

Variations in the Measurement of Weaning Parameters of Mechanical Ventilation in Fortaleza Hospitals*

Variações na Mensuração dos Parâmetros de Desmame da Ventilação Mecânica em Hospitais da Cidade de Fortaleza

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SUMMARY

BACKGROUND AND OBJECTIVES: The number of patients requiring prolonged time on mechanical ventilation is increasing considerably in the intensive care unit (ICU). The objective of this study was to characterize the variability of methods and criteria used by physiotherapists to obtain weaning parameters in hospitals of Fortaleza.

METHODS: After approval by the UNIFOR Ethics Committee, survey questionnaires were distributed among physiotherapists working in the ICU of three public and three private hospitals. Forty-four physiotherapists answered thirty-two multiple choice questions anonymously.

RESULTS: The main results concerned parameters commonly evaluated by physiotherapists. A significant difference between hospitals was found regarding the rapid shallow breathing index and maximum inspiratory pressure, which are more often used in private hospitals, with a percentage of 100% and 89.5%, respectively. Concerning the ventilatory

mode for obtaining the weaning parameters for mechanical ventilation; the T-tube was the most used, not only in the public (56%) but also in the private hospitals (57.9%).

CONCLUSIONS: Variability in the methods and criteria used to obtain weaning parameters by the physiotherapists was found in public and private hospitals in Fortaleza. Results from this survey stress the need to develop new scientific studies to standardize the techniques used for weaning.

Key Words: ICU, Mechanical Ventilation, Ventilator Weaning

RESUMO

JUSTIFICATIVA E OBJETIVOS: A demanda de pacientes que exigem tempo prolongado de ventilação mecânica vem aumentando consideravelmente nas Unidades de Terapia Intensiva (UTI). O objetivo deste estudo foi caracterizar a variabilidade dos métodos e critérios utilizados pelos fisioterapeutas para a obtenção dos parâmetros de desmame da ventilação mecânica em hospitais da cidade de Fortaleza.

MÉTODO: Após aprovação pelo Comitê de Ética da Universidade de Fortaleza (UNIFOR), foram distribuídos questionários de pesquisa entre os fisioterapeutas que trabalham em UTI de seis hospitais (três hospitais públicos e três hospitais particulares). Quarenta e quatro fisioterapeutas anônimos responderam as 32 questões de múltipla escolha.

RESULTADOS: Os principais resultados versam sobre os parâmetros avaliados rotineiramente pelos fisioterapeutas, em que houve diferença significativa entre os hospitais com relação ao índice de Tobin e à Pressão Inspiratória Máxima (Pimáx), sendo mais utilizados nos hospitais particulares, com um percentual de 100% e 89,5%, respecti-

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vamente. Sobre a modalidade ventilatória utilizada para a obtenção dos parâmetros de desmame da ventilação mecânica, o tubo-T foi o mais utilizado tanto nos hospitais públicos (56%) quanto nos particulares (57,9%).

CONCLUSÕES: Existe uma variabilidade nos métodos e critérios utilizados para a obtenção dos parâmetros de desmame entre os fisioterapeutas dos hospitais públicos e particulares da cidade de Fortaleza. Esses resultados reforçam a necessidade de se realizar novos estudos científicos a fim de se obter a padronização das técnicas utilizadas no desmame.

Unitermos: Desmame do Ventilador, UTI, Ventilação Mecânica

INTRODUCTION

The number of patients requiring prolonged time of mechanical ventilation has noticeably increased, encouraging work in the intensive care unit (ICU) resulting in greater survival of patients with acute respiratory failure¹.

Need for ventilatory support is caused by incapacity, temporary or not, of the respiratory system to perform its functions. This incapacity may come from the respiratory system as well as from the central nervous system or from the cardiovascular system².

Researchers discuss that weaning starts as soon as the patient is placed on mechanical ventilation. Interruption or early withdrawal of mechanical ventilation is important to prevent related complications such as toxicity to oxygen, pulmonary injury induced by mechanical ventilation, barotraumas, orotracheal injuries, pneumonias, also increased cost and time of hospital stay³.

Studies have shown that properly conducted weaning may have a direct impact on the evolution of patients submitted to mechanical ventilation, promoting a considerable decrease in weaning time, in duration of mechanical ventilation, in the number of tracheotomies and reintubations, in overall hospitalization due to lesser time in the ICU and hospital stay besides saving more lives⁴.

Empiricism in weaning from mechanical ventilation may lead to a poorer quality of the procedure and therefore increase the rate of failure, morbidity and mortality⁵. Application of a weaning protocol with a scientific rigor and standardized method may

have a series of advantages in relation to empirical weaning⁶.

The objective of this study was to describe the variability of methods and criteria used by physiotherapists to achieve weaning parameters in public and private hospitals in the city of Fortaleza.

METHODS

After approval by the Ethics Committee of the Universidade de Fortaleza (UNIFOR), a quantitative approach of comparative analysis was carried out with physiotherapists working in ICU. This study followed the ethical and legal principles in accordance with the recommendation of Resolution n. 196/96 sanctioned on the 59th Ordinary Meeting of the National Health Council – NHC, on October 10, 1996 setting forth the principles for research with human beings⁷.

This study was made in three public and three private hospitals located in city of Fortaleza, randomly selected, comprising a population of 74 physiotherapists.

All physiotherapists working with patients under mechanical ventilation in ICU at the chosen hospitals agreed to participate in the study and on their free will signed a written consent.

Professionals temporarily away from the institutions due to holidays or leave were excluded.

Data was collected by means of a questionnaire with 32 multiple choice questions designed by Soo Hoo and Park⁸ in a study carried out in nine hospitals in Los Angeles. The questionnaire was translated and adapted to Portuguese and given to the participant physiotherapists after authorization of the person in charge of the physiotherapy sector in each of the selected hospitals. Questionnaires were filled out anonymously and more than one reply per question was accepted.

Questions were about methods and criteria adopted for indication of weaning from mechanical ventilation and also on demographic aspects of the participating hospitals.

Data were presented in tables and figures. Statistical analysis was performed for association among hospitals and qualitative and categorized quantitative variables.

The Exact Fisher and the Pearson's Chi-square tests were used. Results were considered statistically significant with a value $p < 0.05$.

RESULTS

Of the 74 physiotherapists, 44 replied to the questionnaire and of these 25 were filled out by physiotherapists that work in public hospitals and 19 in private hospitals. The remaining physiotherapists refused to participate in the survey.

In replies about titles a similarity was perceived among hospitals, with most being specialists in the area. In public hospitals, 80% (20 physiotherapists) were specialists and in the private 78.9% (15 physiotherapists) ($p = 0.632$).

A statistically significant difference was found among hospitals regarding the time of physiotherapeutic practice. Private hospitals presented a higher percentage of professionals working in the area for less than five years (57.9%; 11 physiotherapists) whereas in public hospitals it was (16%; 4 physiotherapists) ($p = 0.009$).

In public hospitals time of physiotherapeutic practice was higher or equal to 20 years (0%) in private hospitals and 28% (7 physiotherapists) in public hospitals ($p = 0.014$) (Figure 1).

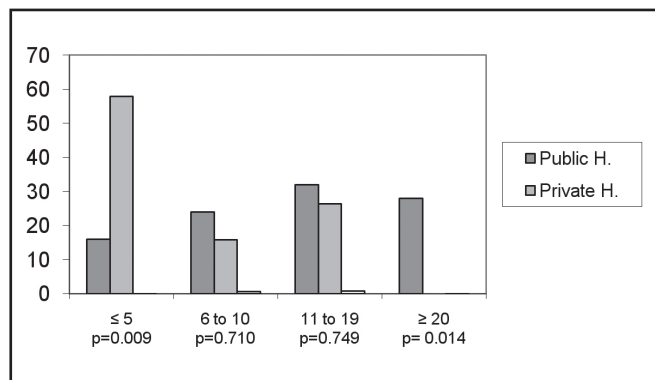


Figure 1 – Time of Physiotherapeutic Practice of the Professionals in the Surveyed Hospitals.

Regarding the routine parameters assessed for indication of weaning from mechanical ventilation it was observed that 100% (19) physiotherapists of the private hospitals use the Tobin index, while in the public hospitals this percentage was of 76% (19) with a significant difference ($p = 0.029$).

Regarding maximum inspiratory pressure (MIP) 89.5% (17) of the physiotherapists in private hospitals use this parameter for indication of weaning while in the public hospitals the percentage was of 56% (14), a statistically significant difference ($p = 0.021$) (Table 1).

Table 1 - Weaning Parameters Used by Physiotherapists in the Surveyed Hospitals

	Public H.		Private H.		Total		p
	n	%	n	%	n	%	
Total	25	100.0	19	100.0	44	100.0	-
RR	25	100.0	18	94.7	43	97.7	0.432
SatO ₂	25	100.0	18	94.7	43	97.7	0.432
Tidal volume	24	96.0	19	100.0	43	97.7	1.000
Tobin index	19	76.0	19	100.0	38	86.4	0.029
Heart rate	22	88.0	14	73.7	36	81.8	0.262
Minute-Volume	18	72.0	17	89.5	35	79.5	0.260
MIP	14	56.0	17	89.5	31	70.5	0.021
Arterial pressure	16	64.0	11	57.9	27	61.4	0.760
Temperature	10	40.0	5	26.4	15	34.1	0.522
Compliance	6	24.0	3	15.8	9	20.5	0.710
Vital capacity	5	20.0	1	5.3	6	13.6	0.213

RR = Respiratory rate; (SvO₂) = partial oxygen saturation in arterial blood; MIP = maximum inspiratory pressure

According to the data observed, there was no significant difference in the percentage of physiotherapists that used the ventilatory mode to obtain parameters of weaning from mechanical ventilation. In private hospitals 57.9% (11) physiotherapists use the T-tube while in the public hospitals this percentage was of 56% (14) ($p = 1.0$). For the mode continued positive airway pressure (CPAP), in public hospitals there were 40% (10) of the physiotherapists and in the private ones, 31.5% (6) ($p = 0.85$) (Figure 2).

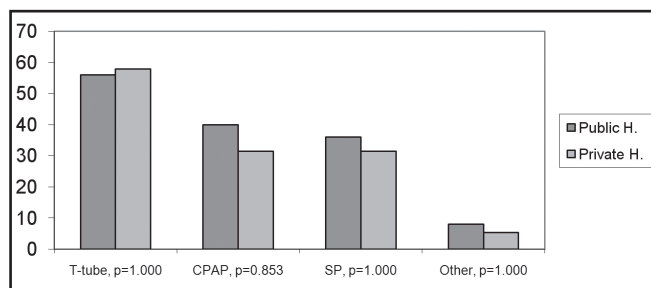


Figure 2 – Ventilatory Mode for Obtaining Weaning Parameters Used by Physiotherapists in the Surveyed Hospitals. CPAP = continuous positive airway pressure; SP = support pressure.

When questioned about ways of measuring respiratory rate (RR), no significant differences were noted and more than 80% (20) physiotherapists in the public hospitals confirmed using direct observation of patients, while in private hospitals this percentage was of 73.3% (14) ($p = 0.477$).

As for reaching the volume-minute (VM), a statistically

significant difference was observed between public and private hospitals with 100% (19) of the physiotherapists in private hospitals found this variable directly with the ventilometer and only 64% (16) physiotherapists in public hospitals reported obtaining this variable by this means ($p = 0.006$).

Regarding ways of obtaining MIP a significant statistical difference was observed among hospitals, 76% (19) physiotherapists of public hospitals stated they measure MIP manually using a manovacuometer, while in private hospitals this percentage was of 100% (19) ($p = 0.029$). Among physiotherapists who measure MIP in public hospitals, 40% (10) stated that they perform the measurement daily, while in private hospitals this percentage is of 84.2% (16) with a significant difference between hospitals ($p = 0.005$) (Figure 3).

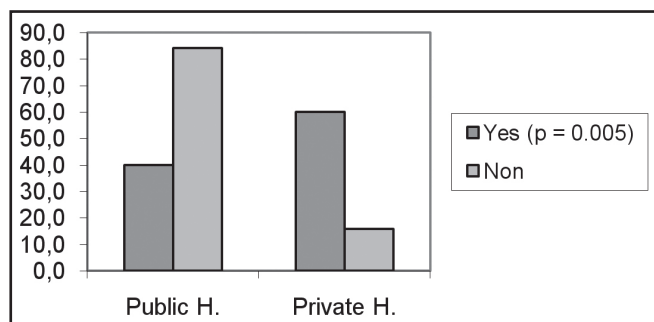


Figure 3 – Measurement of Maximum Inspiratory Pressure by Physiotherapists in the Surveyed Hospitals.

There were no significant differences between the most common methods of weaning used by physiotherapists in public and private hospitals. The CPAP + SP (support pressure) is the most often quoted by 94.7% (18) of the physiotherapists from private hospitals and by 66.7% (17) of the physiotherapists from public hospitals.

DISCUSSION

This study observed variations in the measurement of weaning parameters between the physiotherapists of different hospitals which is in agreement with the original study carried out by Soo Hoo and Park, in the city of Los Angeles⁸ and by Rodrigues et al. among respiratory physiotherapists in the city of São Paulo⁹. In the latter study, differences among physiotherapists at the same hospital were also found.

The parameters most often cited by physiotherapists from public and private hospitals were heart rate (HR), RR, tidal volume (TV), MV, MIP, Tobin index and partial oxygen saturation in arterial blood (SvO₂). How-

ever, in public hospitals the only difference was related to MIP, as only 56% of these physiotherapists use this parameter for weaning. This may be justified by lack of resources in most public hospitals, where a manovacuometer for measurement of MIP is not available. Another fact that may influence this result concerns the type of patient admitted to the ICU. In a unit with bearers of acute disease, this measurement becomes less important in view of other parameters, while in chronic patients this must be a daily practice due to the muscle weakness presented by patients that remain on MV for a long time. The study by Vallverdú et al.¹⁰ showed that MIP is the parameter with the highest predictive value for successful weaning of patients with neurological disease. Notwithstanding its low specificity, MIP is important for detection of inspiratory muscle weakness due to its excellent sensitivity, that is to say patients with low MIP (< 15 cmH₂O) have fewer chances of successful extubation¹¹.

Yang and Tobin¹¹ and Jacob et al.¹², in a study on weaning from mechanical ventilation disclosed that a large majority of professionals monitors parameters of TV and minute-volume using a ventilometer and the RR is obtained by direct observation of the patient. This agrees with the results of this study, where more than 70% of physiotherapists in public and private hospitals stated measuring RR by observing the number of the patient's chest movements. In this study, minute-volume was also measured by ventilometer.

Currently the Tobin index has been subject to much criticism regarding its specificity as a method to evaluate weaning. However some studies¹¹⁻¹³ have shown that the Tobin index is superior to other conventional parameters for the endpoint of weaning. In private hospitals all physiotherapists utilize this method, while in public hospitals only 76% use the rapid shallow breathing index (RSBI). The reason for this difference remains unanswered as in both types of hospital, more than 90% of physiotherapists measure RR and TV separately.

More than 50% of physiotherapists of public and private hospitals use the T-tube as ventilatory mode to obtain weaning parameters, in agreement with the Rodrigues et al.⁹, study which states that 91% of physiotherapists assess parameters with the patient connected to the mechanical ventilation in the PS mode.

The most common weaning method used by physiotherapists of public and private hospitals is the association of CPAP + PS. Studies by Brochard et al.¹⁴ and Esteban et al.¹⁵ say that mandatory intermittent synchronized

ventilation (MISV) is the least efficient weaning method and that there is no superiority among ventilation techniques with support pressure ventilation SPV and the T-tube test. Jones et al.¹⁶ compared the CPAP mode with 5 cmH₂O and the T-tube test in a group of 106 patients under MV and there were no significant differences between the two groups regarding extubation failure.

Action of a multi-professional team is of major significance for weaning of patients under mechanical ventilation. Successful release of patients with a real difficulty to reassume spontaneous ventilation from ventilatory support continues to be tied to careful follow-up by an experienced and qualified multidisciplinary team, able to indicate or contraindicate weaning based upon solid data, thereby avoiding physical weariness and excessive anxiety of the patient¹⁷. Thus the patient's clinical condition is of great importance in the weaning process, therefore algorithms of weaning based only on numbers are no longer so meaningful.

There is no consensus in literature about which criteria must be used for weaning from MV. As such, use of weaning protocols in the ICU has caused many scientific discussions. Weaning has already been defined as "an arbitrary clinical decision based upon judgment and experience"¹⁸ however current practice of weaning shows that empiricism becomes insufficient and inadequate.

There is variability between methods and criteria for obtaining weaning parameters among the physiotherapists of the private and public hospitals surveyed in the city of Fortaleza. It was observed that in the private hospitals there is a higher number of young physiotherapists (practice time < 5 years) in relation to public hospitals. Among the assessed weaning parameters, the Tobin index is the most utilized among private hospital physiotherapists. There was no significant difference among the more common methods of weaning used by the private and public hospitals physiotherapists.

Results of this study stress the need to carry out new scientific studies to achieve a standardization of the techniques used for weaning.

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