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ORIGINAL RESEARCH

Mobilization of intensive care unit patients during renal replacement therapy: a survey with physical therapists

Mobilização de pacientes de unidade de terapia intensiva durante a terapia de substituição renal: um estudo tipo survey com fisioterapeutas

Movilización de pacientes de la unidad de cuidados intensivos durante la terapia de reemplazo renal: un estudio de encuesta con fisioterapeutas

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ABSTRACT | Although physical therapy techniques are widely applied at the intensive care unit (ICU), patients under renal replacement therapy (RRT) are often excluded from mobility studies. We aimed to investigate which are the mobilization interventions performed by physical therapists in ICU patients during RRT and what is the perception regarding its safety. This was a survey study with physical therapists who work at ICUs that have continuous renal replacement therapy (CRRT) and/or intermittent hemodialysis (IHD) in the city of São Paulo, Brazil. A structured questionnaire was sent electronically. Responses were analyzed separately for CRRT and IHD and compared with proportion test. A total of 71 forms were received, and 51 were included. Physical therapists were employed at public (56.8%) and private hospitals, of secondary (54.9%) and tertiary levels. Nine physical therapists reported specific protocols for mobilization practice during RRT at the ICU. Mobilization interventions were performed more frequently during CRRT than IHD (91% vs. 65%, p=0.005). Passive and active limb mobilization were the most frequently performed interventions. 21% of respondents reported complications for IHD and 26% for CRRT, mainly related to the hemodialysis system. Many participants (66.7% for IHD and 44.1% for CRRT) reported to have never searched for literature recommendations. Among those who searched, the findings varied greatly. We concluded that there is lack of standardization for mobilization interventions during RRT. Mobilization is more frequently performed during CRRT and the most applied techniques are passive and active limb mobilization. Complications reported during the mobilization practice were mainly related to the hemodialysis system and not frequent.

Keywords | Physical Therapy Modalities; Early Mobilization; Intensive Care Units; Renal Dialysis; Continuous Renal Replacement Therapy.

RESUMO | Apesar de a fisioterapia ser amplamente aplicada em unidade de terapia intensiva (UTI), pacientes recebendo terapia de substituição renal (TSR) são comumente excluídos de estudos sobre mobilidade. Nosso objetivo foi investigar quais intervenções de mobilização são realizadas por fisioterapeutas em pacientes de UTI durante a TSR e qual a percepção quanto à segurança. Conduzimos um estudo tipo *survey* com fisioterapeutas que atuam em UTIs com TSR contínua (TSRC) e/ou hemodiálise intermitente (HDI) na cidade de São Paulo, Brasil. Um questionário estruturado foi enviado eletronicamente. As respostas foram analisadas separadamente para TSRC e HDI e comparadas por teste de proporção. Foram recebidos 71 formulários, sendo 51 incluídos. Os fisioterapeutas eram de hospitais públicos (56,8%) e privados, de níveis secundário (54,9%) e terciário. Nove fisioterapeutas relataram haver protocolo específico para mobilização durante a TSR. A mobilização foi realizada mais frequentemente durante TSRC (91% *vs.* 65%, p=0,005). Mobilização passiva e ativa de membros foram as intervenções mais frequentes. Cerca de 21% dos respondentes relataram

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complicações durante HDI e 26% para TSRC, sobretudo relacionadas ao sistema de hemodiálise. Muitos dos participantes (66,7% para HDI e 44,1% para TSRC) relataram nunca ter pesquisado recomendações de literatura. Dentre aqueles que procuraram, os achados foram heterogêneos. Como conclusão, há carência de padronização para intervenções de mobilização durante a TSR. A mobilização é mais frequentemente realizada durante a TSRC em comparação à HDI, e as técnicas mais aplicadas foram mobilização passiva e ativa de membros. As complicações relatadas durante a mobilização foram principalmente as relacionadas ao sistema de hemodiálise, com baixa frequência.

Descritores | Modalidades de Fisioterapia; Mobilização Precoce; Unidades de Terapia Intensiva; Diálise Renal; Terapia de Substituição Renal Contínua.

RESUMEN | Aunque la fisioterapia se aplica ampliamente en la unidad de cuidados intensivos (UCI), los pacientes que reciben terapia de reemplazo renal (TRR) suelen ser excluidos de los estudios sobre movilidad. El objetivo de este trabajo fue analizar qué intervenciones de movilización realizan los fisioterapeutas en los pacientes de la UCI durante la TRR y cuál es la percepción de seguridad. Se realizó un estudio de tipo encuesta con fisioterapeutas que trabajan en UCI con TRR continuo (TRRC) y/o hemodiálisis intermitente (HDI) en la ciudad de São Paulo, Brasil. Se envió por correo electrónico un cuestionario estructurado. Las respuestas se analizaron por separado para TRRC y HDI y se compararon por prueba de proporción. Se recibieron 71 formularios, de los cuales 51 fueron incluidos. Los fisioterapeutas fueron de hospitales públicos (56,8%) y privados, con niveles secundarios (54,9%) y terciarios. Nueve fisioterapeutas informaron seguir un protocolo específico para la movilización durante la TRR. La movilización se realizó con mayor frecuencia durante la TRRC (91% *vs.* 65%, p=0,005). La movilización pasiva y activa de las extremidades fueron las intervenciones más frecuentes. Aproximadamente el 21% de los encuestados informaron complicaciones durante el HDI y el 26% para TRRC, sobre todo relacionadas con el sistema de hemodiálisis. Muchos de los participantes (66,7% para el HDI y 44,1% para el TRRC) informaron que nunca habían buscado las recomendaciones de la literatura. Entre los que las buscaron, los hallazgos fueron heterogéneos. Se concluye que existe una falta de estandarización para las intervenciones de movilización durante la TRR. La movilización se realiza con mayor frecuencia durante la TRRC en comparación con la HDI, y las técnicas más aplicadas fueron la movilización pasiva y activa de las extremidades. Las complicaciones reportadas durante la movilización fueron principalmente las relacionadas con el sistema de hemodiálisis, con baja frecuencia.

Palabras clave | Modalidades de Fisioterapia; Movilización Precoz; Unidades de Cuidados Intensivos; Diálisis Renal; Terapia de Reemplazo Renal Continuo.

INTRODUCTION

The stay in the intensive care unit (ICU) is associated with bed restriction, often causing metabolic, musculoskeletal, respiratory, and cardiovascular impairments[1,2]. Physical therapy techniques have been applied in the IC1U for these complications[3], and mobilization has proven to be safe and feasible[2,4,5].

Around 5% of ICU patients require renal replacement therapy (RRT)[6]. The main modalities of RRT performed in the ICU are continuous renal replacement therapy (CRRT) and intermittent hemodialysis (IHD). Conventional IHD is performed for 3 to 4 hours[6], while CRRT is used in unstable patients, as it generates slow and continuous removal of particles and water.

Patients under chronic RRT are described as less active, with worse functional status and quality of life. However, this has been minimized with physical therapy during dialysis sessions[7]. Exercises during RRT seem to improve dialysis efficiency, oxygen consumption, and quality of life; studies have also found they are safe for patients on outpatient dialysis[7-9] and in the ICU[10-12]. Nevertheless, the literature on exercises and mobilization during RRT in the ICU is still scarce[13]. Patients on therapies such as RRT are often excluded from mobility studies, although they are more prone to prolonged immobility[13] and to muscle weakness[14], since RRT is considered a barrier to mobilization in the ICU[15].

This study aimed to investigate what are the mobilization interventions performed by physical therapists in ICU patients during RRT and what is the perception of safety of this practice.

METHODOLOGY

This survey was conducted by structured questionnaire with voluntary and anonymous participation. The inclusion criteria were: physical therapists who work in an adult ICU in the city of São Paulo, Brazil, with hemodialysis service,

and who answered the questionnaire between March and May 2021. Physical therapists from 19 hospitals were found, and those who answered not performing the mobilization were excluded.

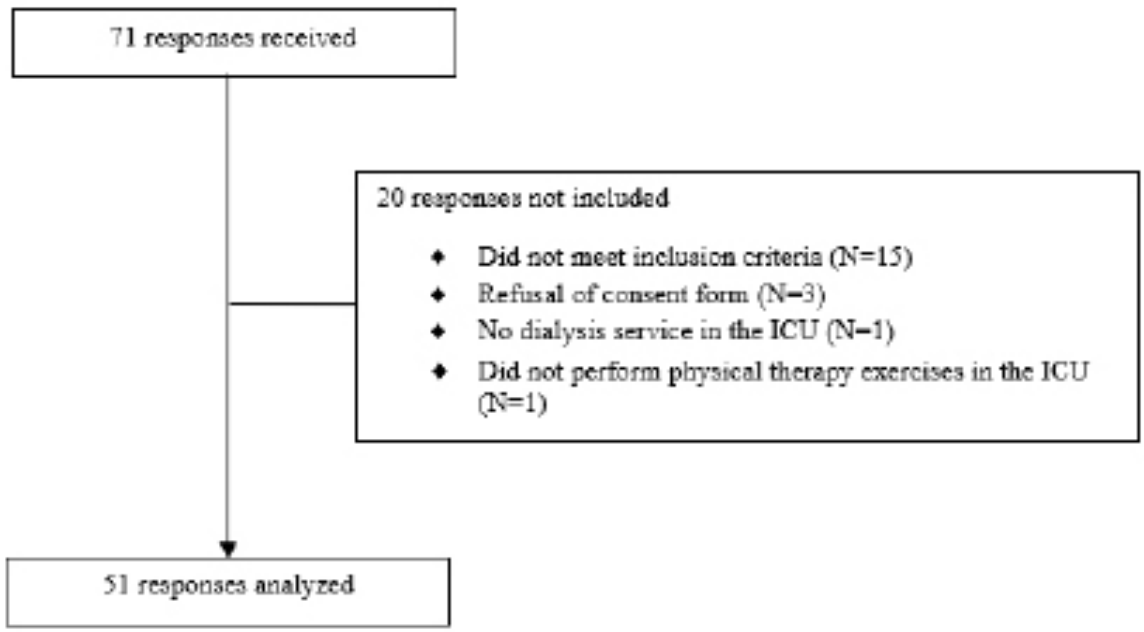
The structured questionnaire with multiple-choice questions was developed by the researchers based on the literature and clinical practice, and it was sent to the participants in electronic format. It consisted of five sections: (1) description of the study and consent form; (2) information about the physical therapist and the hospital; (3) information about the types of RRT available in the intensive care unit; (4) and (5) specific questions about physical therapy interventions and patient mobilization in the ICU during IHD and CRRT, respectively. In some questions it was possible to mark more than one answer.

A descriptive analysis was performed, with numerical variables indicated by mean and standard deviation or median and interquartile range, while qualitative variables were presented by absolute and relative number. The comparison of the responses on the two types of RRT was made by the two proportions test, considering a 5% significance level.

RESULTS

A total of 71 responses were sent and 51 of them were analyzed (Figure 1). We estimate that the overall response rate was around 9%, considering that 19 hospitals were contacted and about 30 physical therapists would be working in each hospital[16].

Figure 1. Study flowchart



The participants had a median age of 34 years, with seven years of professional experience in ICU. Most were females (78%) with graduate education (98%) (Table 1)

Table 2 shows the characteristics of the hospitals and renal replacement therapy services available in the intensive care unit. The respondents worked in public and private hospitals, at secondary and tertiary level. A small number of hospitals (11%) had exclusive professionals to manage RRT in the ICU. In 34 hospitals, both IHD and CRRT were performed in the ICU, but in 17 hospitals only conventional IHD was conducted in the ICU.

Table 1. Characteristics of responding physical therapists

Characteristic	N=51
Female, n (%)	40 (78.4)
Age, years	34 (28-39)
Time since graduation, years	10 (4-15.5)
Graduate, n (%)	50 (98)

Table 1. Continuation

Characteristic	N=51
Type of graduate course, n (%)	
Specialization/Improvement	37 (74)
Residency	6 (12)
Master/PhD/MBA	7 (14)
Time since graduate education, years	7 (2-12)
Length of professional experience in the ICU, years	7 (3.0-11.5)
Number of hospitals that have RRT in the ICU	1 (1-2)
Number of patients met in a 6-hour period	9 (7-10)
Type of working day, n (%)	
Morning	10 (19.6)
Evening	10 (19.6)
12x60 daytime	6 (11.8)
12x60 nighttime	14 (27.5)
Variable according to schedule	11 (21.5)

MBA: Master of Business Administration; ICU: intensive care unit. Data are presented in median (1st-3rd quartiles), except when indicated.

Table 2. Characteristics of hospitals

Characteristic	N=51
Public hospital	29 (56.8)
Secondary level hospital	28 (54.9)
Has an exclusive professional for the management of RRT in the ICU	
Yes	32 (62.7)
No	6 (11.8)
Sometimes	13 (25.5)
Types of RRT performed in the ICU	
Intermittent hemodialysis only	17 (33.3)
Continuous RRT only	0
Both types of RRT	34 (66.7)
Hospital has specific protocol for mobilization during RRT	9 (17.6)

RRT: renal replacement therapy; ICU: intensive care unit. Data are presented in absolute number (%).

Table 3 presents the responses regarding physical therapy exercises and mobilization of patients during intermittent hemodialysis and renal replacement therapy. A higher percentage of physical therapists reported applying mobilization techniques and exercises during CRRT compared to IHD (91% *vs.* 65%); this trend was also observed regarding the permission to perform such procedures (97% *vs.* 74%) and regarding the report of experience with performing these procedures during RRT (88% *vs.* 68%).

A large proportion of participants had never looked in the literature for recommendations on patient mobilization during RRT. Among those who searched, we observed that the responses were heterogeneous. Passive mobilization and active limb exercises were the most frequently reported types of mobilization for both types of RRT. However, more than half of the respondents stated that they encountered resistance to the mobilization of patients during RRT. Around 21% and 26% of the respondents reported having experienced complications with physical therapy sessions applied during CRRT and IHD, respectively. The most frequently mentioned complication was related to the hemodialysis circuit.

Table 3. Topics related to mobilization during continuous renal replacement therapy and conventional intermittent hemodialysis in the ICU

	Conventional intermittent hemodialysis (N=51)	Continuous renal replacement therapy (N=34)	p
Mobilization during RRT is allowed in the hospital	38 (74.5)	33 (97)	0.006
Has experience in conducting mobilization during RRT	35 (68.2)	30 (88.2)	0.037
Finds resistance on the part of the patient to mobilization during RRT	28 (54.9)	19 (55.9)	0.929
Performs mobilization techniques during RRT	33 (64.7)	31 (91.2)	0.005

Table 3. Continuation

	Conventional intermittent hemodialysis (N=51)	Continuous renal replacement therapy (N=34)	p
Interventions performed during RRT[a †]			
Active limb exercises	30 (90.9)	27 (87.1)	0.624
Passive mobilization of members	29 (87.9)	26 (83.9)	0.645
Resistance exercises	7 (21.2)	6 (19.4)	0.857
Sitting at the bedside or in the armchair	2 (6.1)	2 (6.5)	0.952
Bicycle ergometer	2 (6.1)	3 (9.7)	0.589
Considers not safe to carry out the mobilization	15 (29.4)	4 (11.8)	0.056
Reason why considers not safe[b †]			
The risk outweighs the benefits	9 (60)	2 (50)	0.719
The patient will have instability	7 (46.7)	2 (50)	0.904
Risk of damaging the dialysis catheter	6 (40)	1 (25)	0.582
Harming the efficiency of dialysis	4 (26.7)	1 (25)	0.944
Finds resistance on the part of the team to mobilization during RRT	31 (60.8)	18 (52.9)	0.471
Professionals who offer the most resistance to mobilization[c †]			
Hemodialysis team	25 (80.6)	12 (66.7)	0.271
Nursing team	23 (74.2)	13 (72.2)	0.881
Medical team	12 (38.7)	5 (27.8)	0.435
Physical therapy team	3 (9.7)	1 (5.5)	0.610
Has searched the literature for recommendations on mobilization during RRT in the ICU	25 (33.3)	19 (55.9)	0.535
Recommendations found in the literature[d †]			
Physical therapy during RRT in the ICU is beneficial	11 (44)	7 (36.8)	0.631
Did not find enough data	13 (52)	7 (36.8)	0.317
Physical therapy during RRT in the ICU is safe	8 (32)	5 (26.3)	0.682
Physical therapy during RRT in the ICU is recommended	6 (24)	4 (21.1)	0.818
There is no consensus on mobilization	4 (16)	4 (21.1)	0.667
Has experienced complications with mobilization during RRT in the ICU	11 (21.6)	9 (26.5)	0.603
Type of complications with mobilization[e †]			
Complications with dialysis circuit/need to discontinue	9 (81.8)	6 (66.7)	0.435
Hemodynamic instability	6 (54.5)	5 (55.5)	0.960
Patient complaining of malaise	6 (54.5)	2 (22.2)	0.142
Desaturation	2 (18.2)	3 (33.3)	0.435
Inadvertent removal of dialysis catheter	1 (9.1)	0	0.352

RRT: renal replacement therapy; ICU: intensive care unit. Data are presented in absolute number (%). The comparison between dialysis modalities was made by the proportions test. [a]N=33 for intermittent dialysis and N=31 for continuous dialysis. [b]N=15 for intermittent dialysis and N=4 for continuous dialysis. [c]N=31 for intermittent dialysis and N=18 for continuous dialysis. [d]N=25 for intermittent dialysis and N=19 for continuous dialysis. [e]N=11 for intermittent dialysis and N=9 for continuous dialysis. †More than one answer allowed.

DISCUSSION

The main survey results indicate that mobilization techniques during renal replacement therapy are more frequent in the continuous modality, with passive and active exercises in bed being the most used, although physical therapists still face resistance to mobilize patients in RRT. The most commonly reported complication was related to the hemodialysis circuit, and not directly to the patient.

Severe patients requiring RRT have a mortality rate of up to 50%[17], as well as global muscle weakness and reduced quality of life. RRT can cause hemodynamic instability and presents risks, such as disconnection or accidental removal of invasive devices during mobilization, which generates insecurity in professionals to perform physical therapy.

Our findings showed statistically significant difference in responses about physical therapy during continuous renal replacement therapy and intermittent hemodialysis: a higher percentage of physical therapists reported having more experience and performing mobilization during CRRT compared to IHD. This result can be explained by the CRRT allowing slower blood filtration, avoiding osmotic changes and rapid fluid loss, which results in less abrupt hemodynamic changes[17].

Benefits of exercise have been reported in patients with chronic kidney injury, including improved phosphate removal[18] and improved physical function[19], better ability to exercise, prevention of muscle loss, improvement in

RRT adjustment, as well as reduction of depression and improvement in quality of life[20]. Mobilization protocols during RRT have been shown to be safe and effective, prolonging the useful life of the dialysis filter, without adverse effects or increasing the workload of the nursing team[10]. Personalization of therapy to achieve the highest level of mobilization of each patient during CRRT was associated with transient changes in blood pressure, with no adverse effects specifically related to CRRT[12]. Similar results were observed in patients under extracorporeal membrane oxygenation and CRRT[11]. Nevertheless, attention is needed to CRRT parameters such as dialysate rate, dialysis solution flow, and blood flow, since they can interfere with clot formation[11,21].

A systematic review[15] found a low prevalence of higher levels of mobilization, with only 15.5% of cases involving transfer to a chair, stationary gait or walking, a finding compatible with that observed in our study. It was also reported that the feasibility of mobilization techniques and the provision of CRRT were not consistently described. In this study, we observed a high rate of resistance to mobilization by both patients and staff.

In recent expert recommendation on mobilization of patients in the intensive care unit[22], it was suggested that patients on IHD should be mobilized before and after dialysis session. CRRT patients, on the other hand, can be mobilized during the sessions, but restricted to the ICU room, with stationary walking being the most advanced level of mobilization, due to the lines of the dialysis system. Moreover, hip flexion should be limited to 90° if the dialysis catheter is located in the femoral vein.

Among the limitations of this study, we highlight that the questionnaires were sent to physical therapists working in a Brazilian city, which requires caution in generalizing the results. Furthermore, the estimated response rate was low and studies of the *survey* type may have selection bias. However, we included physical therapists from public and private hospitals, at secondary and tertiary levels.

CONCLUSION

There is a lack of standardization of mobilization techniques used during renal replacement therapy in the ICU. Mobilization techniques applied during CRRT are more frequent compared to IHD, and passive and active exercises for limbs in bed are the most commonly performed interventions. Regarding complications, the one most frequently reported was related to the hemodialysis circuit, and not directly to the patient.

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