Cadernos Brasileiros de Terapia Ocupacional
Brazilian Journal of Occupational Therapy

ISSN 2526-8910

Review Article

The role of the occupational therapist in the Intensive Care Unit: a systematic review

A atuação do terapeuta ocupacional em Unidade de Terapia Intensiva: uma revisão sistemática

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How to cite: Bittencourt, E. S., Moreira, P. S., Paixão, G. M., & Cardoso, M. M. (2021). The role of the occupational therapist in the Intensive Care Unit: a systematic review. *Cadernos Brasileiros de Terapia Ocupacional*, 29, e2800. https://doi.org/10.1590/2526-8910.ctoAR2118

Abstract

Introduction: The participation of the occupational therapist (OT) in Intensive Care Units (ICU) is still discreet in Brazil, perhaps because of this, there is a little discussion of interventions and insertion of this professional in this area. **Objective:** To synthesize the actions of OT to restore function in adult patients admitted to the ICU most frequently described in the specialized literature. **Method:** Systematic review based on the PRISMA recommendation. The search for the studies was carried out on the Cochrane, PubMed, OTSeek, and PEDro platforms using the search terms "Occupational Therapy", in the title or abstract, (AND) "Intensive Care Unit" (OR) "Critical Illness" (OR) "Critical Care", in other parts of the text. English-language texts published in the last 20 years were included and texts that describe interventions in pediatric/neonatal ICU, psychiatric diseases, and review articles were excluded. Two independent researchers selected the articles and the agreement was submitted to Kappa analysis. The level of evidence and methodological quality of the included studies were assessed using the PEDro Scale and the Cochrane Collaboration Tool, respectively. **Results:** The main interventions were related to the training of Activities of Daily Living (ADLs) and tasks related to Instrumental Activities of Daily Living (IADLs). These private attributions of the profession occurred isolated or with physiotherapists. The sessions, excluding the contraindication criteria, took place early (24-48h). **Conclusion:** The findings show early mobilization interventions, followed by ADLs/IADLs training and it is also noted that the work of the occupational therapist in the ICU is under development. Studies on other effects of prolonged ICU stay should be conducted. PROSPERO record: CRD42020214615.

Keywords: Intensive Care Units, Hospitals, Occupational Therapy, Activities of Daily Living, Rehabilitation.

Received on June 29, 2020; 1st Revision on October 7, 2020; 2nd Revision on December 9, 2020; Accepted March 15, 2021.

Resumo

Introdução: A participação do terapeuta ocupacional (TO) em Unidades de Terapia Intensiva (UTI) ainda é discreta no Brasil, talvez, por isso, haja pouca discussão das intervenções e inserção do profissional nessa área. **Objetivo:** Sintetizar as atuações do TO para restabelecimento da função em pacientes adultos internados na UTI mais frequentemente descritas na literatura especializada. **Método:** Revisão Sistemática baseada na recomendação PRISMA. A busca dos estudos foi realizada nas plataformas Cochrane, PubMed, OTSeek e PEDro, utilizando os termos de busca "*Occupational Therapy*", no título ou resumo, (*AND*) "*Intensive Care Unit*" (*OR*) "*Critical Illness*" (*OR*) "*Critical Care*", em outras partes do texto. Foram incluídos textos em língua inglesa e publicados nos últimos 20 anos. Excluiu-se textos que abordavam UTI pediátrica/neonatal, doenças psiquiátricas e artigos de revisão. Dois pesquisadores independentes selecionaram os artigos e a concordância foi submetida à análise Kappa. O nível de evidência e a qualidade metodológica dos estudos incluídos foram avaliados pela Escala PEDro e pela Ferramenta de Colaboração Cochrane, respectivamente. **Resultados:** As principais intervenções foram relativas ao treino de Atividades de Vida Diária (AVDs) e tarefas relacionadas às Atividades Instrumentais de Vida Diária (AIVDs). Essas atribuições privativas da profissão ocorreram isoladamente ou com fisioterapeutas. As sessões, excluídos os critérios de contraindicação, aconteceram precocemente (24-48h). **Conclusão:** Os achados evidenciam intervenções de mobilização precoce, seguidas por práticas de treino de AVDs/ AIVDs. Ademais, é notado que a atuação do terapeuta ocupacional na UTI está em elaboração. Estudos sobre outros efeitos da internação prolongada na UTI devem ser conduzidos. Registro PROSPERO: CRD42020214615.

Palavras-chave: UTI, Hospitais, Terapia Ocupacional, Atividades Cotidianas, Reabilitação.

Introduction

The Intensive Care Unit (ICU) is a unique environment within the hospital, as it is an area for the admission of patients who require continuous professional care, specific materials, and technologies necessary for monitoring and treatment. The ICU assists critically ill patients, defined as those with impairment of one or more of the main physiological systems, with loss of self-regulation, and must meet at least one of the following criteria in the medical evaluation: 1) requiring at least 12 hours of nursing care; 2) requiring invasive hemodynamic monitoring; 3) requiring monitoring of intracranial pressure; 4) requiring mechanical ventilation (Brasil, 2010; Affleck et al., 1986). Patients on mechanical ventilation must be under sedation and analgesia to tolerate intubation and maintain positioning in the bed, avoid desynchrony with the ventilator and optimize oxygenation (Gurudatt, 2011). Due to these characteristics, prolonged ICU stay can cause physical problems. The most frequently observed, even after a few days of hospitalization, are acquired weakness (Wieske et al., 2015) and muscle atrophy (Koukourikos et al., 2014), and among the cognitive problems, delirium highlights as the most frequent (Álvarez et al., 2017). The prolonged stay in

these conditions causes a set of symptoms that integrate the Post Intensive Care Syndrome (PICS), standing out the physical and functional, cognitive and psycho-emotional damages (Held & Moss, 2019).

Therefore, the care demanded by critically ill patients under mechanical ventilatory support, sedation, and restricted mobility reinforce the need for qualified training and differentiated knowledge before working in the ICU (Thomas et al., 2017). The specialty, quality, and multidisciplinarity of services bring benefits such as the reduction of the length of stay in the ICU and the length of hospital stay (Wu et al., 2019). In this scenario, we highlight the intervention of the individualized occupational therapist (Dinglas et al., 2013) as a member of the early mobilization/rehabilitation (Ratcliffe & Williams, 2019), or a member of the multidisciplinary team (Hsu et al., 2020).

The specialized literature in the area shows the occupational therapist's activity with patients in the ICU as actions of self-care, cognitive approaches, adaptation devices, and bed positioning, extending to early mobilization (Provancha-Romeo et al., 2019). A recent survey of interventions by occupational therapists in the ICU characterized the actions related to early mobilization as the most demanded, followed by cognitive interventions and setting (Costigan et al., 2019). However, it is not yet clear what are the activities, tasks, or resources that integrate these forms of professional interventions. This situation worsens the perception of the reduced participation of occupational therapists with critically ill patients in the ICU, even with the growing literary collection and the specific normative support of the Health Surveillance Agency since 2010 (Brasil, 2010), which guarantees the participation of the occupational therapist in the team of the ICU (Bombarda et al., 2016). Due to this observation, it is important to identify, classify and expose the private or non-professional attributions of these professionals, integrating them decisively in the care of patients in the ICU.

Thus, the originality of this work is the discrimination and the description of the roles of occupational therapists in the ICU. The findings tend to be important, particularly, to the professionals who are being inserted in this hospital area and to the hospital institutions that do not yet have a set of procedures discussed with the team for insertion of routines inherent to the occupational therapist. Thus, the objective is to synthesize the most recurrent occupational therapeutic roles on the functionality of patients admitted to the ICU, in the last two decades, and to highlight the parameters of indication for the beginning of the service and vital control signs that guarantee the maintenance of the session.

Method

This study is a systematic review prepared according to the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-analyzes - PRISMA (Moher et al., 2015) and registered in the International Prospective Register of Systematic Reviews (PROSPERO), under the coding CRD42020214615.

Search strategies and selection criteria

From January to May 2020, at least two independent researchers searched in the following electronic databases: Cochrane Library, Occupational Therapy Systematic

Evaluation of Evidence (OTSeeker), Physiotherapy Evidence Database (PEDro), and PubMed (National Center for Biotechnology Information). English-language descriptors were obtained from the Medical Subject Headings (MeSH), with the following combination: "Occupational Therapy" AND "Intensive Care Units" OR "Critical Illness" OR "Critical Care". Table 1 shows the details.

Table 1. Search strategy scheme: Boolean descriptors, filter, and operators.

Platforms	Descriptor/ Filter	Boolean	Descriptor/ Boolean	Filter	Quantity of Articles	
Cochrane	*Occupational Therapy* (*Abstract/ Title*)	*AND*	*Intensive Care Units* *OR* *Critical Illness* *OR* *Critical Care*	*All Fields*	273	618
OTSeeker				*All Fields*	13	
PEDro				*Abstract/ Title*	22	
PubMed				*All Fields*	310	

We included in the research English-language studies, published between January 2001 and May 2020, describing the work of occupational therapists in an adult ICU, individually or in a multidisciplinary team. We excluded duplicate studies, in other languages, or that addressed work in pediatric/neonatal ICUs, cases of psychiatric illnesses (changes in mood and anxiety), and any category of review article. Figure 1 summarizes the search flow.

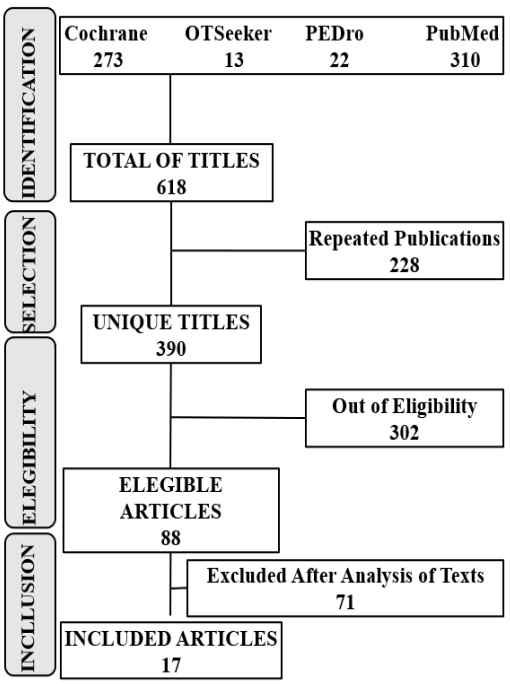

Figure 1. PRISMA flowchart: Identification of articles in the databases and inclusion in the study.

Data extraction and analysis

At least two of the researchers who searched the literature also independently extracted data from the included studies. A third researcher resolved the disagreements. The following variables were extracted: authorship/year, objective, type of ICU, study design, sample, presence or absence of mechanical ventilation, time/period of initiation of the intervention, contraindications to the intervention, vital signs monitored during the session, performance of the individualized occupational therapist or in association with other rehabilitation team/professionals, occupational therapist's roles in the ICU and main result.

The analysis of the included articles and the inferences of the results were according to the evaluation of the methodological quality of the articles, the weighting of the level of evidence, and the degree of reliability and agreement between the researchers.

The Cochrane Collaboration Tool (Higgins et al., 2019a) was used to identify the methodological quality of the articles included, by analyzing the risk of bias, regarding the sequence generation, allocation concealment, masking, results in incomplete data and selective results. These domains were used to weight the quality of publications in high, low, or uncertain (Table 1), according to instructions by Carvalho et al. (2013).

The PEDro Scale analyzed the level of evidence of the articles included. It is an instrument with 11 items of binary scoring: 1 (one) for the presence or 0 (zero) for the absence of the item under survey. The first item on the scale is not scored and the subsequent ones are scored (items 2 to 11) only if they are clearly and satisfactorily identified in the manuscript. Thus, the final score ranges from 0 (zero) to 10 (ten) (Shiwa et al., 2011). Usually, the PEDro Scale qualifies randomized controlled studies and, in this review, we also applied the variations Cohort, Cross-sectional, Prospective, and Pilot studies, similar to previous literature (Zago et al., 2018; Paz et al., 2016).

To determine the degree of agreement between researchers in the selection of articles based on the eligibility criteria, we used Kappa Analysis (k). The definition of the degree of reliability among researchers in calculating the level of evidence for the included publications was established by the Intraclass Correlation Index (ICC). The magnitude k or ICC was interpreted as: Absent (0); Poor (0 - 0.19); Weak (0.20 - 0.39); Moderate (0.40 - 0.59); Substantial (0.60 - 0.79); and Almost Perfect (≥ 0.80) (Higgins et al., 2019b; Ohura et al., 2017; Miot, 2016). The data were analyzed using the SPSS program (IBM®, version 20) and statistical significance was established for values of $p<0.05$.

Results

In the search results on the electronic search platforms, we found 618 articles, of which 390 titles were not repeated. This characterizes the incipience of publications on the topic in the face of the temporal search window. On the other hand, we included 17 articles, published between 2001 and 2020, showing the important timeliness of the information. The selection of titles and the inclusion of articles reached the degree of agreement among researchers with an almost perfect classification ($k = 0.895$, $p <0.001$). It is a relevant value index, whose difference to the level of excellence was hindered by the difficulty of identifying occupational therapist's actions in publications or discriminating against them in the profession's interventions. Once included, the articles had their level of evidence analyzed. This weighting

reached an intraclass correlation of magnitude also almost perfect (ICC = 0.874, 95% CI: 0.656 to 0.954 - p <0.001).

Due to the risk of bias, the methodological evaluation, shows that, from the articles included, the domains of greatest uncertainty were the generation of a randomization sequence (15/17), masking in the outcome evaluation (14/17), and masking of participants and team (13/17). The domains with the lowest risks and the highest frequencies were incomplete outcome data (9/17) and selective reporting of outcomes (7/17). Finally, the highest risk of bias and greater repetition was related to the confidentiality of the allocation (8/17). The general visualization of these data allows the interpretation that most of the articles included have a low or uncertain classification regarding the risk of bias (Table 2).

Table 2. Risk of Bias Analysis: Evaluation by the Cochrane Collaborative Tool.

Studies	Risk of Bias						
	Generation of randomization sequence	Allocation confidentiality	Masking participants and team	Masking in outcome evaluation	Incomplete outcome data	Selective reporting of outcomes	Other sources of bias
Brummel et al. (2014)	Low	Low	High	High	Low	Low	Uncertain
Corcoran et al. (2017)	Uncertain	High	High	High	Uncertain	Low	Uncertain
Davis et al. (2013)	Uncertain	High	Uncertain	Uncertain	Uncertain	Low	Uncertain
Deluzio et al. (2018)	Uncertain	High	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain
Fields et al. (2015)	Uncertain	High	Uncertain	Uncertain	Low	Uncertain	Uncertain
Hsu et al. (2020)	Uncertain	Uncertain	Uncertain	Uncertain	Low	Uncertain	Uncertain
Jolley et al. (2015)	Uncertain	Uncertain	Uncertain	Uncertain	Low	Uncertain	Uncertain
Jolley et al. (2017)	Uncertain	Uncertain	Uncertain	Uncertain	Low	Uncertain	Uncertain
Needham et al. (2010)	Uncertain	High	High	Uncertain	Uncertain	Uncertain	Uncertain
Pohlman et al. (2010)	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain
Schweickert et al. (2009)	Low	Low	High	High	Low	Low	Uncertain
Sigler et al. (2016)	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain
Titsworth et al. (2012)	Uncertain	High	Uncertain	Uncertain	Low	Uncertain	Uncertain
Wahab et al. (2016)	Uncertain	High	Uncertain	Uncertain	Low	Uncertain	Uncertain
Witcher et al. (2015)	Uncertain	High	Uncertain	Uncertain	Low	Low	Uncertain
Yataco et al. (2019)	Uncertain	Uncertain	Uncertain	Uncertain	Low	Low	Uncertain
Zanni et al. (2010)	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain	Low	Uncertain

After consolidating the searches, we found that five articles (29.4%) specifically describe occupational therapist interventions in ICUs, while 12 articles (70.6%) describe early physical rehabilitation practices, citing the professional occupational therapist. Thus, it appears that the occupational therapist's roles are associated with the ICU´s multi-professional/rehabilitation team; or the possibility that the profession needs more scientific scope and technical skills to provide independent activities (Table 3).

Table 3. Scientific presentation. General technical record of the included articles.

Authorship/ Year.	Objective	Study Design	(1) Different occupational therapist's roles from other professions. (2) Other duties.	Main results.	PEDro scale.
Brummel et al. (2014)	Early and combined use of cognitive therapy.	Randomized.	(1) Yes. (2) Cognitive Therapy (Problem-solving; multi-step task execution).	Viable and safe, even under mechanical ventilation.	7/10
Corcoran et al. (2017)	Early mobilization in the ICU.	Prospective.	(1) No. (2) Exercises in bed; Standing up; Ambulation.	Viable with reduced hospitalization and ICU stay.	5/10
Davis et al. (2013)	Feasibility of early mobilization in the ICU and functionality under mechanical ventilation.	Cohort.	(1) No. (2) Decubitus change, sitting on the bed and the edge of the bed; Standing up; Sitting on the chair; Walking.	Viable, safe, and well-tolerated under mechanical ventilation.	5/10
Deluzio et al. (2018)	Viability of the Cycloergometer in critical neurological patients.	Cohort.	(1) Yes. (2) Missing description.	Viable, safe and does not bring physiological, neurological, or cognitive changes.	4/10
Fields et al. (2015)	Early mobilization and associated adverse events.	Retrospective.	(1) Yes. (2) Missing description.	Safe and effective.	4/10
Hsu et al. (2020)	Level of recall, satisfaction, and benefits during mechanical ventilation.	Pilot Study.	(1) Yes. (2) Postural control; Equilibrium reaction; ROM; Sitting and standing up; Transferring to a chair and the bed; Ambulation.	Compromise of factual memory.	5/10
Jolley et al. (2015)	Early mobilization, mechanical ventilation, and associated care.	Transversal.	(1) No. (2) Weight transfer in the bed; Standing up; Walking; Transferring from bed to chair; and Ambulation.	Wide use of early mobilization in the ICU: 95.7% without mechanical ventilation; and 76.6%, under mechanical ventilation.	5/10
Jolley et al. (2017)	Prevalence of mobilization in ICUs and progression of mobility.	Cohort.	(1) No. (2) ROM, passive; Sitting on the bed; Sitting on the edge of the bed; Standing up; Transferring of the chair to the standing position; Walking at the same point; Ambulation.	Prevalence: 32% of patients in the ICU; 16% under mechanical ventilation; and 4% out of bed.	5/10
Needham et al. (2010)	Practices of sedation and analgesia in the ICU and functional mobilization.	Retrospective.	(1) No. (2) Sitting on the bed; Sitting on the edge of the bed; Transferring from bed to chair; Transferring from sitting to standing; and Ambulation.	Deep sedation was not necessary and there was tolerance to mechanical ventilation. Viable, safe, and reduced hospitalization.	5/10

Table 3. Continued…

Authorship/ Year.	Objective	Study Design	(1) Different occupational therapist's roles from other professions. (2) Other duties.	Main results.	PEDro scale.
Pohlman et al. (2010)	Daily interruption of sedation and early mobilization.	Retrospective.	(1) No. (2) ROM (passive, assisted or active); Bed mobility; Sitting down; Standing up; Ambulation; Balance.	Viable and safe right after intubation (ICU).	5/10
Schweickert et al. (2009)	Early mobilization, interruption of sedation, and functional and psychiatric results.	Randomized.	(1) No. (2) Movements (liabilities, assisted and active); Bed mobility (weight transfer, sitting on the bed); Balance; Standing, Sitting in a chair; Ambulation.	Safe, well-tolerated, improving functional status, reducing symptoms associated with the ICU, and increasing weaning.	8/10
Sigler et al. (2016)	Implementation of an early mobilization program.	Cohort.	(1) No. (2) Weight transfer in the bed; Sitting on the bed; ROM (passive, assisted, or active); Sitting on the edge of the bed; Standing up, turning, and sitting on a chair; Standing a few steps and sitting on a chair; Ambulation.	Simple, progressive mobilization, with modification of the analgesic and sedation regimen.	5/10
Titsworth et al. (2012)	Early mobilization in the neuro-intensive care unit.	Retrospective.	(1) No. (2) Sitting on the bed; Sitting on the edge of the bed; Getting out of bed; Walking to the bathroom; Exiting the room; Exercising.	It does not harm the patient's critical condition and reduces the ICU stay.	5/10
Wahab et al. (2016)	Early mobilization in the ICU of a long-term hospital.	Retrospective.	(1) Yes. (2) Missing description.	Reduction in ICU stay and hospitalization.	5/10
Witcher et al. (2015)	Early mobilization and sedation in neurological patients in the ICU.	Retrospective.	(1) No. (2) ROM (passive and active); Sitting down; Standing up; Walking.	Reduced sedation, increased analgesia. It did not reduce the duration of mechanical ventilation or the length of hospital stay.	5/10
Yataco et al. (2019)	Adverse mobilization events.	Retrospective.	(1) No. (2) Transferring (from lying to sitting); Sitting on the edge of the bed; Standing up; Sitting on a chair; Ambulation.	Safety, feasible with low rates of adverse events.	5/10

Table 3. Continued…

Authorship/ Year.	Objective	Study Design	(1) Different occupational therapist's roles from other professions. (2) Other duties.	Main results.	PEDro scale.
Zanni et al. (2010)	Physiological effects and safety of rehabilitation in the ICU.	Cohort.	(1) No. (2) ROM; Muscle strength; Occupation; Bed positioning; Sitting on the bed; Sitting on the edge of the bed; Transferring from seated to standing; Ambulation; Activities.	Safe, without significant physiological changes or adverse effects.	5/10

(1) Differences between the occupational therapist and other professions - If there is a difference in the role of the occupational therapist in the ICU. **(2) Other duties** - Interventions classified as not specific to the occupational therapist, but they can be performed by the professional. **Absent description** - Absence of objective information in the text. **ROM** - Range of Motion.

Regarding the objectives of the included articles, 82% of them raised questions about the use of rehabilitation or early mobilization in the ICU. However, by analyzing the methods of the 17 articles, these practices increase to 94%. This highlights the relevance of using physical and functional activities in the ICU among professionals. The results of these articles highlight the feasibility, safety, the absence of significant increases in adverse events, and the benefits of using activities and early tasks, such as reduction in the time of mechanical ventilation, the anticipation of discharge from the ICU, and shorter hospital stay (Table 3).

To identify the activities and tasks of the occupational therapist performed in the ICU, we order them in: activities shared with the team most frequently published (Table 3); and assignments of the occupational therapists defined by the articles (Table 4). Among the most cited and described interventions, the idea of collaborative action between members of the multidisciplinary team/rehabilitation of the ICU permeates: passive, assisted, and active movements of ROM; changes in bed position (weight transfer); sitting on the bed; sitting on the edge of the bed; standing up (with and without assistance); sitting in the chair, and walking (with and without assistance) (Table 3). Regardless of the form of execution, these interventions followed guidelines of progression and complexity of the approach, from passive movement to active activities and tasks.

The textual analysis of the included articles enabled the identification of 27 types of ICUs grouped in at least four categories: Medical (40.6%), Surgical (26.0%); Neurological (22.2%), and Cardiological (11.1%), totaling 6,346 patients treated (Table 4). During hospitalization in the ICU, more than 82% of publications stated that patients received mechanical ventilatory support, receiving OT services started in the first 24 hours (40% of cases) and between 24 hours and 48 hours (another 30%), suggesting that most consultations started as soon as possible (Table 4).

Due to the attributions defined as an occupational therapeutic nature, the articles that discriminate them represent 29.4% of the total included, and the most cited performance is the training of Activities of Daily Living (ADLs), followed by functional tasks extracted from Instrumental Activities of Daily Living (IADLs) (Table 4). Among these publications, there are references to practices that are not specific to the profession as if they were the occupational therapist skills, with emphasis on bed mobility, transferring, and ambulation.

Some interventions are outside the Brazilian standard of occupational therapy, such as the use of a cycloergometer (Table 4).

Table 4. Presentation of the occupational therapist's performance metadata. Description, characterization, and extension of the professional's performance in the ICU.

Author-ship/ Year.	(1) ICU. (2) Sample. (3) Ventilation. (4) Beginning.	Contraindications.	Vital signs (Monitoring/alert).	Occupational therapist's roles in the ICU.
Brummel et al. (2014)	(1) Medical; Surgical. (2) 87 patients. (3) Yes. (4) In 24 hours.	Missing description.	Missing description.	ADL training (dressing, bathroom), IADLs, or functional activities.
Corcoran et al. (2017)	(1) Medical; Surgical. (2) 443 patients. (3) Yes. (4) In 72 hours.	- Mobility and independent ADLs; - In palliative care; - Surgical indication; - Neurological disorders; - Disorders that impair mobility; - Mental state and level of consciousness; - Organ transplantation; - Risk pregnancy; - Postoperative of moderate to severe stroke; - Ventricular drainage device; - Low oxygen saturation; - Reduced chances of functional gains.	Missing description.	Not specified.
Davis et al. (2013)	(1) Medical; Surgical. (2) 10 patients. (3) Yes. (4) In 48 hours.	**- Hemodynamic instability.** **- Neurological Disorder.**	- Positive expiratory pressure:> 10cmH2O; - Respiratory rate: <5 or> 40 times/minute; - Oximetry: <88%; - Blood pressure: <65 or >110mmHg; - Heart rate: <40 or> 130bpm; - Suspension of vasoactive drugs for 2 hours.	Mentioning ADLs.
Deluzio et al. (2018)	(1) Neurological (2) 06 patients. (3) It is not clear. (4) It is not clear.	- Systolic and diastolic blood pressure; - Average blood pressure; - Heart rate; - Oxygen saturation; and - Intracranial pressure.	- Hemodynamic parameters; - Patient's tolerance; - Attention during the task; - Signs of fatigue; and - Discomfort/pain.	Modality of unusual early mobilization of occupational therapists in Brazil.
Fields et al. (2015)	(1) Cardiac. (2) 366 patients. (3) It is not clear. (4) It is not clear.	- Hemodynamic instability.	- Active bleeding; - Accidental events; - Cardiac arrhythmia; - Discomfort; and	Bed mobility; Transfers; and Ambulation.

Table 4. Continued…

Author-ship/ Year.	(1) ICU. (2) Sample. (3) Ventilation. (4) Beginning.	Contraindications.	Vital signs (Monitoring/alert).	Occupational therapist's roles in the ICU.
			- Intra-aortic balloon.	
Hsu et al. (2020)	(1) Medical; Surgical. (3) 54 patients. (4) Yes. (5) In 48 hours.	- Severely altered mental state; - High intracranial pressure; - Respiratory variables; - Active myocardial ischemia; - Hemodynamic instability; - Active bleeding; and - Open abdomen.	1) Monitoring: - Cardiovascular and respiratory signs; - Comfort level; and - Activity tolerance. 2) Attention and Protection: - Endotracheal, nasogastric, and/or thoracic tubes; - Abdominal/ pelvic, urinary, and/or vascular catheters.	Self-care (facial hygiene, bathing), reading, writing, creating a schedule, and alternative communication.
Jolley et al. (2015)	(1) Surgical; Trauma; Neurological; Cardiac. (2) 47 hospitals. (3) Yes. (4) It is not clear.	Missing description.	Missing description	Not specified.
Jolley et al. (2017)	(1) Surgical; Neurological. (2) 770 patients. (3) Yes. (4) In 48 hours.	Missing description	Missing description	Mentioning ADL.
Needham et al. (2010)	(1) Medical. (2) 57 patients (3) Yes. (4) It is not clear.	Missing description	Missing description	Not specified.
Pohlman et al. (2010)	(1) Medical. (2) 49 patients. (3) Yes. (4) In 72 hours.	- Hemodynamic variables; - Respiratory variables; - Oximetry; - Increases intracranial pressure; - Active bleeding; - Active myocardial ischemia; - Increased sedative (30 minutes).	1) Monitoring: - Heart rate; - Respiratory frequency; - Blood pressure; - Oximetry; - Fan asynchrony. 2) Attention and Protection: - Vascular access catheters; - Enteric tubes; and - Endotracheal tubes.	It describes ADLs: getting dressed, eating, organizing, bathroom and toilet.

Table 4. Continued…

Author-ship/ Year.	(1) ICU. (2) Sample. (3) Ventilation. (4) Beginning.	Contraindications.	Vital signs (Monitoring/alert).	Occupational therapist's roles in the ICU.
Schweickert et al. (2009)	(1) Medical. (2) 104 patients. (3) Yes. (4) In 72 hours.	- Increased intracranial pressure; - Active bleeding; - Active myocardial ischemia; - Intermittent hemodialysis; - Agitation of the patient (administration of sedatives in the last 30 minutes); and - Respiratory variables.	1) Monitoring: - Hemodynamic variables; - Respiratory variables; - Oximetry; - Fan asynchrony; - Suffering of the patient. 2) Attention and Protection: - integrity of airway devices.	It describes ADLs: Feeding, dressing, organizing, bathroom, and toilet.
Sigler et al. (2016)	(1) Medical. (2) 32 patients. (3) Yes. (4) Few days.	Missing description	Missing description	It describes ADLs: going to the bath-room.
Titsworth et al. (2012)	(1) Medical. (3) 170 patients. (4) Yes. (5) It is not clear.	- Unstable spine; - Active AVE alerts; - Up to 24 hours after Tissue Plasminogen Activator (RTPA); - Endovascular intervention; - Increased intracranial pressure; - Active resuscitation; - Hemodynamic instability; - Hemodialysis; - Aggressive ventilation care; and - Palliative care.	Missing description	Not specified.
Wahab et al. (2016)	(1) Neurological. (2) 3,945 patients. (3) Yes. (4) In 24 hours.	- Active coronary ischemia; - Arrhythmia; - Cardiac tamponade; - Respiratory variables; - Oximetry; - Heart rate <40 or> 130 bpm; - Hemodynamic variables; - Blood glucose <50 mg/dL; - Orthopedic contraindication; - Spinal cord injury (unstable); - Intracranial hypertension; and - Morbid obesity.	Monitoring: - Hemodynamic variables; and - Respiratory data; and - Oxygen saturation).	ADL training (Dressing, organizing, eating, bathroom and toilet).
Witcher et al. (2015)	(1) Medical; Cardiac; Surgical. (3) 68 patients. (4) Yes. (5) In 24 hours.	Missing description	Missing description	Not specified.

Table 4. Continued…

Author-ship/ Year.	(1) ICU. (2) Sample. (3) Ventilation. (4) Beginning.	Contraindications.	Vital signs (Monitoring/alert).	Occupational therapist's roles in the ICU.
Yataco et al. (2019)	(1) Neurological. (2) 153 patients. (3) It is not clear. (4) Daily assessment.	- Presence or removal of femoral arterial introducer; - Hemodynamic variables; - Active bleeding; - Angioedema; - Intracranial pressure; - Neurosurgery; - Oximetry; - Accentuated diaphoresis; - Facial pallor; - Active bleeding.	Monitoring: - Intracranial pressure; - cerebral perfusion pressure; - Hemodynamic variables; - Oximetry; - Headache; - Nausea; and - Emesis.	Not specified.
Zanni et al. (2010)	(1) Neurological. (2) 32 patients. (3) Yes. (4) In 24 to 48 hours.	Missing description	1) Monitoring: - Hemodynamic variables; and - Oximetry. 2) Attention and Protection: - Venous and arterial catheters; and - Endotracheal tubes.	It describes ADLs: (dressing up and bathroom).

(1) Type of ICU - Classification of the ICU where the study was conducted. **(2) Sample -** Number of patients participating in the research. (**3) Mechanical Ventilation -** If there was an intervention with patients during ventilation support. **(4) Beginning -** Moment of beginning in the occupational therapy sessions in the ICU, after analyzing the criteria for (contra) indication. **Unspecified -** Description of non-exclusive duties of the profession, but referenced by the articles included as if they were specific to the occupational therapist. **Missing description -** the absence of clear information in the text.

Thus, the analysis of the publications discriminated the training of ADLs and IADLs as the activities of the occupational therapist performing in the ICU. Among the ADLs, we found: eating, getting dressed, organized, self-care (hygiene), (using the) bathroom, and (using a) toilet (Table 4). Among the IADLs, we found: writing, reading, and setting up a schedule (of tasks) (Table 4). Finally, other roles related to alternative communication and mobility devices were found, allocated here as attributions of the scope of the profession (Table 4).

Once the occupational therapist's roles in the ICU were identified, the indication and contraindication parameters of these services were followed, together with the warning signs monitored during the execution of the activities, understood as requirements for the maintenance or suspension of the session in progress. Not all publications present these topics. Thus, regarding the indication and contraindication, 59% of the articles focus on contraindications (Table 4). We can infer that the contraindication limits are more important and should be more consolidated by the occupational therapist and the team at the time of the assessment at the beginning of the sessions in the ICU.

Among the contraindication items found, the following stand out: hemodynamic variables (Heart rate: <40 or> 130 bpm; Mean blood pressure <55 mmHg; Systolic blood pressure <90 or> 180 mmHg; Diastolic blood pressure> 105 mmHg; Heart rate, at rest, 50% maximum or less than predicted by age; cerebral perfusion pressure <50 mmHg; and orthostatic

hypotension), respiratory variables (respiratory distress; respiratory rate <5 or> 40 incursions/minute; and unstable airways), low oxygen saturation (SpO2 <88%), post-surgery (open abdomen, incisions, catheters, wounds), intracranial pressure (unstable or> 25 mmHg), active bleeding (active gastrointestinal hemorrhage), unstable spinal cord injury, mental state and level of consciousness of the patient (from moderate to severe state of dementia), discomfort/pain (Facial expression of anxiety or pain) and adverse events (Table 4).

Also, the most commented indication factors were: clinical parameters not found in the contraindication (respiratory, hemodynamic, and oxygen saturation), and the patient's levels of consciousness and delirium (data not shown).

Once the requirements for the beginning of occupational therapy sessions had been overcome, we proceeded to the identification of alert situations during the execution of the session. For this purpose, in 59% of the articles included, we identified nine monitoring points and vital signs of the patients: Hemodynamic parameters (Heart Rate <40 or> 130 bpm; Mean arterial pressure: <65 mmHg or> 110 mmHg; Systolic pressure:> 200 mmHg), Positive Expiratory Pressure (> 10cmH2O), Respiratory Rate (<5 or> 40 incursions/minute); Peripheral O_2 saturation (SpO2 <88%), ventilator asynchrony, active bleeding (bleeding at the catheter site), fatigue, discomfort/pain (patient discomfort with the catheter), vasoactive drugs (2h) and accidental events (displacement or accidental removal of the device) (Table 4). These and other points are confused with the contraindications and are parameters of permanent monitoring that determine the continuity or suspension of the planned activity.

Discussion

First, the results show that the occupational therapist is part of the care team and has active participation in interventions with critically ill patients, especially in the Medical ICU. This performance occurs in an individualized manner, with the scope of private roles of the profession or as a member of the multidisciplinary team and early rehabilitation/mobilization. For these demands, the role of the most recurrent occupational therapist in the ICU was the training of ADLs, followed by IADLs. Other practices were established by the professional in partnership, mainly with the physiotherapist. Second, the parameters for the indication of sessions with the occupational therapist in the ICU demonstrate that the knowledge of the contraindications is more important and must be first when deciding to start treatment. Once the session starts, the patient must be monitored permanently, and changes in vital signs are decisive for the suspension of the session.

In the context of the ICU, included articles report the possibility of starting treatment with mobilization, an option with progressive practices, from passive and assisted activities to reach active tasks (Hsu et al., 2020; Jolley et al., 2017; Sigler et al., 2016; Wahab et al., 2016; Witcher et al., 2015; Brummel et al., 2014; Pohlman et al., 2010; Schweickert et al., 2009). This finding is consistent in the national literature, in which joint mobilizations and bed positioning are used in the ICU as precedents to interventions that aim at functionality, such as training for ADLs (Bombarda et al., 2016).

The progression of complexity is also frequent in the training of ADLs such as feeding, get dressed, bathing, bathroom, toilet, organized and self-care tasks (Hsu et al., 2020; Sigler et al., 2016; Wahab et al., 2016; Brummel et al., 2014; Pohlman et al.,

2010; Zanni et al., 2010; Schweickert et al., 2009). These findings of the occupational therapist's roles in the ICU are also present in the study by Weinreich et al. (2017), who, in addition to assigning the training of ADLs to the occupational therapist, estimates the professional in the ICU to work with functional tasks, based on IADLs (Weinreich et al., 2017).

This observation in the use of ADLs and significant functional tasks in the ICU are not recent actions described in the specialized literature and date from at least three decades (Affleck et al., 1986). However, among the articles included in this proposal, only one publication makes direct reference to the ADLs/IADLs (Brummel et al., 2014), which represents a gap to be explored by researchers and professionals. About this, Hsu et al. (2020) present possibilities worked on in the studies of this group, such as elaboration of a schedule (of tasks), reading, and writing - without, however, classifying these tasks as IADLs.

Thus, the findings exposed here corroborate the literature and show the participation of the occupational therapist in the ICU, mainly due to roles related to early rehabilitation/mobilization. This occurs through exclusive attributions of the scope of occupational therapy, in particular: ADLs, IADLs, and other functional tasks (Hsu et al., 2020; Wahab et al., 2016; Fields et al., 2015; Brummel et al., 2014). We believe that this form of intervention is reinforced by the recurring partnership with Physiotherapy during decubitus changes, sitting on the bed, standing up, sitting on a chair, and walking (Yataco et al., 2019; Corcoran et al., 2017; Jolley et al., 2017; Sigler et al., 2016; Jolley et al., 2015; Witcher et al., 2015; Davis et al., 2013; Titsworth et al., 2012; Needham et al., 2010; Pohlman et al., 2010; Zanni et al., 2010; Schweickert et al., 2009). It is important to note that these findings do not represent the possible scope of work for the occupational therapist; they reflect only one form of intervention in response to the dynamics of the ICU and the needs that patients manifest, such as weakness, pain, reduced mobility, limited self-care, bathing and hygiene (Okuma et al., 2017). These data extracted from the literature suggest that there is a considerable demand for physical/functional care in the ICU.

The characterization of the outcomes of the publications reviewed here demonstrates that the roles of occupational therapists bring benefits to critically ill patients such as physical recovery, functional recovery, independence in ADLs, and improvement in quality of life (Hsu et al., 2020; Wahab et al., 2016; Fields et al., 2015; Brummel et al., 2014). These points corroborate the literature and receive supplements with other benefits mentioned in studies not included, such as: gain in muscle strength, functional recovery, shorter hospital stay and ICU stay (Aquim et al., 2019; Weinreich et al., 2017).

The reported results show that rehabilitation and early mobilization, conducted by occupational therapists in the ICU, in a partnership or not with other professionals, also discussed in other studies (Aquim et al., 2019; Costigan et al., 2019; Weinreich et al., 2017), prevent or reduce the deleterious effects of Post-Intensive Care Syndrome (PICS) (Corcoran et al., 2017; Wahab et al., 2016; Davis et al., 2013; Needham et al., 2010; Titsworth et al., 2012). This conclusion is consistent with the publications reviewed here, and also reinforces that multidisciplinary work is the most usual and achieves the best results in patient management in the ICU (Hsu et al., 2020; Jolley et al., 2017; Rawal et al., 2017; Wahab et al., 2016; Jolley et al., 2015; Davis et al., 2013; Needham et al., 2010).

Due to its versatility, in addition to ADLs and IADLs, another identified form of occupational therapist's performance in the ICU was the use of alternative communication devices (Hsu et al., 2020). The augmented or alternative communication devices in the ICU are unique instruments to provide opportunities for the involvement of critically ill patients, whether on mechanical ventilation or not, in the care provided by the team (Zaga et al., 2019). Initially, communication with the patient can occur in a binary manifestation (yes or no) about basic needs, such as pain, (dis) comfort, ambience and need for aspiration (Duffy et al., 2018). The participation of the occupational therapist in the making, training, and use of alternative communication in the ICU is supported by the literature and represents another specialized field of roles for the profession with critically ill patients (Costigan et al., 2019; Duffy et al., 2018; Koester et al., 2018; Brasil, 2006).

The results obtained on the parameters of indication and contraindication, for the beginning of sessions with the occupational therapist, highlight especially, the relevance of the observation of the contraindications (Hsu et al., 2020; Yataco et al., 2019; Deluzio et al., 2018; Corcoran et al., 2017; Wahab et al., 2016; Fields et al., 2015; Davis et al., 2013; Titsworth et al., 2012; Pohlman et al., 2010; Schweickert et al., 2009). The criteria highlighted in this study are corroborated by previous publications, whose understanding is not to delay the services of the rehabilitation team, but the provision of safety and the reduction of risks of adverse events in the management of the patient in the ICU, under mechanical ventilation, in bed or outside of it (Aquim et al., 2019; Miranda Rocha et al., 2017; Hodgson et al., 2014).

Once the intervention has started, the continuity or suspension of the session depends on the patient's (physical, mental, or vital) signs or the occurrence of adverse events (Hsu et al., 2020; Yataco et al., 2019; Deluzio et al., 2018; Wahab et al., 2016; Fields et al., 2015; Davis et al., 2013; Titsworth et al., 2012; Pohlman et al., 2010; Zanni et al., 2010; Schweickert et al., 2009). The monitoring and use of these parameters are consistent with the literature that, in addition, to determine the beginning or end of the session, here is understood as a joint responsibility of the multidisciplinary ICU team (Aquim et al., 2019; Ratcliffe & Williams, 2019).

Thus, the evaluation of the ICU multidisciplinary team by the beginning of sessions with the occupational therapist, in most of the studies analyzed, begins in the first 24 hours (Wahab et al., 2016; Brummel et al., 2014; Witcher et al., 2015; Zanni et al., 2010) or within 48 hours (Hsu et al., 2020; Davis et al., 2013; Jolley et al., 2017). This average time is consistent with the literature, which highlights the benefits of occupational therapy when started within 1.5 days (Hashem et al., 2016).

This study has limitations compatible with manifestations in equivalent publications. First, because the search for articles was carried out in only four scientific databases to select articles edited entirely in English (Costigan et al., 2019; Zaga et al., 2019; Weinreich et al., 2017). This procedure may have left out relevant searches for publications in the area of occupational therapy in the ICU that are not indexed or published in another native language, other than English.

Second, 12 articles of the 17 publications were reviewed to deal with the occupational therapist's roles in the ICU during a multidisciplinary or rehabilitation team, in which the private duties of the profession were not discriminated against

(Costigan et al., 2019). The five other publications that differentiate the occupational therapist's private practices were not presented in detail.

Third, one of these five publications addressed an unusual practice by Brazilian occupational therapists, involving the Cycloergometer, suggesting possible cross-cultural particularities in the profession's exclusive attributions or, at least, different research interests (World Federation of Occupational Therapists, 2017).

Finally, the fourth limitation refers to PICS, recognized as a set of signs and symptoms agglutinated in physical manifestations (muscle weakness acquired from the ICU); mental (anxiety, depression); cognitive (attention and memory deficit); damage to self-care; and reduced quality of life (Held & Moss, 2019; Daniels et al., 2018). By the criteria employed in this systematic review, intentionally, the selected activities of occupational therapists in the ICU meet the physical demands, in this first moment.

However, among the publications not included, there are reports of the occupational therapist's performance in the ICU context on other aspects of PICS, such as anxiety (Provancha-Romeo et al., 2019), delirium/mental confusion (Álvarez et al., 2017), and quality of life (Daniels et al., 2018) - which need further exploration. If included, these findings would increase the range of occupational therapist practices with critically ill patients in the ICU shown here.

Conclusion

This study highlights that the activities most performed by occupational therapists in the ICU involve rehabilitation/early mobilization interventions, followed by the profession's exclusive attributions. We conclude that, despite the findings presented, the performance of the professional in this hospital area is still under construction, mainly due to the number of references that do not discriminate the professional's performance in the ICU. Thus, we offer plausible suggestions within the scope of physical rehabilitation, of interventions demanded by the critical patient, and under the aegis of the immediacy, productivity, and results required of the members of the team of this hospital specialty. As we explained, the text can be a guide for the occupational therapist working in the ICU who needs more information or an instrument to instigate the search for new practices mediated by specialized research. This includes studies on other harmful effects of prolonged ICU stay, such as delirium and cognitive, mental, and quality of life impairments.

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Author's Contributions

Estéfanny da Silva Bittencourt and Paula Silva Moreira: Identification of the articles, analysis of the included articles, tabulation of the data, text conception, and textual writing. Glenda Miranda da Paixão and Marcelo Marques Cardoso: conception of the text, analysis, and review of the data, the orientation of the study, and textual writing. All authors approved the final version of the article.

Funding Source

Faculdade de Fisioterapia e Terapia Ocupacional, Instituto de Ciências da Saúde – Universidade Federal do Pará (FFTO, ICS – UFPA).

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