

Walkyria Araújo Macedo Pinto¹, Heloisa Baccaro Rossetti¹, Abigail Araújo¹, José Jonas Spósito Júnior¹, Hellen Salomão¹, Simone Siqueira Mattos¹, Melina Vieira Rabelo¹, Flávia Ribeiro Machado¹

Impact of a continuous education program on the quality of assistance offered by intensive care physiotherapy

Impacto de um programa de educação continuada na qualidade assistencial oferecida pela fisioterapia em terapia intensiva

1. Discipline of Anesthesiology, Pain and Intensive Care, Escola Paulista de Medicina, Universidade Federal de São Paulo - São Paulo (SP), Brazil.

ABSTRACT

Objective: To evaluate the role of quality indicators and adverse events registering in the quality assessment of intensive care physiotherapy and to evaluate the impact of implementing protocolized care and professional training in the quality improvement process.

Methods: A prospective before-after study was designed to assess 15 indicators of the quality of care. Baseline compliance and adverse events were collected before and after the implementation of treatment protocols and staff training.

Results: Eighty-nine patients admitted, being 48 in the pre-intervention period and 41 in the post-intervention period with a total of 1246 and 1191 observations respectively. Among the indicators related to the global population, there was a significant improvement in chest x-ray control, multidisciplinary rounds and shift changes as well as in compliance with these decisions. Indicators related to the population under mechanical ventilation, obtained by direct observation at bedside, showed a significant

improvement in the compliance with the tidal volume of 6-8mL/Kg, plateau pressure <30cmH₂O, adequate mechanical ventilation alarm setting, mechanical ventilation humidification control, adequate humidification line exchange and orotracheal tube position. Among the mechanical ventilation indicators collected through the physiotherapy records, there was significantly improved compliance with the predicted tidal volume registry and cuff pressure registry. There was a significant reduction in the number of adverse events. There was no impact on intensive care unit mortality, length of stay, duration of mechanical ventilation and ventilator-free days.

Conclusion: It is possible to measure the quality of physiotherapy care using indicators of quality control. The implementation of care protocols and training of the professionals can improve team performance.

Keywords: Education, continuing; Indicators of health service; Quality management; Quality improvement; Respiratory therapy; Physical therapy modalities; Intensive care

Conflicts of interest: None.

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Corresponding author:

Walkyria Araújo Macedo Pinto
Disciplina de Anestesiologia, Dor e
Terapia Intensiva
Rua Napoleão de Barros, 715, 5º andar -
Vila Clementino
Zip code: 04024-900 - São Paulo (SP), Brazil
E-mail: walky64@hotmail.com

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INTRODUCTION

Intensive care units (ICU) are characterized by intense and dynamic routines, requiring prompt decisions that ideally use evidence-based guidelines. The organization of their structure is complex and costly, requiring the excellent management of material and human resources. The quality improvement in intensive care is considered imperative in all of their facets, including security and scientific, ethical, economic and social aspects. The improvement of the care

process is one of the most important interventions and involves individual and institutional behavioral changes.⁽¹⁻⁵⁾

The multidisciplinary team in intensive care includes physiotherapists, who are responsible for performing diagnoses and procedures for critically ill patients, such as ventilation, respiratory monitoring and assessments of musculoskeletal, neurological, metabolic and cardiovascular diseases, and for the prevention and treatment of the effects of prolonged immobility. However, there is still large variability in the care, with no standardized quality indicators specific to intensive physiotherapy. The literature on this point is rather sparse, justifying the need for studies on specific indicators for intensive physiotherapy, quality assessment, planning and control services. Therefore, the aims of this study were evaluate the role of quality indicators and adverse events assessment in the quality of intensive care physiotherapy as the evaluate the impact of implementing protocolized care and professional training in the quality improvement process.⁽⁶⁻¹⁰⁾

METHODS

This before-after study was conducted in an ICU of a university hospital. All patients admitted to the ICU aged 18 years or older were consecutively included, regardless of the use of MV. Patients under airborne infection precautions were excluded from the study. The study was approved by the Ethics and Research Committee *Universidade Federal de São Paulo* under number 1396/08. The Research Ethics Committee waived the need to obtain patient consent due to the characteristics of the study. All physiotherapists involved in the study provided informed consent.

The study was divided into three phases. In the first phase, we established 15 indicators of quality related to physiotherapy based on their relevance to patient care under mechanical ventilation (MV) or not and the ability to perform objective measurements (Electronic supplementary material - ESM - Table 1). These indicators were applied to three patient settings, which were the whole population, those under MV and those treated with an artificial airway. They were evaluated either by analyzing the patient's chart or the physiotherapy shift change register or by bedside observation. These indicators were assessed one to three times per day, depending on the indicator. Thus, the denominator used to calculate the indicator varied. The baseline data for the compliance with the indicators were collected during one month (October

2008). In this phase, we also established the protocols related to intensive care physiotherapy. The adequacy of the indicators was evaluated based on these protocols. Previously defined adverse events related to physiotherapy care were also collected (ESM - Table 2).

In the second phase of the study (January-March 2009), we implemented the protocols of care and a continuing education program, aiming to train and improve the capacity of the physiotherapy staff. Meetings were held to present the protocols to the professionals on all shifts. All physiotherapy fellows who worked in the unit also participated in this process. All material was revised, sent electronically to the team and made available for open consultation inside the ICU. The team was encouraged to follow the established guidelines, and clinical guidance was discussed in multidisciplinary rounds. All noncompliant situations were discussed with the responsible physiotherapist for guidance. The leadership of the physiotherapy department supported this process, motivating the team to comply with the protocols.

The third phase of the study occurred six months after the implementation of the protocols (September 2009). Compliance with all indicators and the occurrence of adverse events was evaluated and compared with the baseline data. In the first and third phases, we also collected patient characteristics and clinical outcomes, such as ventilator-free days, length of ICU stay and ICU mortality.

Categorical variables were expressed as numbers and percentages, using the chi square test for comparison between groups. Continuous variables were tested using the Shapiro-Wilk test to assess their distribution. Variables without a normal distribution were expressed as medians and interquartile and submitted to the Mann-Whitney test. The results were considered significant with a descriptive value of $p < 0.05$.

RESULTS

We included 89 patients, with 48 in the pre-intervention phase (October 2008) and 41 in the post-intervention phase (September 2009). There were no significant differences in the demographic data, as shown in table 1.

Among the indicators related to the global population, there was a significant improvement in the chart registry of chest x-ray control, multidisciplinary rounds and clinical decisions in the shift change as well as in the compliance with the decisions of the multidisciplinary round. Among

Table 1 - Characteristics of the groups

Variable	Whole population (N=89)	Pre-intervention (N=48)	Post-intervention (N=41)	p value
Age (years)	54 (34.5-67.5)	54 (37.5-68.0)	54 (28.5-67.0)	0.770
Gender				0.100
Female	60 (67.4)	36 (75.0)	24 (58.5)	
Male	29 (32.6)	12 (25.0)	17 (41.5)	
APACHE II	15.0 (10.5-21.0)	14.0 (11.5-21.5)	15.0 (10.5-20.5)	0.689
SOFA	7.0 (4.0-10.0)	7.0 (5.0-11)	6.0 (3.5-9.5)	0.276
MV	60 (67.4)	30 (62.5)	30 (73.2)	0.287
Admission category				0.924
Medical	28 (31.5)	15 (31.3)	13 (31.7)	
Elective surgery	30 (33.7)	17 (35.4)	13 (31.7)	
Emergency surgery	31 (34.4)	16 (33.3)	15 (36.6)	

APACHE - Acute Physiological and Chronic Health Evaluation; SOFA - Sequential Organ Failure Assessment; MV - mechanical ventilation. The results are expressed as median (25%-75%) or number (%).

the indicators related to patients under MV that were obtained by direct bedside observation, there was a significant improvement in compliance with a TV of 6-8mL/Kg, plateau pressure <30cmH₂O, orotracheal tube position, adequate MV alarm setting, adequate MV humidification control and humidification line exchange. In the same population, for those indicators obtained through the physiotherapy chart records, there

were significant improvements in the compliance with the predicted TV registry and cuff pressure registry (Table 2).

After the intervention, there was a significant reduction in the number of adverse events (74 [5.9%] versus 29 [2.4%], before and after the intervention, p<0.001) (Table 3). There was no significant difference in the clinical outcomes (Table 4).

Table 2 - Compliance with quality indicators

Indicator	Number of observations	Pre-intervention	Post-intervention	p value
All patients - obtained by chart review				
Chest x-ray control*	730	297/388 (76.5)	305/342 (89.2)	<0.001
Multidisciplinary round*	808	366/412 (88.8)	386/396 (97.5)	<0.001
Airway secretion aspect**	2437	1169/1246 (93.8)	1118/1191 (93.9)	0.513
Shift change**	2437	1151/1246 (92.4)	1131/1191 (95.0)	0.008
Compliance with decisions of the multidisciplinary round**	2437	1038/1246 (83.3)	1053/1191(88.4)	<0.001
Patients under MV - obtained by direct observation				
TV of 6-8mL/Kg**	1501	587/810 (72.5)	638/691 (92.3)	<0.001
Plateau pressure <30cmH ₂ O**	1501	727/810 (89.8)	660/691 (95.5)	<0.001
Adequate MV alarm setting**	1501	558/810 (68.9)	656/691(94.9)	<0.001
Adequate MV humidification control**	1005	395/549 (71.9)	428/456 (93.9)	<0.001
Adequate humidification line exchange**	1005	457/549 (83.2)	411/456 (90.1)	0.001
Adequate MV circuit exchange**,#	1005	504/549 (91.8)	415/456 (91.0)	0.654
Adequate orotracheal tube position**.,##	835	302/415 (72.8)	369/420 (87.9)	<0.001
Patients with artificial airways - obtained by chart review				
Anthropometry registry*	491	257/265 (97)	216/226 (95.6)	0.409
Predicted TV registry*	491	226/265 (85.3)	222/226 (98.2)	<0.001
Cuff pressure registry***	1128	688/863 (79.7)	440/512 (85.9)	0.003

MV - mechanical ventilation; TV - tidal volume. The results are expressed as the number of adherent observations/total number of observations (%). * Assessed once per day, ** assessed three times per day, *** assessed twice per day, # some patients were using hydroscopic filters, ## some patients had a tracheostomy.

Table 3 - Adverse events related to intensive physiotherapy

Events	Pre-intervention (N=1246)	Post-intervention (N=1191)	p value
Early failure of MV discontinuation	3 (0.2)	3 (0.3)	0.955
Late failure of MV discontinuation	34 (2.7)	12 (1.0)	0.001
MV-associated pneumothorax	0 (0.0)	0 (0.0)	-
Atelectasis on chest r-ray	1 (0.1)	1 (0.1)	0.974
Cardiac arrest secondary to hypoxia	2 (0.2)	0 (0.0)	0.166
Artificial airway obstruction	0 (0.0)	0 (0.0)	-
Bronchoaspiration	24 (1.9)	5 (0.4)	<0.001
Accidental extubation	4 (0.3)	6 (0.5)	0.480
Tracheostomy decannulation	0 (0.0)	0 (0.0)	-
Withdrawal of tubes, drains or catheters during physiotherapy	1 (0.1)	0 (0.0)	0.328
Physiotherapy-related complications during transport	0 (0.0)	0 (0.0)	-
Lack of ventilatory supplies or equipment failure	5 (0.4)	2 (0.2)	0.282
Total number of events (N=103)	74 (5.9)	29 (2.4)	<0.001

MV - mechanical ventilation. The results are expressed as number (%).

Table 4 - Impact of implementing protocols on clinical outcomes

Clinical outcomes	Entire population studied (N=89)	Pre-intervention (N=48)	Post-intervention (N=41)	p value
ICU length of stay	6.0 (3.0-14.50)	5.0 (3.0-14.50)	6.0 (4.0-14.0)	0.424
MV duration	7.0 (3.0-15.0)	1.0 (0.0-9.5)	5.0 (0.0-9.0)	0.265
Ventilator-free days	0.0 (11.0-23.0)	0.0 (0.0-23.0)	12.5 (0.0-23.0)	0.566
ICU mortality	22 (24.7)	14 (29.2)	8 (19.5)	0.29

ICU - intensive care unit; MV - mechanical ventilation. The results are expressed as median (25%-75%) or number (%).

DISCUSSION

In this study, we were able to show that it is possible to improve the quality of care offered by intensive physiotherapy by standardizing the processes and developing protocols and actions to improve patient safety. Our results showed a significant increase in 12 of 15 indicators assessed, even in a scenario in which several of them already had high adherence. Among the indicators evaluated, 3 showed no significant change, most likely because they already had compliance above 90% in the initial phase of the study.

We sought to delineate a system applicable in intensive care units using indicators that lend themselves to objective assessment, thereby allowing the system to be reproduced in other services. The professionals had the opportunity to participate in the development of the protocols. Training meetings were held during the working hours inside the units, thus facilitating team participation. Similar studies have shown that the availability of time for professionals to participate in continuing education programs is a barrier to be overcome, as gathering a team at a single time can be a complex task.^(9,11,12)

This sort of continuing education proved to be a viable alternative to ensure the team's participation in these programs. Additionally, the participation of the ICU physiotherapy leadership in this process was important to validate the actions taken by strengthening communication and teamwork.^(1,9,13-15)

The challenge in this type of study is related to changing the team's behavior and instituting new clinical practices, which requires the professionals to be aware of the relevance of these modifications and the need for sustained actions to maintain the achieved results. It is important to emphasize that this quality assessment has been specially designed for intensive physiotherapy, using careful methodology and systematic collection with more than one daily observation to increase accuracy. The use of indicators and protocols in accordance with clinical guidelines recommended in the literature possibly facilitated the achievement of good compliance by the healthcare team. The forms created were well accepted by the team and were incorporated into the routine, even after the end of the study.

The assessment of adverse events was an important strategy for improving the professionals' perceptions

of the critical status of our patients. We observed a significant reduction in the occurrence of events after the proposed interventions. Similar studies have also noted the importance of developing a culture of safety among ICU team professionals, with numerous strategies being developed to identify risk situations and prevent complications during hospitalization.^(4,5,10,16-18)

Despite adequate results in the quality indicators, there was no significant impact on the clinical outcomes. Although it was possible to improve the physiotherapy care, an impact on global clinical outcomes is less likely to occur considering the importance of the multidisciplinary treatment of patients. The indicators assessed in this study concerned only the assistance of intensive physiotherapy and were not designed to assess the impact of actions taken by other teams working in the ICU, which could also influence these outcomes. Moreover, many of the indicators already had high compliance at baseline, and even a significant improvement would likely not impact the clinical outcomes. However, demonstrating this impact would be easier in services with lower compliance rates.

Our study has some limitations. We highlight the scarcity of similar studies in the literature, making it difficult to compare results. The diversity of the role of the physiotherapist in intensive care is also a limiting factor, as each service can set different tasks for this professional.

As this was a single centre study, the reproducibility of these indicators can be limited because we could not assess them in other contexts, such as ICU indicators with low baseline compliance. This factor reduces the external validity of our results. As the team knew about the quality implementation process, we were unable to collect data in a blinded fashion, which could have influenced the baseline compliance and even the post-intervention data. The lack of long-term follow-up also precludes the evaluation of whether the results were sustained. Further studies could be designed with a longer observation time and a larger number of patients.

CONCLUSION

In summary, our results showed that it is possible to measure the quality of physiotherapy care through quality indicators and the occurrence of adverse events. Moreover, implementing care protocols and professional training is able to improve the team's performance in terms of the indicators selected.

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RESUMO

Objetivo: Avaliar o papel de indicadores de qualidade e registro de eventos adversos na qualidade assistencial da fisioterapia em terapia intensiva, bem como o impacto da implantação de protocolos de cuidado e treinamento profissional no processo de melhoria da qualidade.

Métodos: Estudo prospectivo antes-depois para avaliar 15 indicadores de qualidade assistencial. Dados basais a respeito de adesão e eventos adversos foram coletados antes e após a implantação de protocolos de tratamento e treinamento da equipe.

Resultados: Foram avaliados 89 pacientes, sendo 48 admitidos no período pré-intervenção e 41 no período pós-intervenção, com um total de 1.246 e 1.191 observações, respectivamente. Entre os indicadores relacionados à população global, houve melhora significativa no controle radiográfico, passagem de plantão, visita multiprofissional, assim como na adesão a essas decisões. Os indicadores relacionados com a população sob ventilação mecânica, obtidos por observação direta no leito, mostraram melhora significativa na adesão ao

volume corrente de 6 a 8mL/kg, pressão platô <30cmH₂O, adequação dos alarmes da ventilação mecânica, controle de umidificação da ventilação mecânica, troca dos equipos de umidificação, e posicionamento do tubo orotraqueal. Entre os indicadores de ventilação mecânica coletados por meio de registros da fisioterapia, ocorreu melhora significativa da adesão ao registro do volume corrente predito e ao registro da pressão do balonete. Houve redução significativa no número de eventos adversos. Não houve impacto na mortalidade na unidade de terapia intensiva, no tempo de internação, tempo de ventilação mecânica e no tempo livre da ventilação mecânica.

Conclusão: É possível medir a qualidade do cuidado fisioterapêutico utilizando indicadores de controle de qualidade. A implantação de protocolos de cuidado e treinamento dos profissionais pode melhorar o desempenho da equipe.

Descritores: Educação continuada; Indicadores de serviços; Gestão de qualidade; Melhoria de qualidade; Terapia respiratória; Modalidades de fisioterapia; Terapia intensiva

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