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Withdrawal of bed following mechanic ventilation discontinuation: are there reflexes on mortality and intensive care unit length of stay?

Retirada do leito após a descontinuação da ventilação mecânica: há repercussão na mortalidade e no tempo de permanência na unidade de terapia intensiva?

ABSTRACT

Objective: To describe the withdrawal of the bed frequency in mechanic ventilation patients and its impact on mortality and length of stay in the intensive care unit.

Methods: This was a retrospective cohort study in mechanical ventilation patients. Clinical and epidemiological variables, withdrawal of bed related motor therapy, intensive care unit length of stay and mortality were evaluated.

Results: We studied 91 patients, mean age of 62.5±18.8 years, predominantly female (52%) and mean intensive care unit length of stay of 07 days (95% CI, 8-13 days). Con-

sidering the withdrawal of the bed or not, no difference was observed between groups regarding length of stay in intensive care unit. Patients who were withdrawn of bed had a lower clinical severity. Their mortality rate was 29.7%. The not withdrawn of bed group had higher both actual and expected mortality.

Conclusions: Patients withdrawn of bed following mechanical ventilation discontinuation showed lower mortality. It is suggested that early intensive care unit mobilization and withdrawal of bed should be stimulated.

Keywords: Respiration, artificial; Early ambulation; Mortality; Physical therapy modalities

INTRODUCTION

Invasive ventilatory support is used in 39% of the patients admitted to intensive care units (ICU).⁽¹⁾ Of these, 10% need long term mechanic ventilation (MV), and are subject to the associated complications and long hospital stay.^(2,3)

Prolonged MV patients are frequently deconditioned and kinetic-functionally limited. Several aspects independently contribute to neuromuscular changes: the underlying disease, organs failure severity and duration, adverse effects of drug treatments, and specially prolonged immobilization.⁽³⁻⁵⁾ Peripheral skeletal muscles weakness, associated with respiratory muscles weakness additionally influence the functional loss and health-related quality of life.⁽⁵⁾

Historically, ICU-acquired neuromuscular disorders complications are common, although their actual incidence remains unknown.^(4,6) These changes-related clinical aspects include motor dysfunction, recurrent infections, delusions and difficult MV weaning.^(6,7)

Understanding the pathophysiology, prognostic implications and diagnostic methods of ICU-acquired neuromuscular disorders, particularly in MV patients, may help driving the therapeutic perspectives. In this context, critically ill patients physical activity and early withdrawal of bed have fundamental roles on regaining the lost function.^(3,8)

Physiotherapeutic support for critically ill patients may help on early kinetic-functional issues identification, and the rehabilitation program is recommended as both crucial and safe practice for recovering these patients.⁽⁸⁻¹¹⁾

The therapeutic value of bed rest has been challenged.⁽¹²⁾ Several studies have shown the benefits of early ICU patients mobilization, among them the functional status improvement and acceleration of the return to pre-disease activities. Thus, leaving the bed, and particularly walking, emerges as a frequent and crucial objective for critically ill patients.⁽¹³⁾

Thus, this study aims to describe the withdrawal of bed frequency in invasive MV ICU patients, and its reflexes on mortality and length of stay in the intensive care unit.

METHODS

Study design

This was a longitudinal, retrospective study, developed in a 16 beds private hospital ICU.

Casuistic

All patients admitted to the ICU from September 2008 to January 2009 undergoing invasive mechanic ventilation during their stay, were studied. No age, gender or admission cause restrictions were applied to allow the epidemiological profile description.

Protocol and variables of interest

The data collection was performed on the patients' electronic medical records. The data were collected only by the article's authors, contributing to the data reliability.

The clinical and epidemiological variables of interest included: age, gender, admission diagnosis, length of stay, reintubation, and ICU mortality. The first 24 hours ICU Acute Physiological and Chronic Health Evaluation (APACHE II) score and anticipated mortality for this score were calculated.

Regarding withdrawal of bed, the following events were considered: seating with pending lower limbs, chair seating, stationary march, and walking. For patients withdrawn of bed during the ICU stay, the time from MV discontinuation to the first time leaving the bed was recorded. For these, the following alternatives were considered, regarding the time after the MV discontinuation: up to 24 hours (the same day), 24-48 hours, and after 48 hours.

Statistical analysis

T Student test was used for parametrical data comparison. For non-parametrical data comparison, the Mann-Whitney test was used. The Chi-square (X^2) test was used for rates comparison. The statistical significance level was established as 0.05 or 5%.

Ethical aspects

This was a retrospective, observational search, involving medical charts analysis. The project was approved by the Ethics Committee of the União Metropolitana de Educação e Cultura (UNIME), in compliance with the Resolution 196/96 of the Conselho Nacional de Ética em Pesquisa [National Ethics Committee]. The institution issued a research agreement document.

RESULTS

Ninety one ICU MV patients were sequentially included. The sample mean age was of 62.5 ± 18.8 years, and 52% were female. The analysis was performed considering the patients either withdrawn or not of bed. The patients' demographic and clinical characteristics are shown on table 1.

Considering withdrawal of bed or not, the female predominance was maintained. Regarding age, the group leaving the bed was in average younger than the group not leaving the bed (57.9 ± 18.1 and 68.4 ± 18.3 years, respectively), and this difference was statistically significant ($p=0.008$).

The admission diagnoses for both groups were similar. It is important emphasizing that 61% of the patients had more than one associated disease. Only two patients had chronic obstructive pulmonary disease, one in each group. No group had critically ill patient's polyneuropathy subjects.

Regarding the patients' length of stay, independently of withdrawing or not of the bed, a 7 days

Table 1 – Patients’ demographic and clinical characteristics, either or not withdrawn of bed

Demographic and clinical characteristics	Withdrawn of bed (N=91)		P value
	Yes (N=51)	No (N=40)	
Age (years)	57.9±18.1	68.4±18.3	0.008
Female	26 (51)	21(53)	0.98
Diagnosis			
Heart diseases	2 (4)	2 (5)	0.78
Lung diseases			
COPD	1 (2)	1 (3)	0.70
Other lung diseases	10 (20)	5 (13)	0.55
Neurological diseases	9 (18)	6 (15)	0.92
Surgical procedures	9 (18)	8 (20)	0.98
Vascular diseases	4 (8)	–	0.19
Metabolic diseases	9 (18)	8 (20)	0.98
Urologic diseases	1 (2)	2 (5)	0.84
Gastric diseases	5 (10)	4 (10)	0.73
Orthopedic diseases	1 (2)	–	0.92
APACHE II	13.6±4.9	16.7±6.3	0.01
Actual mortality	5 (10)	22 (55)	<0.001
Anticipated mortality (%)	9.6 (11.5-20.5)	22.4 (19.1-33.0)	0.004
Reintubation	5 (10)	4 (10)	0.73
Hospital stay (days)	5 (6-14)	10 (8-13)	0.14

COPD – chronic obstructive pulmonary disease; APACHE II - Acute Physiology and Chronic Health Evaluation. II. Results expressed as number (%), mean ± standard deviation or median (25-75%).

median (95% CI 8-13 days) was seen. Clustering the patients based on withdrawal of bed, those withdrawn of bed stayed shorter in the ICU than those not withdrawn – 5 days (95% CI 6-14 days) and 10 days (95% CI 8-13 days), respectively (Table 1, Figure 1). However this difference was non-significant (p=0.14).

Considering the APACHE II calculated prognosis, patients who were withdrawn of bed were less severe as compared with those not withdrawn of bed (Table 1, Figure 2), and this difference was statistically significant (p=0.01).

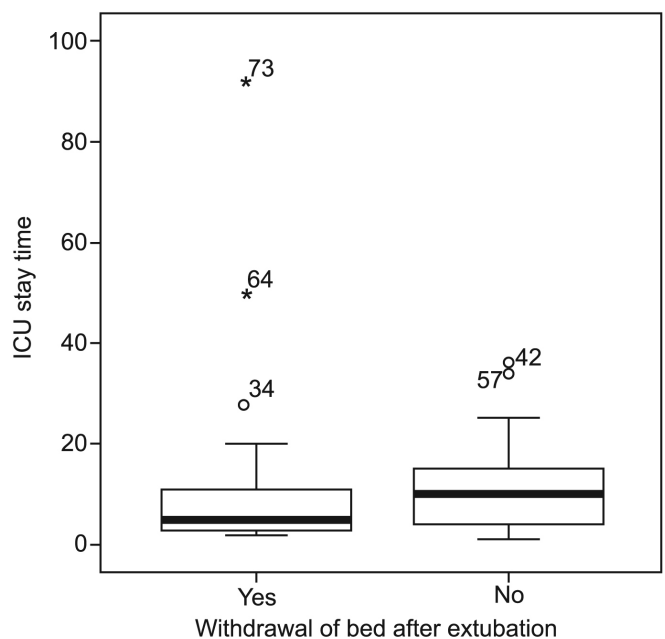
Regarding the outcome death, 29.7% of the patients died. Regarding withdrawal or not of bed after mechanic ventilation discontinuation, higher both actual and anticipated mortality was seen for the not withdrawn of bed group as compared with the withdrawn group (Table 1), and this difference was statistically significant (p<0.001 and p=0.004, respectively).

Evaluating the association between “leaving the bed” and the outcome “death” as compared to absence of this factor, a 0.08 (95% CI 0.03-0.27; p<0.01) odds ratio was found.

Regarding the recurrence of tracheal intuba-

tion, only 10% of the patients in any group were reintubated.

Of the studied patients, 56% were withdrawn

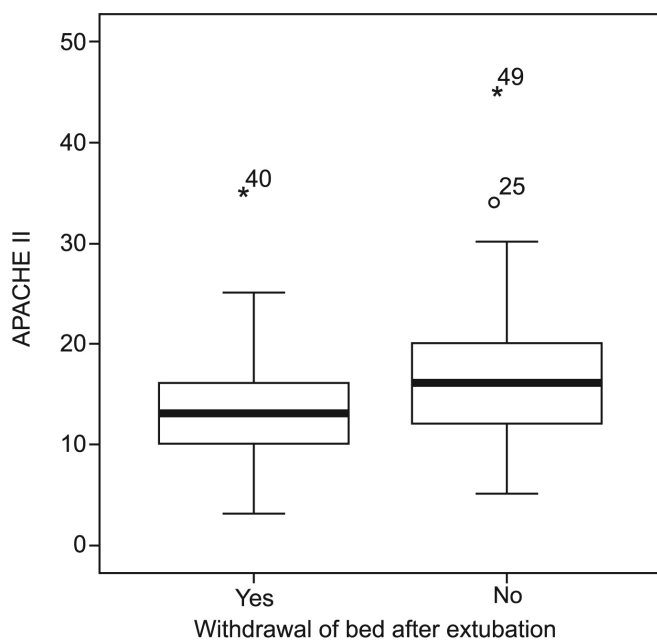


ICU – intensive care unit.

Figure 1- ICU length of stay.

of the bed during the ICU stay. Considering the withdrawal of bed related therapies, 34.5% of the patients were seated on the bed with pending lower limbs; 31.2% were seated on chair; 8.5% performed stationary march and 25.5% walked on the ICU during their stay (Table 2).

For patients withdrawn of bed, the time from the MV discontinuation to first time leaving bed was analyzed. Of the 56% patients leaving the bed, 27.5% were withdrawn of bed on the same day (up to 24 hours after MV discontinuation); 54.9% between 24-48 hours and 17.6% after 48 hours (Table 3).



APACHE II – Acute Physiology and Chronic Health II.

Figure 2 - APACHE II Calculated patients' prognosis.

Table 2 – Patients' distribution regarding withdrawal of bed procedures during intensive care unit stay

Procedures	Patients (N=51)
Seating by the bed side with pending legs	73 (34.5)
Chair seating	66 (31.2)
Stationary march	18 (8.5)
Walking	54 (25.5)
Total records	211 (100)

Results expressed as number (%).

Table 3 – Patients' distribution regarding the time to the first time leaving bed after mechanic ventilation discontinuation

First time leaving bed after MV discontinuation	Patients (N=51)
Up to 24 hours	14 (27.5)
24 to 48 hours	28 (54.9)
After 48 hours	9 (17.6)

MV – mechanic ventilation. Results expressed as numbers (%).

DISCUSSION

This study has shown that invasive support patients were mostly elderly (62.5 ± 18.8 years). These results are consistent with epidemiological studies showing mean ages ranging between 54.2 and 63.6 years for these patients.⁽¹⁴⁻¹⁶⁾ The age difference between the studied groups is believed to corroborate this study findings.

Some authors have described a male gender predominance over female in MV patients.⁽¹⁴⁻¹⁷⁾ Nevertheless, this predominance was not seen in this study. The studied sample profile appears to be related with the admission diagnosis. According to some authors, men are more involved on non-natural and violent deaths, thus predisposing this gender to mechanic ventilator support. Thus, a possible explanation for the female gender prevalence in this sample is that the study ICU is not a referral unit for trauma.

Analyzing this ICU population, and considering that the admission cause conditioned the MV start cause, we stress that the clinical profiles observed were: surgical, neurological and pulmonary patients. This was similar to the findings by Damasceno et al,⁽¹⁴⁾ Esteban et al.⁽¹⁵⁾ and Kárason et al.,⁽¹⁷⁾ who have shown a prevalence of clinical-surgical patients among the studied populations.

Considering the length of ICU stay, epidemiological studies disagree regarding the mean stay time for mechanically ventilated patients. Damasceno et al.⁽¹⁴⁾ have seen statistically significant differences between the non-ventilated versus ventilated patients groups regarding mean length of stay (8.5 and 22.3 days, respectively). Yet Esteban et al.⁽¹⁵⁾ observed 11.2 days (interquartile interval 5-13 days) ICU stay. In this study we observed an ICU length of stay shorter than these authors.

Ntoumenopoulos et al.,⁽¹⁸⁾ in a prospective trial showed that early mobilization of invasive mechanic ventilation surgical patients resulted in reduced morbidity and hospitalization time.

In this study, although retrospective, patients withdrawn of bed were shown to remain shorter in the ICU. Although these patients were clinically less severe, we emphasize that leaving the bed should be associated not only to the patient's severity, but mainly to the patient's functionality.

Regarding mortality, in this series the "not-leaving bed" factor was associated to increased chance of the outcome "death". However, it is important emphasizing that these findings were influenced by the patients' age and severity.

Generalized muscle weakness is a common consequence in bed restricted patients, particularly in those with invasive ventilation support. Studies on the inactivity effects on skeletal muscles demonstrated a 1-1.5% daily reduction in bed restricted patients, and in MV patients this decline may be even more relevant, ranging from 5% to 6% daily.^(5,8,19)

Studies suggest that muscle strength and endurance loss are the most prominent long term immobilization effects.^(20,21) According to Dittmer et al.⁽²¹⁾ muscles at full rest loose weekly 10 to 15% strength. It is important stressing that the patients weren't in absolute rest in this study. Both groups were mobilized, even in bed. The groups' difference was just regarding leaving the bed.

Brown, Friedkin & Inouye⁽²²⁾ identified different hospital mobility levels associated effects. The low morbidity versus high morbidity groups comparison portrayed a growing association with adverse results, such as daily living activities decline, new institutionalization need, home care and mortality. In this study, bed rest was a specific medical request only in 33% of the patients, while in 60% of the bed rest patients in the low morbidity group had no documented medical indication.

Martin et al.⁽²³⁾ have shown the delay in the physical activity start in invasive respiratory support patients to be associated with increased physical weakness and lower functional performance after ICU discharge. These authors have seen that, nevertheless the substantial post-ICU discharge improvement, the walk distance was in average 52 ± 18 feet, suggesting that delaying these ICU patients mobilization is a risk factor for functional rehabili-

tation process.

Considering that patients requiring long term MV are frequently poorly conditioned, Chiang et al.⁽³⁾ have shown that a six-weeks physical training program may improve peripheral skeletal muscles strength and out-of-MV time, thus improving these patients' functional outcomes.

Immobility and bed restriction effects on severely ill patients' inflammatory status were shown. Activity and mobilization therapy are explored as inflammatory process and muscle function influencing processes. It is hypothesized that inactivity is related with oxidative stress and pro-inflammatory cytokines. After four hours of immobilization, muscles start a deterioration process in which sarcomeres are reduced, muscle fibers are lost, and consequently overall muscle strength is reduced.⁽²⁴⁾

This study has some limitations related to its clinical design. This was a retrospective study, involving data extraction from medical records. Thus, it couldn't be avoided that some relevant information would not be available. Another design-associated limitation is the missing comparison to a control group. The distribution for the groups was not randomized. On the other hand, a positive aspect should be stressed: the sample's clinical data are not divergent from other literature descriptive retrospective studies, which appeases the previously mentioned limitation.

CONCLUSION

There is an apparent trend to lower ICU mortality rate in patients withdrawn of bed. However, clinical trials on early mobilization and its relationship with MV patients' complications and functional outcomes are warranted.

Considering that early mobilization and withdrawal of bed are part of the rehabilitation process, and that this process is able to restore functional limitations and attenuate dysfunctions and morbidities, we suggest this procedure to be highly stimulated in the ICU.

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RESUMO

Objetivo: Descrever a frequência de retirada do leito em pacientes submetidos à ventilação mecânica e sua repercussão na mortalidade e no tempo de permanência na unidade de terapia intensiva.

Métodos: Estudo longitudinal, retrospectivo, realizado com os pacientes submetidos à ventilação mecânica. Avaliadas variáveis clínicas e epidemiológicas, condutas motoras relacionadas à retirada do leito, tempo de permanência e mortalidade.

Resultados: Foram estudados 91 pacientes com média de idade de $62,5 \pm 18,8$ anos, predomínio do gênero feminino (52%) e tempo de permanência na unidade de terapia inten-

siva de 07 dias (IC 95%, 8-13 dias). Considerando a retirada ou não do leito, não foi observada diferença entre os grupos quanto ao tempo de permanência na unidade de terapia intensiva. Observou-se que os pacientes que foram retirados do leito possuíam menor gravidade clínica. A taxa de mortalidade foi de 29,7%, sendo que o grupo que não foi retirado do leito apresentou maior mortalidade real e prevista.

Conclusões: Os pacientes retirados do leito após a descontinuação da ventilação mecânica apresentaram menor mortalidade. Sugere-se que, cada vez mais, seja estimulada a realização de mobilização precoce e da retirada do leito na unidade de terapia intensiva.

Descritores: Respiração artificial; Deambulação precoce; Mortalidade; Modalidades de fisioterapia

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