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# CHARACTERIZATION OF PARAMETERS AND STRATEGIES USED BY PHYSICAL THERAPISTS IN DIFFICULT MECHANICAL VENTILATION WEANING

*Caracterização de parâmetros e estratégias do desmame difícil da ventilação mecânica adotados por fisioterapeutas*

*Descripción de los parámetros y estrategias de destete difícil de la ventilación mecánica utilizados por fisioterapeutas*

Original Article

## ABSTRACT

**Objective:** To characterize the main strategies and parameters used by physical therapists in difficult mechanical ventilation weaning. **Methods:** Cross-sectional study including all the physical therapists working in adult Intensive Care Units in three public hospitals in Fortaleza-CE. A questionnaire with closed questions related to difficult mechanical ventilation weaning was applied, with either one or multiple answers. The data was treated with descriptive and non-parametric analysis. **Results:** Among the parameters mostly used by the 56 interviewed physical therapists for the difficult weaning, were found: current volume reduction (26 - 46.4%) and desaturation during aspiration (17 - 30.4%). It was observed that 38 (67.9%) alternate T-tube and continuous positive airway pressure (CPAP) as strategies for difficult weaning, and 28 (50%) reported reducing the pressure support. There was no statistical difference between the strategies used in the studied hospitals, neither correlation between strategies and parameters. **Conclusion:** It was found that physical therapists have been performing similar strategies, which are also shown in the literature, but this is not the case with the parameters. The parameters used are not supported by the literature.

**Descriptors:** Diaphragm; Muscle Fatigue; Physical Therapy; Muscle Strength; Intensive Care Units; Respiration; Artificial.

## RESUMO

**Objetivos:** Caracterizar as principais estratégias e parâmetros adotados por fisioterapeutas no desmame difícil da ventilação mecânica. **Métodos:** Estudo transversal incluindo todos os fisioterapeutas que atuam nas Unidades de Terapia Intensiva adulto em três hospitais públicos da cidade de Fortaleza-CE. Utilizou-se um questionário com perguntas objetivas, relacionadas ao desmame difícil da ventilação mecânica, havendo itens com possibilidade de respostas múltiplas. Os dados foram tratados de forma descritiva e não paramétrica. **Resultados:** Dentre os principais parâmetros adotados para o desmame difícil pelos 56 fisioterapeutas entrevistados, encontrou-se: redução do volume corrente (26 - 46,4%) e dessaturação durante aspiração (17 - 30,4%). Observou-se que 38 (67,9%) afirmam intercalar pressão positiva contínua em vias aérea (CPAP) e tubo T como estratégia adotada no desmame difícil, e 28 (50%) responderam redução da pressão de suporte. Não houve significância estatística entre as estratégias adotadas nos hospitais estudados, assim como na correlação entre estratégias e parâmetros. **Conclusão:** Constatou-se que os fisioterapeutas têm realizado estratégias semelhantes entre si e correspondentes à literatura, mas não em relação aos parâmetros. Os parâmetros adotados não corroboram com os descritos pelos estudos científicos.

**Descritores:** Diafragma; Fadiga Muscular; Fisioterapia; Força Muscular; Unidade de Terapia Intensiva; Ventilação Mecânica.

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## RESUMEN

**Objetivos:** Caracterizar las principales estrategias y parámetros adoptados por fisioterapeutas en desmame difícil de la ventilación mecánica. **Métodos:** Estudio transversal que incluye a todos los fisioterapeutas que actúan en las Unidades de Cuidados Intensivos de adultos en tres hospitales públicos de la ciudad de Fortaleza-CE. Se utilizó un cuestionario con preguntas objetivas relacionadas con el destete difícil de la ventilación mecánica, habiendo ítems con posibilidad de respuestas múltiples. Los datos fueron tratados de forma descriptiva y no paramétrica. **Resultados:** Entre los principales parámetros adoptados para el destete difícil por los 56 fisioterapeutas entrevistados se observó: reducción del volumen corriente (26 - 46,4%) y desaturación durante la aspiración (17 - 30,4%). Se observó que 38 (67,9%) afirman intercalar presión positiva continua en las vías aéreas (CPAP) y tubo T como estrategia adoptada en el destete difícil, y 28 (50%) respondieron a una reducción de la presión de soporte. No hubo diferencias estadísticamente significativas entre las estrategias adoptadas en los hospitales estudiados, así como en la correlación entre estrategias y parámetros. **Conclusión:** Se constató que los fisioterapeutas realizan estrategias semejantes entre sí y correspondientes a la literatura, pero no en relación a los parámetros. Los parámetros adoptados no confirman los descritos por los estudios científicos.

**Descriptores:** Diafragma; Fatiga Muscular; Fisioterapia; Fuerza Muscular; Unidad de Cuidados Intensivos; Respiración Artificial

## INTRODUCTION

The need for prolonged mechanical ventilation (MV) is a reality in the Intensive Care Units (ICU), resulting in a longer period of hospitalization, increasing morbidity and mortality indices. Within the process of weaning from mechanical ventilation failures might occur, often due to respiratory muscle deficit because of the diaphragm atrophy or other adverse complications. When, within a period of a week, the attempts for removal of the ventilatory device are unsuccessful, it is then characterized a difficult weaning (DW)<sup>(1-3)</sup>.

One of the possible complications presented by the critical patient in prolonged MV would be the DW, so the removal of ventilatory assistance should be implemented through planning, followed by protocols and strategies in order aiming to reduce the time of ventilatory assistance and avoid subsequent reintubation. The reduction in respiratory muscle strength is one of the possible complications that impact the failure in discontinuing MV. Thus, the implementation of muscle training with incremental load on the respiratory muscles should be considered as a strategy for weaning<sup>(3,4)</sup>.

Some strategies employed by physical therapists to strengthen the respiratory muscles are the gradual decrease

of the pressure support, alternate continuous positive airway pressure (CPAP) with T tube, increased MV sensitivity and threshold<sup>(5,6)</sup>.

In addition to those strategies, some tests should be performed to ensure the success of ventilatory assistance withdrawal in patients classified as difficult to wean. Among them, stands the test of spontaneous breathing, one of the most effective ways to assess the interruption of MV<sup>(7)</sup>.

This scientific analysis takes into consideration the need for better definition and characterization of measures currently used by physical therapists in cases of DW. Therefore, the general objective of this study was to characterize the main strategies and parameters adopted by physical therapists in difficult weaning from mechanical ventilation in the Adult Intensive Care Unit.

## METHODS

This is a descriptive epidemiological study, observational and cross-sectional, with quantitative approach, developed in three adult Intensive Care Units in public hospitals in the city of Fortaleza-CE, in 2010.

All the physical therapists from the above-mentioned hospitals were selected to participate in the study (63) as long as they fulfilled the inclusion and exclusion criteria in the study. Inclusion criteria were: physical therapists with more than six months of work experience in the adult ICU, regardless of sex, who agreed to participate in the study by signing the Free Informed Consent Form. Those who were temporarily away from the institution due to vacation or leave were excluded.

As an instrument for data collection, a questionnaire was applied, with multiple choice questions originally developed by the researchers, addressing the identification of the DW and the parameters and strategies adopted for difficult weaning, considering the research objectives. Among the 09 variables assessed, these are included: 'In your opinion, what would be a difficult weaning in ventilatory assistance?'; 'Can you identify when a patient is in difficult weaning?'; 'Which parameters do you use more frequently for a difficult weaning?'; 'Which strategies do you use for muscular training?'. The questions about the parameters used by the physical therapists for difficult weaning had more than one option that could be pointed out by the professionals as isolated alternatives or associated with one or more strategies.

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS), version 17.0, in which descriptive and comparative nonparametric tests were used to demonstrate the profile of the procedure used for DW. Chi-square tests, with Contingency Tables, were used to assess correlations between variables, observing

the value of statistical significance  $p \leq 0.05$ , and data was represented in figures.

This research was approved by the *Comitê de Ética em Pesquisa do Hospital Geral Dr. César Cals* (Research Ethics Committee of the General Hospital Dr. César Cals), under the protocol number 355/09, and followed the ethical recommendations of the *Resolução 196/96 do Conselho Nacional de Saúde* (Resolution 196/96 of the National Health Council), which establishes the principles for research with human beings<sup>(8)</sup>.

## RESULTS

Of the 63 physical therapists, 56 completed the questionnaire, since 02 professionals refused to answer and 05 were absent by the time of data collection.

Regarding the concept of DW, most physical therapists (44 - 78%) related it to the failure in MV withdrawal soon after 3 attempts in a week, while 12 (22%) related it to the failure in removing the MV after more than 3 attempts within a week. Regarding the identification of the patient

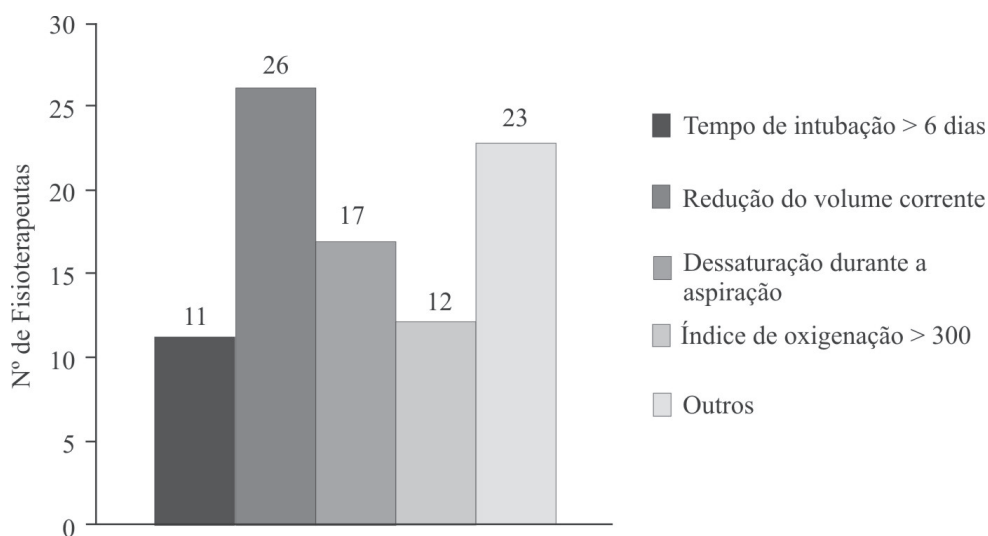


Figure 1 - Parameters commonly used by physical therapists to identify a patient in difficult weaning. Fortaleza-CE, 2010.

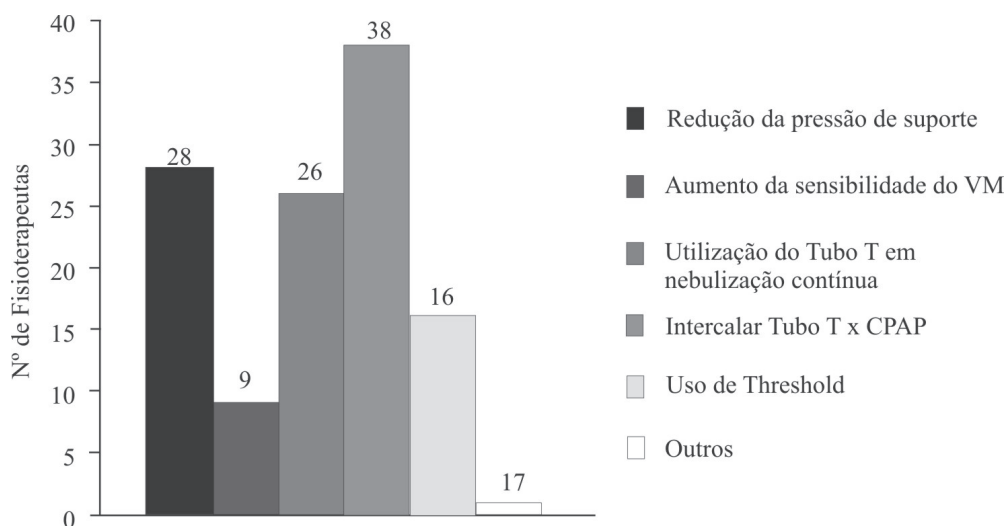


Figure 2 - Strategies currently used by physical therapists on muscle training in patients with difficult weaning. Fortaleza-CE, 2010.

in DW, 55 (98.2%) practitioners showed to be able to verify it. This result was significant ( $p < 0.05$ ), demonstrating their ability to identify patients who are in DW.

Among the parameters adopted to identify a patient in DW, the most related ones were the reduction of the current volume (26 - 46.4%) and desaturation during aspiration (17 - 30.4%). It is worth noting that, besides these parameters, others were chosen by some physiotherapists (23 - 41.1%), such as Tobin index, increased respiratory rate, and decreased muscle strength (Figure 1).

When asked about the evaluation of muscle strength during weaning from MV and muscular training in DW cases, the majority of the professionals, 45 (80.4%) and 48 (85.7%), respectively, stated to perform them, showing statistical significance ( $p < 0.05$ ).

Among the strategies employed by the physical therapists, these were highlighted: alternating CPAP X Tube T (38 - 67.9%), reduction of pressure support (28-50%) and use of the T tube in continuous nebulization (26 - 46.4%). These results were pointed out by the physical therapists as options, either alone or associated with one or more strategies (Figure 2). There was no significant difference between the strategies employed by the physical therapists in the public hospitals studied ( $p = 0.08$ ).

## DISCUSSION

The results related to the concept and characterization of DW found in this study corroborate other work<sup>(2)</sup>. Studies<sup>(9,10)</sup> show that DW can be defined as a failure in three attempts of weaning from mechanical ventilation in a week. After that, patients cannot manage to breathe spontaneously, having a failure as result. Hence the importance of the physical therapists' ability to identify when the patient is in DW, so that they can take measures to facilitate the process of weaning from mechanical ventilation as soon as possible<sup>(2)</sup>.

Other parameters, such as the reduction in tidal volume and desaturation during aspiration, mentioned by some physical therapists in this study, are not related by other researchers<sup>(11)</sup>, who actually mentioned hemodynamic stability, sedation, gas exchange and airway autonomy as key parameters for difficult weaning. This fact can be explained by taking some features into consideration, such as: less concern in establishing and following a better standardization among practitioners into ICU, and the paucity of scientific publications to reach an agreement and a definition concerning the specific standardization of these criteria for professionals who perform DW<sup>(4)</sup>.

The results of this study corroborate other study<sup>(12)</sup>, when it comes to the strength of respiratory muscles, stating that it may influence the weaning process. In recent years, the manometer has been used by physical therapists in

the ICU as an effective method to assess muscle strength, contributing to the strategies implementation during the DW.

The available data in this analysis are similar to those found in another research<sup>(13)</sup>, which describes the assessment of muscular strength as a much common and necessary method for the physical therapy interventions, since the patient under MV presents respiratory muscle weakness and this can lead to failure at the time of MV discontinuation.

In a recent study<sup>(12)</sup>, it is reported that patients who are admitted to ICU under MV present respiratory muscle weakness, which contributes to a failure in ventilatory weaning. It can be concluded that training with incremental load on the respiratory muscles becomes important for muscle strength maintenance, aiming at a better condition of the muscular mechanics regarding the outcomes of the MV discontinuity.

These survey results are consistent with those described in recent studies<sup>(5,7,14)</sup>, which report the same strategies stated herein. These strategies have also been highlighted in another study<sup>(12)</sup>, which emphasized load increase on the respiratory muscles in patients who are in prolonged MV in order to promote endurance of the respiratory muscles.

The correlation between parameters and strategies observed in the present study did not show significance ( $p = 0.061$ ), what may be related to the professionals who don't follow a pattern in DW.

## CONCLUSION

The purpose of this study was to characterize the strategies and parameters currently used in difficult weaning in three referral public hospitals. The initial hypothesis was that there would be a significant association between parameters and strategies employed by the physical therapists. It was observed that the parameters mentioned by these professionals in the DW are not compatible with the specific literature. However, the strategies were shown to be similar, without significant correlation with the parameters used, demonstrating a lack of standardization of these criteria.

It is necessary to conduct further studies that include an extension of the scientific object studied, in order to establish a better standardization of parameters and strategies on DW.

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