereas sleep disorders occurred in 43.3%.

Conclusions: Patients who remained in an intensive care unit for 72 hours or longer exhibited a reduced functional capacity and an increased degree of dependence during the first week after intensive care unit discharge. In addition, the incidence of depressive symptoms, anxiety, and sleep disorders was high among that population.

Keywords: Quality of life; Critical care; Sleep disorders; Patient discharge

INTRODUCTION

The mortality in the intensive care unit (ICU) setting has been decreasing by 2% per year since 2000. This reduction has been attributed to changes in the care provided to critically ill patients (i.e., development of knowledge specific to intensive care, optimization of multidisciplinary assistance, and elaboration of protocols and routines for the care and safety of critically ill patients),⁽¹⁾ improved decision making, and a concern with strategies targeting communication among the ICU staff, patients, and their relatives.⁽²⁾

Nevertheless, this population of survivors is more susceptible to develop chronic diseases⁽³⁻⁶⁾ and exhibits high rates of mortality after ICU discharge^(4,7),

as well as poorer quality of life (QOL) months and years after discharge.⁽⁸⁾ Indeed, much evidence points to the occurrence of poorer QOL in ICU survivors compared with the overall population.^(5,7-9) In this regard, several studies have reported the occurrence of psychological problems,^(6,9,10) such as anxiety, depression,^(6,11) sleep disorders,⁽¹²⁾ and posttraumatic stress disorder; cognitive dysfunction;⁽¹³⁾ poorer pulmonary function;⁽⁹⁾ and peripheral neuromuscular complications.⁽¹⁴⁾ All such problems have a deep implication for patients, their relatives, and caregivers, in addition to imposing a steady financial onus on private and public healthcare services.^(5,10)

Therefore, the aim of the present study was to assess several functional and psychological features of patients immediately following discharge from an ICU.

METHODS

The present investigation was a prospective cohort study that included all the patients admitted to and discharged from the ICU of *Hospital Ernesto Dornelles* (a 22-bed clinical-surgical ICU) during a 4-month period (i.e., admitted from August to November 2012). Patients younger than 18 years, patients who remained in the ICU for less than 72 hours, patients subjected to elective surgery without clinical or surgical complications, patients already participating in the study, and patients who refused to sign the informed consent form were excluded. The study was approved by the research ethics committee of *Hospital Ernesto Dornelles* (no. 011/2012) and consisted of a preliminary analysis of an ongoing multicenter cohort that is expected to include 2,000 participants.

Each eligible patient or a close relative was requested to sign the informed consent form during the first week following discharge from the ICU. The patients who agreed to participate were subjected to an interview with physical therapists and psychologists previously trained to apply the following questionnaires to assess the participants' current condition: (a) the modified Barthel scale and Karnofsky scale, to assess their degree of dependence and functional capacity; (b) the Hospital Anxiety and Depression Scale (HADS); (c) and the Epworth Sleepiness Scale, to assess daytime sleepiness. The Portuguese translations of all these scales have already been validated.⁽¹⁵⁻¹⁷⁾ If a patient exhibited emotional disorders, then the attending physician was notified.

The modified Barthel scale objectively assesses the degree of dependence of individuals relative to 10 categories of activities of daily living: personal hygiene,

bathing, feeding, toilet use, climbing stairs, dressing, bladder and anal sphincter function, walking, and transfer from bed to chair.⁽¹⁸⁾ The score ranges from 0 to 100 and is interpreted as follows: 0 to 20, totally dependent; 21 to 60, severely dependent; 61 to 90, moderately dependent; 91 to 99, slightly dependent; and 100, totally independent.^(19,20) The questionnaire could be answered by the patients, their relatives, or their caregivers. For the present analysis, the absolute values (from 1, totally dependent, to 5, totally independent) of each domain were used.

The Karnofsky scale assesses the degree of functional impairment. It was initially elaborated to assess the physical performance of patients with cancer, but its use was extended to other chronic disabling diseases. Based on their scores, individuals are classified as follows: 100 - normal, no complaints, and no evidence of disease; 90 - capable of normal activity and with few symptoms of disease; 80 - normal activity with some difficulty and some symptoms of disease; 70 - cares for self and is not capable of normal activity or work; 60 - occasionally requires some assistance but can take care of most personal needs; 50 - requires considerable assistance or frequent medical care; 40 - disabled and requires special care and assistance; 30 - severely disabled, with hospital admission indicated although death is not imminent; 20 - very ill, requiring hospital admission; and 10 - moribund, with the fatal process progressing rapidly.^(15,21-23)

The HADS has been validated for the ICU population. It comprises 14 statements with scores ranging from 0 to 21 relative to anxiety and depression. Scores of 8 to 10 indicate the possibility of anxiety or depression, and scores above 11 indicate the probable presence of anxiety or depression.⁽²⁴⁾

In the present study, daytime sleepiness was assessed using the Epworth Sleepiness Scale, which assesses in a simple and rapid manner an individual's proneness to fall asleep during eight common daily activities. The total score ranges from 0 to 24, and the cutoff point of normality is 10.^(17,25)

The information relative to the participants' ICU stay was collected from their clinical records and included demographic data, severity scores, the reason for the ICU admission, diseases present before the ICU admission, any requirement for life support (e.g., invasive or non-invasive mechanical ventilation; hemodialysis; vasopressors such as dopamine, noradrenaline, and dobutamine; or blood-component transfusions, such as red blood cell concentrates, plasma, and platelets), and the ICU outcomes.

The modified Barthel scale and Karnofsky scale were applied twice to collect data relative to the period before admission to the hospital. For the analysis, the participants were divided in two groups based on their functional capacity before admission to the hospital: one group included the functionally independent and partially dependent individuals (Karnofsky scores >40), and the other group included the patients with total functional dependence (Karnofsky scores ≤40). In the cases in which the Karnofsky score after the ICU discharge was ≤40 (i.e., unable to care for self or requiring care similar to that provided in the hospital setting), the remaining questionnaires were not applied, except for the modified Barthel scale.

Statistical analysis

The data were expressed as the mean ± standard deviation (SD), the median (25%-75%), or the absolute and relative frequencies. The Kolmogorov-Smirnov test was used to investigate the normal distribution of the data. The categorical variables were analyzed using the chi-square and Fisher's exact tests, and the quantitative variables were analyzed by Student's t-test for independent samples. The comparison of the average scores in the Karnofsky and modified Barthel scales before the ICU admission and after the ICU discharge was performed using the paired-sample Student's t-test. The data of the graphics were described as the mean±standard error. The significance level was established as p<0.05. The analysis was performed using the Statistical Package for Social Science (SPSS) software, version 16.0 (Inc., Chicago, IL, USA).

RESULTS

During the study period, 79 patients discharged from the ICU were included in the study (Figure 1). The data corresponding to their ICU stay are described in table 1, and the following results stand out: the predominance of patients with urgent clinical and surgical conditions (88.6%); an APACHE II (Acute Physiology and Chronic Health Evaluation II) median score of 20 (9 to 31); and a high invasive-ventilatory-support rate (69.6%). The participants remained in the ICU for 8 (3 to 14) days.

The results from the modified Barthel scale indicated an increased degree of dependence following the ICU discharge compared with the scores before admission to the hospital (57±30 versus 47±36; p<0.001). Furthermore,

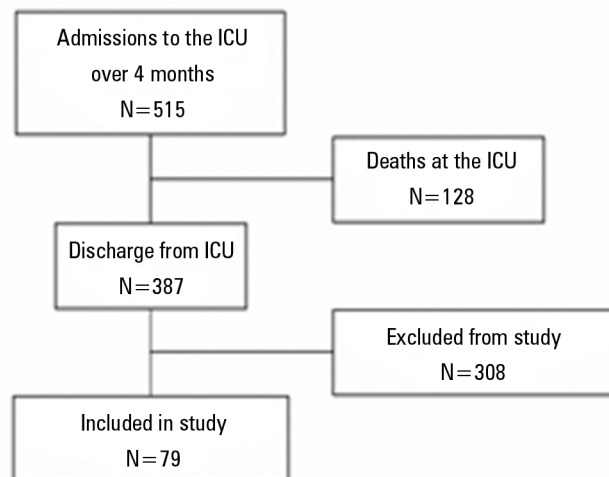


Figure 1 - Patient recruitment. ICU - intensive care unit.

Table 1 - Characteristics of the participants during their intensive care unit stay

| Variables | N (%) |
|--|------------------|
| First 24 hours in the ICU | |
| Age (years)* | 71 (52-90) |
| Male gender | 43 (54.0) |
| Body mass index (kg/m ²)* | 25.7 (18.7-32.7) |
| Reason for admission to the ICU | |
| Cardiovascular | 41 (52.6) |
| Respiratory | 11 (14.1) |
| Neurological | 8 (10.2) |
| Digestive/liver | 4 (5.1) |
| Metabolic | 3 (3.8) |
| Trauma | 2 (2.5) |
| After surgery | 7 (8.9) |
| Other | 3 (3.8) |
| Provenance (N=76) | |
| Emergency | 37 (46.8) |
| Ward | 21 (26.5) |
| Surgical area | 14 (17.7) |
| Transfer from another hospital | 4 (5.1) |
| Charlson comorbidity index* | 5 (0-15) |
| Functional dependence before admission to the hospital (Karnofsky score ≤40) | 15 (18.9) |
| Previous diseases | |
| Chronic obstructive pulmonary disease | 12 (15.2) |
| Bronchial asthma | 5 (6.3) |
| Cerebrovascular disease | 10 (12.7) |
| Degenerative brain disorders | 7 (8.9) |
| Heart failure | 11 (13.9) |
| Coronary artery disease | 6 (7.6) |
| Peripheral artery disease | 3 (3.8) |

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| Non-metastatic solid tumor | 25 (31.7) |
| Diabetes mellitus | 18 (22.8) |
| Terminal chronic kidney failure | 4 (5.1) |
| Disease severity | |
| APACHE II* | 20 (9-31) |
| Glasgow coma scale * | 15 (7-15) |
| Severe sepsis | 41 (51.8) |
| During the ICU stay | |
| Requirement for life support | |
| Invasive mechanical ventilation | 55 (69.6) |
| Non-invasive mechanical ventilation | 19 (24.1) |
| Length of mechanical ventilation (days)* | 1 (0-5) |
| Kidney-replacement therapy | 9 (11.4) |
| Hemodynamic (vasoactive drugs) | 49 (62.0) |
| Blood component transfusion | 12 (15.2) |
| Complications during the ICU stay | |
| Acute myocardial infarction | 3 (3.8) |
| Cardiopulmonary arrest | 2 (2.5) |
| Stroke | 2 (2.5) |
| Muscle weakness | 7 (8.9) |
| Pressure ulcer | 8 (10.1) |
| Acute respiratory distress syndrome | 7 (8.9) |
| Acute kidney failure | 5 (6.3) |
| Delirium | 28 (35.4) |
| Septic shock due to nosocomial infections | 9 (11.4) |

ICU- intensive care unit; APACHE II - Acute Physiology and Chronic Health Evaluation II.
* Median (25%-75%).

the Karnofsky scale revealed a poorer functional capacity following the discharge (70 ± 23 versus 52 ± 18 ; $p < 0.001$).

The comparison of the scores in the modified Barthel scale before and after the ICU admission was performed separately in the group of patients who were highly dependent before admission (Karnofsky score ≤ 40) and the ones with moderate to adequate independence (Karnofsky > 40). Figure 2 shows that the degree of dependence increased in both groups. Figures 3 and 4 depict the individual variation of each category in the modified Barthel scale. The patients who were more independent before admission to the hospital exhibited a poorer performance on all the scale items (Figure 3), whereas the patients who were previously more dependent exhibited poorer scores only on the personal-hygiene and stair-climbing items (Figure 4).

Relative to the psychological changes, the corresponding questionnaires were not applied to 28 participants because

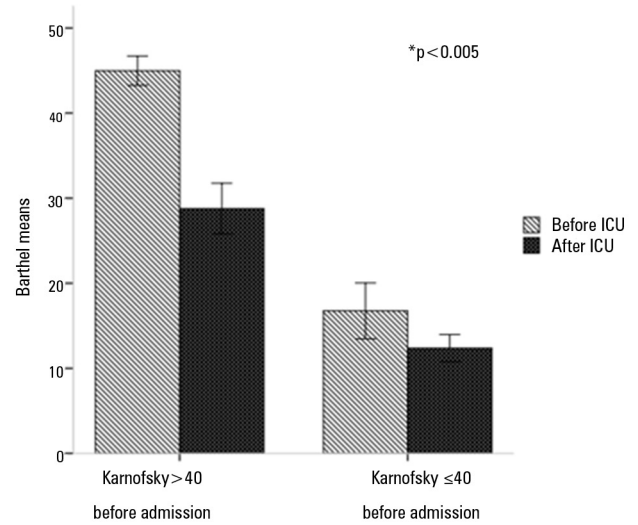


Figure 2 - Comparison of the scores on the modified Barthel scale before and after the intensive care unit admission of patients who were previously dependent (Karnofsky score ≤ 40) or independent (Karnofsky score > 40). ICU - intensive care unit; *p relative to intergroup (Karnofsky score > 40 and ≤ 40), comparison before and after the intensive care unit admission.

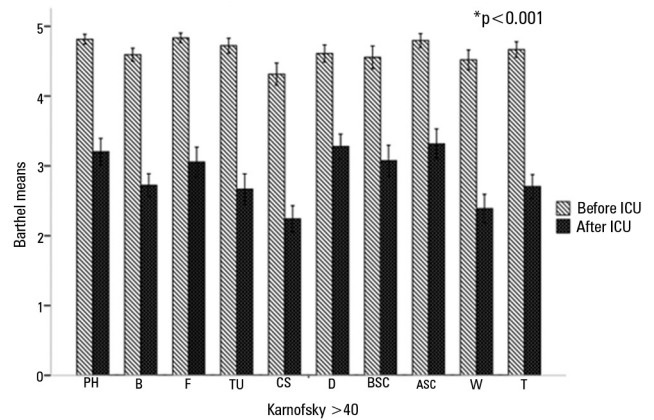


Figure 3 - Variation of the scores on the modified Barthel scale categories before and after the intensive care unit admission of the partially or totally independent patients (Karnofsky score > 40) before admission. ICU - intensive care unit; *p corresponding to the comparison of all categories before and after the intensive care unit admission. Categories in the modified Barthel scale: PH - personal hygiene; B - bathing; F - feeding; TU - toilet use; CS - climbing stairs; D - dressing; BSC - sphincter control (bladder); ASC - sphincter control (anal); W - walking; T - bed-to-chair transfer.

they scored ≤ 40 on the Karnofsky scale, i.e., these patients were unable to answer the questions. In addition, the data corresponding to an additional four participants who had begun pharmacological treatment for depression before admission were not included in the analysis. Mood disorders (anxiety and/or depression) occurred in 16 participants (31%), of whom 14 exhibited symptoms of anxiety, one exhibited symptoms of depression, and one exhibited symptoms of both during the previous week.

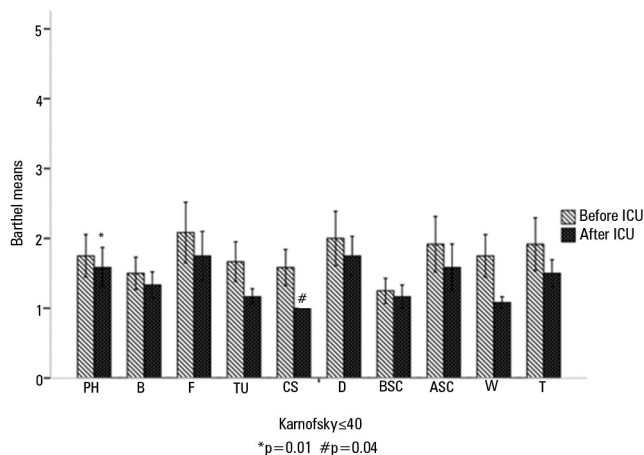


Figure 4 - Variation of the scores from the modified Barthel scale categories before and after the intensive care unit admission of the highly dependent patients (Karnofsky score ≤ 40) before admission. ICU - intensive care unit. *p corresponding to the comparison of items PH and CS before and after the intensive care unit admission. Categories on the modified Barthel scale: PH - personal hygiene; B - bathing; F - feeding; TU - toilet use; CS - climbing stairs; D - dressing; BSC - sphincter control (bladder); ASC - sphincter control (anal); W - walking; T - bed-to-chair transfer.

DISCUSSION

The main finding of the present study is that the investigated population of individuals admitted to the ICU for ≥ 72 hours exhibited a reduced functional capacity and an increased degree of dependence, as well as a high incidence of mood disorders and daytime sleepiness, during the first week following the ICU discharge.

Although all the participants exhibited reduced autonomy, the patients who were independent before admission displayed significantly increased dependence in all the categories of the modified Barthel scale. The study population was divided into dependent and independent groups before admission based on the Karnofsky-scale results, to make the retrospective definition objective and uniform. The participants who scored ≤ 40 on the Karnofsky scale before admission (i.e., highly disabled and requiring integral care and assistance) represented the smallest group ($n=15$; 18.9%); in our view, these individuals did not need to be assessed as to psychological changes after discharge because their basal condition was already extremely poor. The reduced autonomy found in the previously independent participants (Karnofsky score >40) after their ICU discharge is consistent with the reports in the literature.^(5,8,9,11) Nevertheless, the comparison of the results between the present investigation and other studies is impaired by the lack of data on the degree of dependence immediately after discharge from the ICU.^(8,9) The results of the patients with previously better performance (Karnofsky score >40) points to the

most significant sequel of ICU admission and certainly reflects a worsening QOL *a posteriori*.^(5,8,9) Such physical limitations might be a consequence of the neuromuscular disorders that develop in critically ill patients,^(5,26) long-lasting mechanical ventilation,⁽²⁶⁻²⁹⁾ and/or previously present diseases.⁽³⁰⁾ Unfortunately, an assessment of worsening QOL as a function of the reason for admission and an analysis of the outcomes of critically ill patients would require a larger sample size.

Among inpatients, the frequency of mood disorders varies from 20% to 30% based on the studied population.^(6,11) Although such disorders cause suffering and discomfort, they are often not perceived by doctors. In this regard, the HADS is easy to apply and interpret, can detect the presence of mild symptoms, and is thereby a useful tool for screening mood disorders.^(31,32)

Sleep disorders are a common occurrence in ICU patients and might persist over an indefinite period after discharge.^(5,10) There are few data in the literature relative to the sleep quality of patients discharged from ICUs.^(8,12) In the present study, 43.3% of the participants scored ≥ 10 on the Epworth Sleepiness Scale, which corresponds to excessive sleepiness.

Long-term (i.e., months and years) assessment of the population of ICU survivors has paramount importance for individualized treatment, as well as for motor and psychological rehabilitation. Consequently, these individuals are subjected to surveillance relative to pre-scheduled future interviews (e.g., at 6 and 12 months).^(4,33,34) Medium- and long-term follow up of this population of patients is crucial to assess their speed of recovery and allows for estimating the investment in healthcare that is necessary for their motor and psychological rehabilitation. Does the early detection of functional, psychological, and cognitive disorders anticipate the long-term results? Are the therapeutic actions performed immediately after the ICU discharge associated with better long-term outcomes? Would we refer more patients to specialized services were we to detect such alterations by means of protocol-based actions? If so, why should not one assess the patients immediately after their ICU discharge, from this perspective? It is believed that the care provided and the assessment of the interventions performed in the ICU setting should be assessed early along the interval between discharge from the ICU and discharge from the hospital because these measures have a long-term impact on the QOL of critically ill patients.⁽³⁵⁾

Regarding limitations of the present study, first mentioned should be the method of assessment selected (i.e., the use of questionnaires) because, although this technique is not subjective, it depends on the individuals'

reading and understanding skills, their honesty, and their hearing capacity during the interviews. Moreover, the memory bias should be considered in the case of the questionnaires applied to collect the data on the participants' conditions before admission to the ICU. In this context, it is noteworthy that survivors of severe diseases might overestimate their state before admission, as also other authors have reported.⁽³⁶⁾

CONCLUSIONS

The participants of the present study - particularly the subjects who were previously either independent or only partially dependent - exhibited a reduced functional capacity and an increased degree of dependence during the first week after their intensive care unit discharge. In addition, the sample exhibited a high frequency of symptoms of anxiety and/or depression and sleep disorders.

RESUMO

Objetivo: Avaliar aspectos funcionais e psicológicos dos pacientes imediatamente após alta da unidade de terapia intensiva.

Métodos: Coorte prospectiva. Na primeira semana após alta da unidade de terapia intensiva, por meio de uma entrevista estruturada, foram aplicados questionários e escalas referentes à avaliação do grau de dependência e da capacidade funcional (escalas de Barthel modificada e Karnofsky), e aos problemas psíquicos (questionário hospitalar de ansiedade e depressão), além da escala de sonolência de Epworth, em todos os sobreviventes com mais de 72 horas de internação na unidade de terapia intensiva, admitidos de agosto a novembro de 2012.

Resultados: Nos 79 pacientes incluídos no estudo, houve aumento do grau de dependência após a alta da unidade de terapia intensiva, quando comparados aos dados pré-hospitalização, por meio da escala de Barthel modificada (57 ± 30 versus 47 ± 36 ;

$p < 0,001$). Nos 64 pacientes independentes ou parcialmente dependentes previamente à internação (Karnofsky >40), o prejuízo foi uniforme em todas as categorias da escala de Barthel modificada ($p < 0,001$). Já nos 15 pacientes previamente muito dependentes (Karnofsky ≤ 40), o prejuízo ocorreu somente nas categorias de higiene pessoal ($p = 0,01$) e na capacidade de subir escadas ($p = 0,04$). Na avaliação dos distúrbios psicológicos, os transtornos do humor (ansiedade e/ou depressão) ocorreram em 31% dos pacientes e os distúrbios do sono em 43,3%.

Conclusão: Em pacientes internados na unidade de terapia intensiva por 72 horas ou mais, observaram-se redução da capacidade funcional e aumento do grau de dependência na primeira semana após alta da unidade de terapia intensiva, bem como elevada incidência de sintomas depressivos, de ansiedade e distúrbios do sono.

Descritores: Qualidade de vida; Cuidados críticos; Transtornos do sono; Alta do paciente

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