

Early mobilization of critically ill ICU patients: A survey of knowledge, perceptions, and practices of Malaysian physiotherapists

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ABSTRACT

Introduction: Early mobilization and rehabilitation of critically ill patients in the Intensive care unit (ICU) is a topic of growing interest. Current evidence suggests that early mobilization is safe, feasible, and effective at reducing the incidence of ICU-acquired weakness. However, early mobilization is still not the standard of care in most ICUs worldwide. The aim of the study was to determine the level of knowledge, perceptions, and practice among ICU physiotherapists of early mobilization in critically ill ICU patients in Malaysia.

Materials and Methods: A cross-sectional study was undertaken in 45 public, teaching, and private hospitals in Malaysia that provide ≥ 10 beds in their ICUs. Knowledge, perceived barriers, facilitators, and practice of early mobilization were assessed using a previously validated mobility survey questionnaire.

Results: Only 35% of ICU physiotherapists reported receiving training/courses on early mobilization in the ICU. 100 (86%) physiotherapists underestimated the incidence of ICU-acquired weakness, and 88 (75%) were unfamiliar with the current literature on early mobilization in the ICU. The need for physician orders before mobilization, medical instability, excessive sedation, and risk of dislodgement of devices or lines were the most common barriers to early mobilization. Nearly half (49 [42%]) of the respondents reported physiotherapist as early mobilization clinical champion in their setting, but the most common physiotherapy treatment techniques in the ICU reported by the respondents' were still chest physiotherapy, range of motion exercises, and bed mobility.

Conclusion: We observed strong enthusiasm for early mobilization among Malaysian physiotherapists. Most respondents believed that early mobilization is important and beneficial to ICU patients. However, there is still a big gap in knowledge and training of early mobilization in ICU patients among Malaysian physiotherapists.

KEYWORDS:

Early mobilization, intensive care unit, knowledge, perceptions, practice

INTRODUCTION

Bed rest was prescribed for critically ill patients in the past because bed rest was thought to be necessary to prevent complications and for the comfort of patients being 'critically ill'. However, no one randomized controlled trial has been able to demonstrate the benefits of bed rest not only in critically ill patients but also during the postoperative period, where bed rest is common. On the contrary, bed rest has been found to be associated with multiple complications, especially to the musculoskeletal system. Bed rest induced loss of muscle mass predominantly to the lower extremities and is more rapid in the elderly and during critical illness.^{1,2} In critically ill ICU patients, the cross-sectional area of rectus femoris was found to be reduced by as high as 12.5% within as short as 7 days.³ Those with multiple organ failure were found to have greater muscle loss than those with single organ failure (-15.7% vs. -3.0% by day 7 and -8.7% vs. -1.8% by day 3).³ Despite the availability of such data, bed rest during the period of ICU admission, especially among those requiring mechanical ventilation is common practice in most ICU settings, worldwide.

ICU-acquired weakness is a commonly used term to describe the presence of clinically detectable muscle weakness among ICU patients with no possible aetiology other than being critically ill. In a systematic review of 33 studies involving 2686 ICU patients, ICU-acquired weakness was reported in as high as 1080 patients (i.e., 40%). Even worse, those with ICU-acquired weakness were found to associate with several other negative consequences such as (i) longer mechanical ventilation days (11 vs. 8 days), (ii) extended hospital length of stay (36 vs. 23 days), (iii) greater expenditure (\$23,277 vs. \$17,834) and (iv) higher 1-year mortality (31% vs. 17%), all $p < 0.05$.⁴ With the growing literature on ICU-acquired weakness and the harms of bed rest, early mobilization and rehabilitation in critically ill ICU patients has been gaining attention.

Early mobilization is defined as a pattern of increasing activity beginning with a passive to active range of motion through ambulation that starts immediately after stabilization of hemodynamic and respiratory physiology, generally within 24-48 hours after ICU admission.⁵ The current evidence suggests that early mobilization is safe and feasible and has the potential to reduce the incidence of ICU-

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acquired weakness.⁶ In a systematic review of 32 RCTs involving 2,308 critically ill patients, Zhang et al.⁷ found that early mobilization decreased the incidence of ICU-acquired weakness at discharge, increased the number of patients who can stand, shorter the mechanical ventilation days, increased the distance patient can walk independently at hospital discharge and increased the rate of discharge. Adverse events following early mobilization in the ICU were reported between 2%⁸ and 21%⁹ depending on the number and events each study used to define complications.^{8,9} However, it is important to note that most studies reported no differences in the rate of adverse events during in-bed vs. out-of-bed mobilization, and most of the complications resolved after temporary cessation of mobilization (e.g., desaturation, blood pressure changes and ventilator dyssynchrony).⁹⁻¹¹

Despite the availability of evidence supporting the safety, feasibility, and benefits of early mobilization in the ICU, early mobilization is not yet a standard of care in most ICUs worldwide. In a survey conducted in Australia and New Zealand, Berney et al.¹² found that, of the 498 ICU patients, 140 (28%) completed an in-bed exercise program, 93 (19%) sat over the edge of the bed, 182 (37%) sat out of bed, 124 (25%) stood and 89 (18%) walked. No patient requiring mechanical ventilation sat out of bed or walked. In the USA, a country in which early mobilization practice has been advanced, Jolley et al.¹³ found that out-of-bed mobilization was still not a standard of care in 42 ICUs, with only halved (56%) of their non-mechanically ventilated patients received out of bed mobility. In Malaysia, data reporting the levels of mobilization in the ICU is limited. In one teaching hospital in which early mobilization is also considered advanced,¹⁴ bed mobility was still the standard nursing care in the ICU with a majority of the nurses performed supine (88%), side (70%) and fowler/semi fowler (68%) bed mobility. In bed stretching/strengthening exercises was done by less than 20% and standing and walking was done by as low as 11% of the ICU nurses. One of the main barriers to early mobilization reported in this study was majority (72%) of their respondents (i.e., ICU nurses) had not gone through early mobilization training but is expected to keep up with the strong evidence supporting early mobilization in the ICU. Other than nurses who, without doubt, are involve in ICU patient care, the profession that holds the key to the rehabilitation of ICU patients is physiotherapist. Similarly, training on early mobilization may not have been compulsory for all ICU physiotherapists. In fact, in Malaysia, most of the healthcare settings still practice rotation basis where no one physiotherapist stays in an area of practice. Therefore, it is important to first identify the level of knowledge, perception, and practice of early mobilization among ICU physiotherapists in Malaysia for further action and recommendation.

MATERIALS AND METHODS

Study Design and Protocol

This cross-sectional study was conducted from May 2020 to June 2021. Potential study sites were identified through the Malaysia Ministry of Health directory,¹⁵ teaching hospital directory¹⁶ and private hospitals directory.¹⁷ All hospitals that provide ≥ 10 beds in their ICUs were eligible to be included in this study.

The eligibility criteria for the respondents were physiotherapists primarily involved in the management of patients in adult ICU/CICU/CCU/Neuro ICU during the year 2020. Physiotherapists who were on temporary relief duty or were on-call in adult ICU/CICU/CCU/Neuro ICU were excluded from this study.

Survey administration

Initial contact was made with the head of physiotherapy unit or Senior physiotherapist in each of the 45 eligible hospitals (i.e., hospitals that provide ≥ 10 beds in their ICUs) via phone call or email to identify all potential study respondents (i.e., physiotherapist primarily involved in the management of patients admitted to adult ICU/CICU/CCU/Neuro ICU). A total of 200 potential respondents was identified (i.e., 3 to 5 physiotherapists from each study site [depending on the number and size of the ICU]). The survey questions were then sent to the same head of physiotherapy unit or senior physiotherapist through email or WhatsApp using a Google Form link to be distributed to potential respondents. All participants were informed of the objectives of the study and provided informed consent electronically before they were allowed to start filling in the questionnaire.

Study Instruments

A self-administered Mobility Survey Questionnaire was used in this study.¹⁸ The questionnaire has 25-items assessing knowledge of ICU-acquired weakness and early mobilization (4 items), perceptions on levels of activity by patient characteristics and barriers to early mobilization in the ICU (6 items); and assessments for initiation, intensity, and frequency of early mobilization practices; staffing and sedation issues as well as rehabilitation after ICU discharge (15 items).

Each item included various question formats (i.e., true/false, yes/no, nominal, ordinal and Likert scales) but no open-ended questions. Data such as age, gender, level of education, current working area, working experiences, duration of time spent working in ICU, any training or course for early mobilization in ICU, and current workplace were recorded.

Statistical Analysis

Data analysis was conducted using IBM SPSS Statistic software version 26. Descriptive statistical analysis were used to describe the responses in frequency (n) and percentage (%) or mean and standard deviation of the variables of interests.

Ethics Approval and Informed Consent

Approval for the study was granted by the Malaysian National Medical Research Register (NMRR-20-2424-56674), the Malaysian Medical Research and Ethics Committee (202162-10191) and Universiti Teknologi MARA (UiTM) Human Research Ethics Committee (600-TNCPI (5/1/6)). All participants were informed of the objectives of the study and provided informed consent electronically before they were allowed to start filling in the questionnaire.

RESULTS

Forty-five hospitals (36 public, 5 privates, and 4 teaching) participated in this study. Table I describes the demographic

Table I: Characteristics of the survey respondents (n=117)

Characteristics	Mean ± SD	n	(%)
Age, years	32.7 ± 5.8		
20-29		36	(31)
30-39		67	(57)
40-49		10	(9)
50-59		4	(3)
Gender, M		32	(27)
Working experience			
6 months to 1 year		5	(4)
2 years to 5 years		18	(15)
6 years to 10 years		60	(51)
>10 years		34	(29)
Current Working Place			
Public		63	(54)
Teaching		44	(38)
Private		10	(9)
Highest education level			
Diploma		81	(69)
Degree		31	(27)
Master		4	(3)
PhD		1	(1)
Type of ICU			
General ICU		74	(63)
Medical-surgical ICU		8	(7)
Cardiovascular ICU		18	(15)
Neurological ICU		17	(15)
Duration Working in ICU			
Less than 1 year		41	(35)
1 - 2 years		37	(32)
<5 years		21	(18)
>5 years		18	(15)

Data are presented as Mean±SD and n (%). Abbreviations: ICU, intensive care unit; M, male.

Table II: Perception of physiotherapists on maximum level of activity for patients with cardiovascular, respiratory, and neurological limitations

Physiological status	Bed rest	In-bed activities	Out-of-bed activities	Not sure
Cardiovascular				
Receiving ≥ 3 vasopressors or inotropic infusions	43 (37)	54 (46)	4 (3)	16 (14)
Receiving 2 vasopressors or inotropic infusions	9 (8)	86 (74)	6 (5)	16 (14)
Receiving 1 high dose vasopressor or inotropic infusion	10 (9)	87 (74)	5 (4)	15 (13)
Receiving 1 medium dose vasopressor or inotropic infusion	2 (2)	89 (76)	10 (9)	16 (14)
Receiving 1 low dose vasopressor or inotropic infusion	0 (0)	74 (63)	29 (25)	14 (12)
Respiratory				
Minimal pressure support on conventional mode of mechanical ventilation (e.g., FiO2 0.5, PEEP 10)	0 (0)	54 (46)	54 (46)	9 (8)
Moderate pressure support on conventional mode of mechanical ventilation (e.g., FiO2 0.5, PEEP 10)	2 (2)	88 (75)	18 (15)	9 (8)
Advanced mode of mechanical ventilation (e.g., high frequency oscillation)	15 (13)	83 (71)	10 (9)	9 (8)
Neurological				
Unresponsive to verbal and motor	5 (4)	101 (86)	6 (5)	5 (4)
Purposeful motor response, not obeying verbal commands	2 (2)	98 (84)	12 (10)	4 (3)
Purposeful motor response, obeys verbal commands	0 (0)	55 (47)	57 (49)	5 (4)

characteristics of the 117 study respondents. The response rate to questionnaire administration was 59%. Of the 117 study respondents, only 41 (35%) reported receiving training/courses for early mobilization in ICU.

Knowledge

Overall, 100 (86%) respondents underestimated or were unaware of the incidence of ICU-acquired weakness (i.e., 40% based on prospective observational studies of 2686 critically

ill ICU patients).¹⁹ Two-thirds of the respondents (88 [75%]) were not familiar with the current literature on early mobilization in the ICU. Only 2 (2%) physiotherapists responded correctly to all five true/false questions in relation to clinical trials on the benefits of early mobilization in the ICU. Despite only involving physiotherapists primarily in charge of ICU patients, only as low as 22 (19%) respondents reported sufficient knowledge to mobilize patients receiving mechanical ventilation.

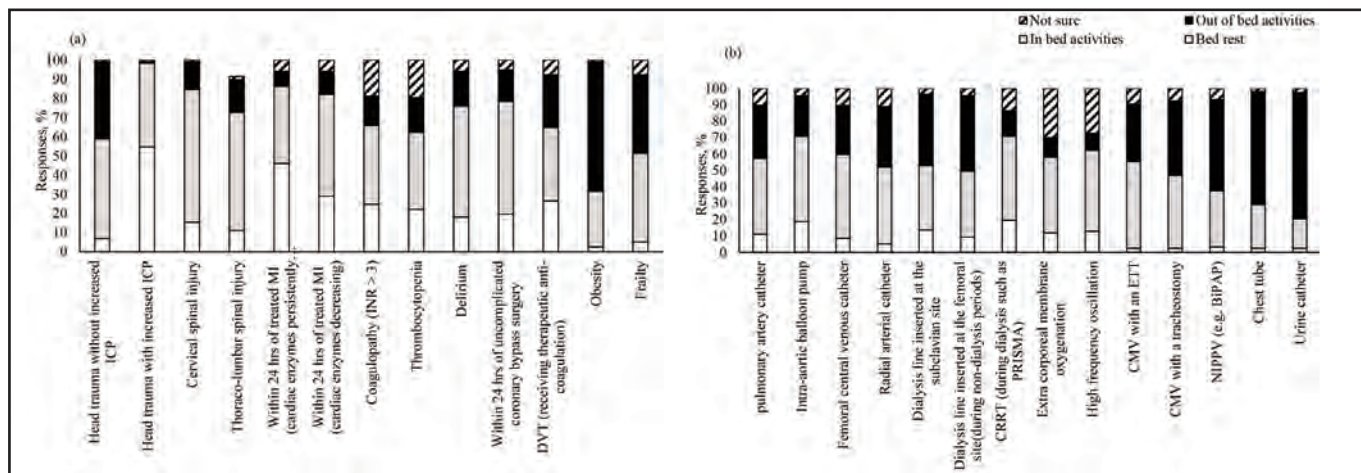


Fig. 1: Physiotherapist perception on permissible level of activity based on patient's diagnosis and condition (a) and devices (b). Abbreviations: CRRT, continuous renal replacement therapy; DVT, deep vein thrombosis; ETT, endotracheal tube; ICP, intracranial pressure; INR, international normalised ratio; MI, myocardial infarction; MV, mechanical ventilation; NIPPV, non-invasive positive pressure ventilation

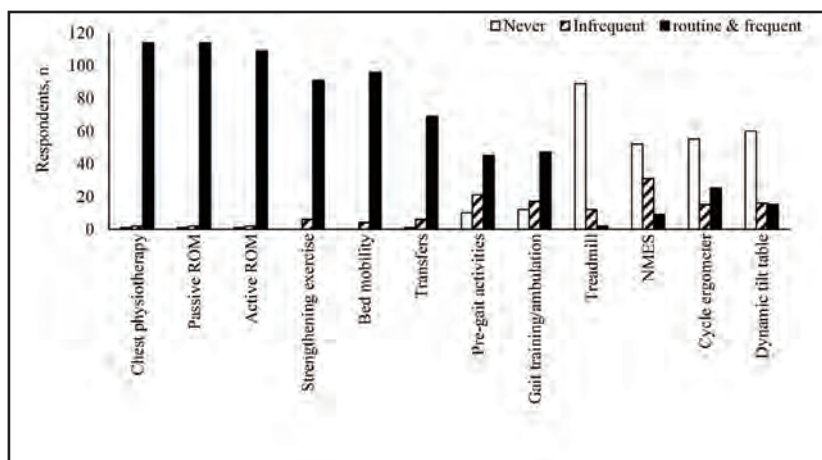


Fig. 2: Frequency (a) and intensity (b) of mobilization performed by physiotherapists

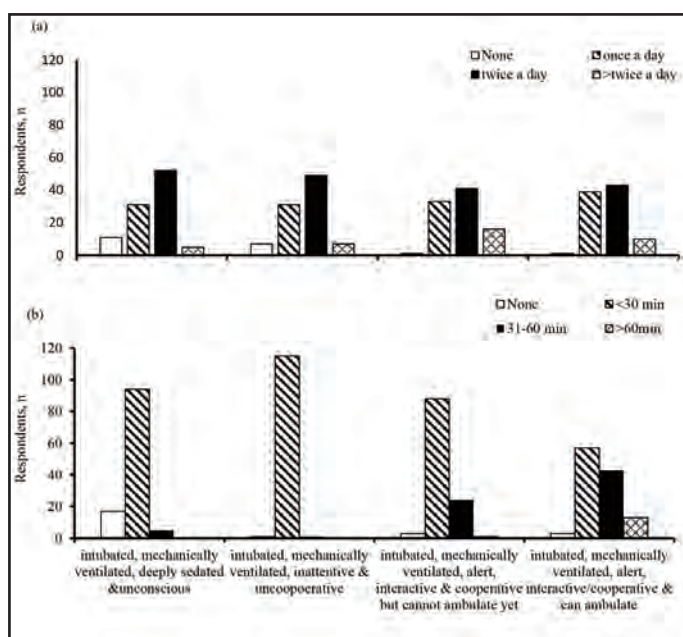


Fig. 3: Frequency (a) and intensity (b) of mobilization performed by physiotherapists

Perceptions

A total of 90 (77%) physiotherapists perceived that early mobilization is crucial in the care of ICU patients. Most of the physiotherapists (106 [91%]) reported early mobilization should be initiated as soon as the cardiorespiratory status of the patients has been stabilized, while over half of the respondents (60%) reported early mobilization should begin as soon as the patient is conscious and able to cooperate.

Barriers to Mobilization of ICU Patients

Several barriers to early mobilization were reported by the respondents. The most common perceived institutional barriers were the need for orders from physicians before mobilization (67%), routine bed rest orders on ICU admission (61%), and insufficient physical space (51%). Most of the physiotherapists reported medical instability (98%), excessive sedation (85%), and risk of dislodgement of devices or lines (80%) as patient-level barriers to early mobilization in the ICU. For the provider level barriers, the most frequently reported barrier was lack of communication about rehabilitation during the handover at shift change among nurses (33%), limited staffing (mainly nurses and physiotherapists) to routinely mobilize the patients (27%),

and lack of specific decision-making authority to initiate early mobilization in the ICU (25%).

Perceptions of Physiotherapists on Permissible Level of Activity based on Patient's Diagnosis, Condition, and Devices

Figure 1 illustrates the perception of the physiotherapists on permissible activity levels based on the diagnosis of the patients, their condition, and devices. Over half of the physiotherapists (64 [55%]) believed that patients with head trauma with increased intracranial pressure should be restricted to bed rest, whereas the majority agreed that bed rest was not necessary for patients with head trauma without increased intracranial pressure (108 [92.3%]). Although majority of the physiotherapists deemed bed rest was not a necessity for patients with a catheter attached, most of them were more comfortable prescribing in-bed activities compared to out-of-bed activities for patients with pulmonary artery catheter (54 [46%] vs. 38 [33%]), a femoral central venous catheter (60 [51%] vs. 35 [30%]) and radial arterial catheter (55[47% vs. 43 [37%]).

Perceptions of Physiotherapists on the Maximum Level of Activity for Patients with Cardiovascular, Respiratory, and Neurological Limitations

More than two-thirds of the physiotherapists (43 [37%]) consider only bed rest for patients receiving ≥ 3 vasopressors/inotropic infusions (Table II). Majority of the physiotherapist believed that in-bed activities such as passive and active ROM exercises were the highest activity level for patients receiving ≤ 2 vasopressors/inotropic infusion(s). Nearly half of the physiotherapists (54 [46%]), reported out-of-bed activities as the highest level of activity for patients requiring minimal respiratory support. Majority (>70%) believed that only in-bed activities were appropriate for those requiring moderate and high respiratory support (FiO_2 0.5, PEEP 10 and high-frequency oscillation). Regarding neurological limitations, out-of-bed activities was only seen as appropriate to patients with a purposeful motor response and obeying commands by nearly half of the respondents (57 [49%]).

Practices

Although majority of the respondents (82 [70%]) agreed that their initial assessment required a written medical order by a physician, more than half (62 [53%]) reported assessing all ICU patients for the appropriateness of early mobilization even before they received the order or request from any other healthcare provider. In fact, the number of respondents who reported physician as the first healthcare provider to identify patient readiness for mobilization was similar to those who reported physiotherapist as the first to identify patient readiness to mobilization (59 [50%] vs. 56 [48%]). More than half of the respondents (70 [60%]) reported at least one early mobilization champion in their ICU, of which almost half (49 [42%]) reported the champion was a physiotherapist.

Figure 2 illustrates the commonly used physiotherapy treatment techniques in the ICU as reported by the respondents. The four physiotherapy treatment techniques routinely used in the ICU were chest physiotherapy (97 [83%]), passive range of motion (91 [78%]), active range of motion (79 [68%]) and bed mobility (63 [54%]). Figure 3 describes the intensity and frequency of mobilization performed by physiotherapists in the ICU.

DISCUSSION

Knowledge

The present study reports the findings from a national survey among Malaysian physiotherapists on knowledge, perceptions, and practices of early mobilization of critically ill ICU patients. The results highlight significant gaps in knowledge of ICU-acquired weakness among Malaysian physiotherapists: 100 (86%) of our respondents either underestimated or were unaware of the incidence of ICU-acquired weakness. This number is higher than previously reported 69% of Canadian physicians and physiotherapists also underestimated the incidence of ICU-acquired weakness.¹⁸ Although involving only physiotherapists primarily in ICU patient care, most were unfamiliar with the current literature on early mobilization. Only two physiotherapists answered the true/false questions on the benefits of early mobilization correctly. Only as low as 19% of the physiotherapists reported sufficient knowledge or training to mobilize patients receiving mechanical ventilation. Factors such as majority of the respondents being diploma holders²⁰ (69% [Table I]) and working in the ICU for less than two years²¹ (67% [Table I]) could have in part contributed to the limited knowledge and training on early mobilization among the respondents.^{18,21,22} Of note, the training in evidence-based practice was emphasized more in the bachelor's degree than diploma program, and in most setting in Malaysia, physiotherapist is subjected to rotation in the clinical area every 1 to 2 years. The rotation will allow physiotherapist to be competent to practice in all treatment areas but limit specialization. Future physiotherapy practice should consider physiotherapy specialisation so that every healthcare setting has a dedicated physiotherapist for specialized areas like ICU.

Perception

The findings of this study show that majority of the physiotherapists believed that early mobilization is important during the care of critically ill patients in the ICU. Similarly, Anekwe et al.²² also found physiotherapists are more likely to agree that early mobilization is very important in the ICU and should be initiated as soon as the cardiorespiratory condition of the patients has been stabilized. Sommers et al.²³ recommend initiating early mobilization as soon as the cardiorespiratory status of patients has been stabilized as early mobilization within 48 hours of mechanical ventilation has been found to reduce ICU and hospital stays,²⁴ while early mobilization within 48 – 72 hours of mechanical ventilation improved ICU-AW and reduce the duration of mechanical ventilation.²⁵ Thus, it is important to determine when to initiate early mobilization to provide optimal outcomes for patients.²⁶ However, this study was unable to definitively say to what extent it has been implemented in practice.

Barriers to Mobilization of ICU Patients

The barriers perceived by the physiotherapists in this study are similar as reported in other studies.^{14,18,22,27} Interestingly, a patient-level barrier such as medical instability, excessive sedation, and risk of dislodgement of devices or lines has a much higher overall vote compared to other types of perceived barriers in this study. Previous studies found that the medical stability and safety concerns on early mobilization patients were the most common barriers reported in initiating early mobilization.^{18,27} This supports the

findings in this study that most physiotherapists generally have insufficient knowledge of the current literature and lack proper training on early mobilization in the ICU. This needs to be emphasized as it reflects the ability of Malaysian physiotherapy to perform early mobilization on critically ill patients. Therefore, there is a need for continuous education and training programs to improve knowledge and technical skills regarding early mobilization in the ICU.

Requiring physician orders to initiate early mobilization and lack of communication about rehabilitation during the handover at shift changes among nurses were the most common perceived barriers at the institutional- and provider-level, respectively. These findings are consistent with previous studies.^{14,18,27,28} Requiring a physician referral to initiate early mobilization is most likely a hospital policy and communication issues among nurses may related to the limited available staff in the ICU. Previous studies found that the need to wait for physician orders and lack of nursing availability delay early mobilization^{14,29} and cause it to be minimally practiced in the ICU settings.¹⁴ This shows that a sufficient number of staff and utilization of multi-disciplinary teams are needed to overcome multiple barriers of mobilization in the ICU settings.²²

Perceptions of Physiotherapists on Permissible Level of Activity Based on Patient's Diagnosis, Condition, and Devices

Responses from the physiotherapists on the permissible activity level based on the diagnosis or devices patients' show that most ICU patients did not receive the most beneficial activity level. Most physiotherapists who participated in this survey tend to prescribe in-bed activities for ICU patients. Previous studies in peninsular Malaysia and Sarawak found a low rate of advanced mobilization and ambulation practice done on patients with mechanical ventilation in the ICU.^{14,30} This finding shows that Malaysian physiotherapists did not necessarily follow the existing recommendation³¹ for early mobilization in the ICU settings. One of the reasons for the low practice of early mobilization in the ICU may be related to physiotherapists who are not familiar with existing evidence on early mobilizations in the ICU. Lack of knowledge¹⁸ and awareness of existing protocol²² regarding mobilization in the ICU result in poor practice of early mobilization in the ICU.^{18,22,28} These findings suggest further education and the presence of a written protocol may help improve the knowledge necessary to facilitate early mobilization in the ICU.

Practice

A physiotherapist is the most important person for early mobilization in the ICU to most of the respondents. Majority reported (i) screening the appropriateness of patients for early mobilization even before they received the order for mobilization from the physician, (ii) being the first to identify patient readiness for early mobilization, and (iii) physiotherapist as the ICU early mobilization champion in their hospitals. Despite the above findings, ambulation was a routine practice in the ICU by not even half of the respondents (Figure 2). Chest physiotherapy, passive/active ROM exercises, and bed mobility, on the other hand, were the three most used physiotherapy treatment techniques in the ICU by majority of the respondents.

When the respondents were asked about their mobilization practice in intubated, mechanically ventilated patients, about 50% reported seeing these patients for <30 min per session twice a day. Less time (<15 min) was spent with intubated patients who were sedated or uncooperative compared to those spent with intubated, mechanically ventilated patients who are cooperative and can be ambulated. These findings must be interpreted cautiously because mobilization in this context includes both in-bed and out-of-bed mobilizations. That could also explain why lesser time is spent on those who cannot ambulate when compared to the time spent on those who can. Future studies reporting early mobilization practices in the ICU should separate the two types of mobilization (in-bed vs. out-of-bed) to understand the concept of early mobilization better.

CONCLUSION

We observed strong enthusiasm for early mobilization among Malaysian physiotherapists. Most respondents believed that early mobilization is important and beneficial to ICU patients. However, there is still a huge gap in knowledge and training of early mobilization in ICU patients among Malaysian physiotherapists. Future studies aimed at intervention to reduce the modifiable barriers (e.g., lack of knowledge and inadequate training, lack of communication among the staff) to early mobilization are recommended.

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CONFLICT OF INTEREST

The authors declare there are no conflict of interests.

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