

# Physiotherapy practice of early mobilization in intensive care units of selected west Malaysian hospitals: a cross-sectional survey

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## Abstract

**Introduction.** Early mobilization (EM) in the intensive care unit (ICU) improves clinical outcomes. Despite the positive evidence, the implementation of EM is low in many countries. However, little is known about the practice of EM in ICU by physiotherapists in West Malaysia. Hence, this study was planned to assess the practice of physiotherapist-initiated EM in respiratory ICUs of selected West Malaysian hospitals.

**Methods.** A cross-sectional survey was conducted by using a self-administered questionnaire. The participants were registered physiotherapists with a minimum of 2 years working experience in respiratory ICUs, recruited from private or government hospitals with the convenience sampling method.

**Results.** Overall, 102 complete responses out of 200 were received. Most respondents stated that they practised EM in ICU, while 73.53% claimed that they mobilized patients with ventilator support. The majority indicated that they used a standard protocol to select patients for EM. The most common factors that influenced the physiotherapists' clinical decision to perform EM were patient's medical stability and safety concerns about EM.

**Conclusions.** Most physiotherapists in the selected West Malaysian hospitals stated that they practised EM in ICU. However, studies are required to assess the effectiveness and outcomes of the EM performed by physiotherapists in Malaysia.

**Key words:** early mobilization, intensive care unit, physiotherapist

## Introduction

Prolonged immobilization has a deleterious effect on bone mineral density, muscle mass, and impairment of major body systems, especially in critically ill patients of intensive care units (ICU), leading to a neuromuscular dysfunction which is known as ICU-acquired weakness [1, 2]. ICU-acquired weakness increases the duration of ICU stay by prolonging the period of mechanical ventilation [3]. Early mobilization (EM) in ICU is proven to be effective in improving skeletal muscle function, which in turn reduces the time of mechanical ventilation in patients with respiratory disorders. EM is reported to decrease the ICU and hospital stay by improving functional capacity. It is also important to note that EM in critically ill patients raises their quality of life in the longer perspective. Safe and feasible, EM is recommended in the routine care of the critically ill in the developed countries [4–8].

The definition of EM varies widely in the literature [9]. Generally, EM involves in-bed and out-of-bed activities with or without a healthcare provider's assistance [9]. EM begins within 24–72 hours of ICU admission. The risk of EM is comparatively low when compared with its benefits. Reported adverse effect such as line removal, extubation, abnormal physiological responses, or need for alteration in the medical plan of care accounted for less than 5% [10, 11].

The practice of EM in the clinical area is surprisingly low in many countries. A survey conducted among physicians and physiotherapists of Canada showed that 59.8% did not have sufficient knowledge or skills to mobilize mechanically ventilated patients [12]. A point prevalence study performed in the United States reported that only 32% of therapists

provided mobilization in the specified time [13]. Similarly, studies from New Zealand, Australia, and Germany also revealed a low patient mobilization rate [14, 15]. When the developed countries show a low patient mobilization rate, the issues in developing countries are different. EM practice in developing countries differs from that in developed countries. Physician referral is mandatory to decide on physiotherapist practice and EM in Nepal and India [16–18]. Out-of-bed mobilization was reported to be low in Brazil and Zimbabwe [19, 20].

The median bed occupancy rate in Malaysian ICUs in 2016 was 87.7% out of 660 beds of the Ministry of Health hospitals [21]. Respiratory disorders are among the top causes for ICU admissions in Malaysia [21]. As physiotherapists are important team members to perform EM in ICU patients with respiratory conditions, understanding physiotherapists' practice in ICU is crucial. A study among Malaysian nurses found that half of them mobilized their mechanically ventilated patients 3 or more times per shift using passive and active exercises [22]. However, the physiotherapists' practice of EM in Malaysian ICUs in subjects with respiratory diseases is not documented. Hence, this study aimed to assess the practice of EM in respiratory ICUs by physiotherapists of selected West Malaysian hospitals.

## Subjects and methods

### Study design

A cross-sectional survey was conducted by using a self-administered questionnaire (see Appendix) through e-mail

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and/or hard copy. The participants were physiotherapists with a minimum of 2 years working experience in respiratory ICUs of private or government hospitals. The convenience sampling method was applied to recruit the participants from various states of West Malaysia. The physiotherapists were identified through the Malaysian Physiotherapy Association members registry and through hospitals.

### Study tool

A self-administered questionnaire (see Appendix) was developed by the investigators in English on the basis of a literature review. The content of the questionnaire was validated by 2 specialist physiotherapists working in respiratory ICUs. The items included in the questionnaire referred to demographic data, assessments carried out by physiotherapists in ICU, current treatment practices with adult respiratory patients in ICU, and rationale for their choices of treatment practice. The questionnaire items were recorded in opened-ended, Likert-type rating scales and predetermined ranked responses.

The questionnaire was either sent through e-mail or distributed to the participants directly between March and April 2018. A reminder was sent in the case of no response from a participant within 2 weeks. A researcher distributed the questionnaire directly to therapists during the Malaysian Physiotherapy Association 55<sup>th</sup> annual general meeting and also approached physiotherapy departments of some selected hospitals in West Malaysia.

### Analysis

The data were exported to Microsoft Excel 2013 from a Google Form, while the data from paper questionnaires were entered into Microsoft Excel 2013 and combined together for analysis. Descriptive analysis in the form of frequency distribution and percentage for each section of the questionnaire was reported. All items requiring nominal responses were given a numerical code, starting from 1. The Likert score for question 10 was changed to code 1–5, in accordance with the sequence of the responses of always, usually, sometimes, rarely, and never. For open-ended questions, the responses were grouped on the basis of the common theme and reported.

### Ethical approval

The research related to human use has complied with all the relevant national regulations and institutional policies, has followed the tenets of the Declaration of Helsinki, and has been approved by the INTI International University research ethics committee (dated December 15, 2017).

### Informed consent

Informed consent has been obtained from all individuals included in this study.

### Results

A total of 200 questionnaires and e-mails were distributed and 115 responses received (response rate: 57.5%), out of which 13 responses were excluded owing to incomplete information. Hence, 102 responses were included for analysis.

The majority of the physiotherapists were female (70.59%), with 2–4 years of working experience in ICU. Even though the questionnaires were distributed to all the states of West Malaysia, no response was received from the states of Pahang, Perak, Kelantan, Kedah, or Perlis. Figure 1 presents the state distribution of the participants. Overall, 50.98% of the respondents were undergraduate physiotherapists, followed by 41.18% of diploma holders; the remaining ones were master degree holders. Most subjects (60.78%) worked in private hospital setting.

Among the 102 respondents, 92 (90.2%) reported that they practised EM in ICU patients, while 10 (9.8%) stated that they did not. Those who applied EM in ICU among respiratory patients presented different attitudes towards EM (Table 1). The parameters of EM as reported by the physiotherapists are summarized in Table 2.

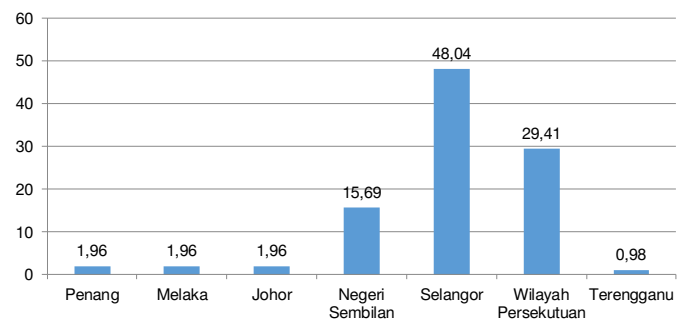
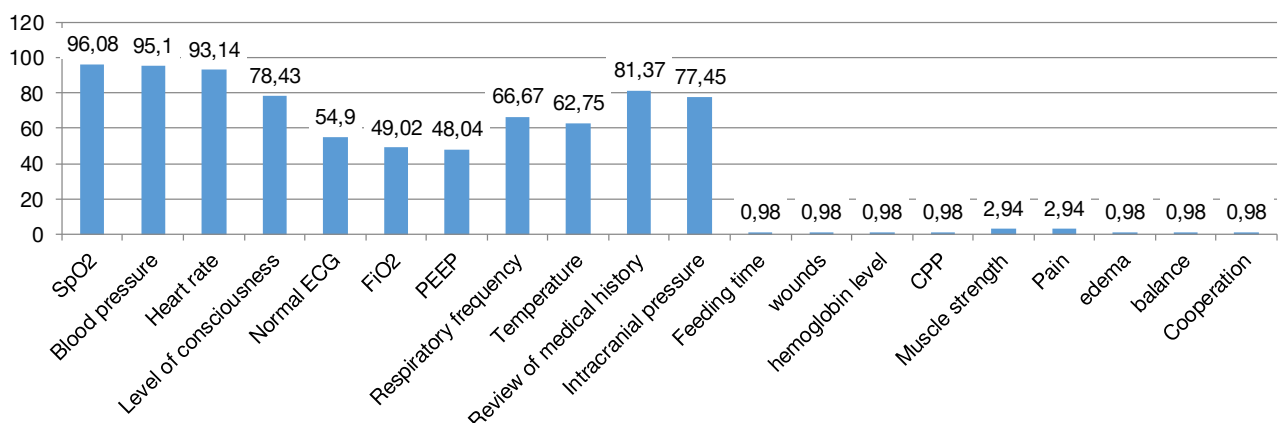


Figure 1. Percentage of respondents from various states of West Malaysia



SpO<sub>2</sub> – peripheral oxygen saturation, ECG – electrocardiography, FIO<sub>2</sub> – fraction of inspired oxygen, PEEP – positive end-expiratory pressure, CPP – cerebral perfusion pressure

Figure 2. Criteria of eligibility for early mobilization

Table 1. Practice and definition of EM

EM practice	Count of respondents (n = 102)	Percentage (%)
Yes	92	90.20
No	10	9.80
EM definition	Count of respondents (n = 92)	Percentage (%)
Start from passive range of motion, bed positioning, and slowly progress the treatment plan to active exercise depending on the patient's condition as early as possible	29	31.52
Involve the patient for active mobilization as early as possible and slowly progress the treatment plan depending on the patient's condition	32	34.78
Involve the patient for active mobilization as early as possible and slowly progress the treatment plan out of bed depending on the patient's condition	14	15.22
To prevent future complications after ICU admission	4	4.35
Improve the patient's functional capacity and prevent prolonged bed-ridden condition	3	3.26
Bed mobility	5	5.43
Start from passive range of motion, bed positioning, and slowly progress the treatment plan to active exercise and include chest physiotherapy depending on the patient's condition as early as possible	4	4.35
Involve the patient for active mobilization as early as possible and slowly progress the treatment plan depending on the patient's condition combined with chest physiotherapy	1	1.09

EM – early mobilization, ICU – intensive care unit

Table 2. EM parameters

EM practice based on day of ICU admission	Count of respondents (n = 102)	Percentage (%)
1–2	47	46.08
2–5	47	46.08
6–8	3	2.94
> 8	2	1.96
Not specified	3	2.94
Frequency	Count of respondents (n = 102)	Percentage (%)
1 time in > 4 days	6	5.88
1 time in 3 days	1	0.98
1 time in 2 days	2	1.96
1 time daily	26	25.49
2 times daily	62	60.78
3 times daily	5	4.90
EM of patients with ventilator support	Count of respondents (n = 102)	Percentage (%)
Yes	75	73.53
No	27	26.47

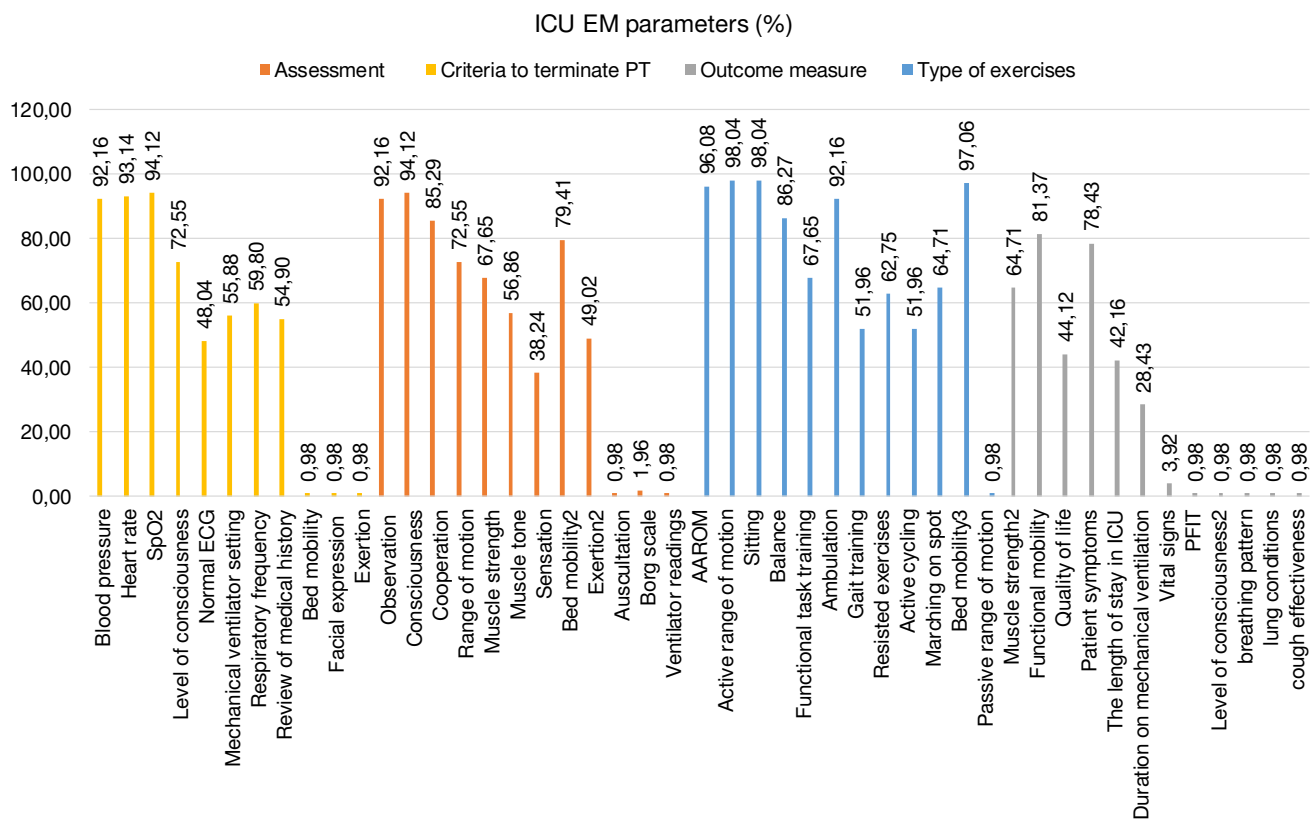
EM – early mobilization, ICU – intensive care unit

The criteria applied by physiotherapists in West Malaysia to decide on the patients' eligibility for EM are shown in Figure 2. The ICU EM parameters are summarized in Figure 3. Table 3 lists the factors that influenced the therapists' clinical decisions regarding EM.

Table 3. Factors that influenced therapists' clinical decision on EM

Factors	Count of respondents (n = 102)	Percentage (%)
Protocols or guidelines provided	74	72.55
Equipment provided for EM	60	58.82
Physical space	46	45.10
Assistance from other staff	66	64.71
Clinical experience in EM	64	62.75
Knowledge or training about EM	66	64.71
Safety concerns about EM	83	81.37
Patient's medical stability	86	84.31
Amount of sedation used in the patient	53	51.96
Catheter location	27	26.47
Patient body weight	39	38.24
Cognitive level	76	74.51
Endotracheal intubation	40	39.22
Psychological status	1	0.98

EM – early mobilization



PT – physiotherapy, SpO<sub>2</sub> – peripheral oxygen saturation, ECG – electrocardiography, AAROM – active assistive range of motion, PFIT – physical function intensive care unit test

Figure 3. Intensive care unit early mobilization parameters

## Discussion

To our knowledge, this is the first study in West Malaysia to assess the EM practice of physiotherapists in respiratory ICUs. Overall, 90.2% of the respondents reported that they practised EM in respiratory ICUs. When comparing these data with those from other developed and developing countries, the percentage seems to be high [12–20]. However, caution should be taken while interpreting the data. The data from developed countries are point prevalence study data which reflect the actual practice and also focus on out-of-bed mobilization. Nonetheless, there is a high possibility of response bias in this study as it involves data self-reported by physiotherapists. The definition of EM provided by physiotherapist in this study widely varies, from passive movements to out-of-bed mobility.

The Malaysian management protocols in ICU state that EM should be started 24–48 hours after ICU admission in the absence of contraindications. The program consists of progressive mobilization, with progression depending on a patient's functional capability and ability to tolerate the activity [23]. Nevertheless, only 46% of the respondents stated that they started the mobilization on the 1<sup>st</sup> or 2<sup>nd</sup> day. In Malaysia, physiotherapists depend on physicians' order to start EM and that could be a reason for the delay. However, the majority of physiotherapists provided EM twice daily, while the frequency in the literature is not clear [10].

Overall, 1/3 of the participants stated that they mobilized patients with ventilator support, which is a higher rate than that reported in the literature from developed countries [13, 24]. On the other hand, these data should be interpreted with caution, considering the meaning of EM in ICU and the response bias.

Most physiotherapists chose peripheral oxygen saturation (SpO<sub>2</sub>), blood pressure, heart rate, level of consciousness, review of medical history, and intracranial pressure as the eligibility criteria for EM, which is accordance with the reports from the previous systematic reviews and guidelines [6, 23, 25–28]. Contrarily, slightly more than half of the respondents selected positive end-expiratory pressure (PEEP), fraction of inspired oxygen (FiO<sub>2</sub>), electrocardiography (ECG), respiratory frequency, and temperature, which are very important criteria as per the guidelines [6, 23, 25–28]. Besides, physiotherapists only mobilized the patients under a physician's order as required for physiotherapy in Malaysia [29]. Hence, they might not know about certain factors as the decision is always on the part of the physician. More than 80% of the respondents chose the evidence-based range for eligibility criteria of EM provided in the questionnaires except for the heart rate, where only 77.89% selected the given range. Some subjects mentioned that they used the Glasgow Coma Scale instead of the Richmond Agitation-Sedation Scale, which is also supported by the literature [30].

For the criteria to terminate an EM session, most respondents chose important vital parameters like blood pressure [11, 23]. Nonetheless, less than 60% would take ECG, mechanical ventilator setting, respiratory frequency, and review of medical history into consideration to terminate their mobilization sessions. This may be unsafe as these are important parameters to prevent adverse events.

Consciousness, observation, cooperation, range of motion, and muscle strength were assessments performed by most physiotherapists before EM, which is in accordance with the available evidence and guidelines [25]. The foremost outcome measures used by physiotherapists in West Malaysia were functional mobility, patient symptoms, and

muscle strength, which is consistent with the literature reported [11]. Conversely, less than half of the participants chose quality of life and the length of ICU stay as their outcome measures, which are also important as per the reported literature [8, 11].

More than 90% of the physiotherapists claimed that they would perform active and active assisted range of motion, sitting, bed mobility, and ambulation in their practice of EM, which is higher than the reported values from developed and other developing countries [13, 16, 19, 20, 24]. Active cycling, which is widely implemented in ICU, is not commonly carried out in Malaysia [9]. It could be due to the limited equipment availability in West Malaysia ICUs as more than half of the physiotherapists stated that as the factor that affected their clinical decisions to perform EM. Besides, less practice of ambulation, marching on spot, resisted exercise, and active cycling may be attributed to patients' medical instability, the physiotherapists' experience and education as most of the physiotherapists in this survey were with 2–4 years of experience in ICU with diploma qualification. Also, this research particularly focused on respiratory patients whereas most studies assessed EM in ICU irrespective of diagnosis; this could be a reason for variation in practices.

Patients' medical stability, safety concerns about EM, cognitive level, and protocols or guidelines provided were the most reported factors influencing physiotherapists' clinical decisions on EM. Similarly, a survey from Canada reported that patient medical stability and no written guidelines or protocols were the major barrier to EM [12]. Even though Kementerian Kesihatan Malaysia and Malaysian Society of Intensive Care published a protocol on ICU patients management, its availability and knowledge among physiotherapists is not clear and there has been no update in the protocol since it was released in 2012 [23]. However, most of the physiotherapists' practice relates to the protocol. Also, private hospitals may follow different guidelines as per their hospital policy, which may also influence the physiotherapists' EM practice.

## Limitations

The main limitation of this research is the small sample size and unproportioned samples from each state of West Malaysia. The respondents were mainly from Selangor, Wilayah Persekutuan, and Negeri Sembilan, as time and funding were the major limitation to reach all the states personally. Hence, this survey result might not reflect the practice of EM in the entire West Malaysia. Even though the questionnaire presents details like ranges for each factor, the ranges were not discussed in the paper. A further point prevalence study to assess the EM implementation in ICU may give a better understanding of West Malaysian practice. Also, studies to assess the knowledge, perception, and barriers of EM in ICUs have to be carried out to address the difficulties in providing EM in West Malaysia.

## Conclusions

Most physiotherapists in the selected West Malaysian hospitals practise EM in ICUs for respiratory patients. However, there is a wide variation in their practice. Hence, further studies are required to assess the effectiveness, clinical reasoning behind the decisions, and outcomes of EM performed by physiotherapists in Malaysia.

## Disclosure statement

No author has any financial interest or received any financial benefit from this research.

## Conflict of interest

The authors state no conflict of interest.

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## Appendix

### Questionnaire

#### Demographic data

- Age:
  - Gender:
    - Male
    - Female
  - Working experience in adult ICU with respiratory disease patients:
    - Less than 2 years
    - 2–4 years
    - 5–7 years
    - 8–10 years
    - More than 10 years
  - Qualification level:
    - Diploma
    - Undergraduate
    - Master
    - Doctor level
- Other:
- In what hospital setting do you work now?
    - Private
    - Government
  - Which state do you work in?
    - Johor
    - Melaka
    - Negeri Sembilan
    - Selangor
    - Pahang
    - Penang
    - Perak
    - Kedah
    - Kelantan
    - Perlis
    - Terengganu

#### Practice pattern of early mobilization in respiratory disease patients in intensive care unit

- Do you practise early mobilization in ICU?
  - Yes
  - No
- If yes, what do you mean by early mobilization? .....
- When will you usually start early mobilization in respiratory disease patients depending on their day of admission?
  - 1<sup>st</sup>–2<sup>nd</sup>
  - 2<sup>nd</sup>–5<sup>th</sup>
  - 6<sup>th</sup>–8<sup>th</sup>
  - After 8 days
- How often will you treat the patients in ICU?
  - 1 time in more than 4 days
  - 1 time in 3 days
  - 1 time in 2 days
  - 1 time daily
  - 2 times daily
  - 3 times daily
  - Other:
- Select the respiratory disease conditions with which you practise early mobilization in ICU. (Please tick the boxes below, you can choose more than one option)
  - COPD
  - Pneumonia
  - Pleural effusion

- Asthma
  - Respiratory failure
  - Other:
- On the basis of which criteria do you decide on the patients' eligibility for early mobilization and what are the ranges? (Please tick the boxes below, you can choose more than one option. Please write the range if it differs from the criteria below)
- | Factors  | Range   |
|--|---|
| <input type="checkbox"/> Blood pressure            | <input type="checkbox"/> Criteria: mean arterial pressure: 60–110 mm Hg<br><input type="checkbox"/> .....   |
| <input type="checkbox"/> Heart rate                | <input type="checkbox"/> Criteria: 40–130 beats/min<br><input type="checkbox"/> .....   |
| <input type="checkbox"/> SpO <sub>2</sub>          | <input type="checkbox"/> Criteria: SpO <sub>2</sub> > 88% or SpO <sub>2</sub> > 90% with 4% oscillation<br><input type="checkbox"/> .....   |
| <input type="checkbox"/> Level of consciousness    | <input type="checkbox"/> Criteria: Richmond Agitation-Sedation Scale (RASS) score: –4, –5, 3, 4<br><input type="checkbox"/> .....   |
| <input type="checkbox"/> Normal ECG                | <input type="checkbox"/> Criteria: without evidence of heart attack or arrhythmia<br><input type="checkbox"/> .....   |
| <input type="checkbox"/> FiO <sub>2</sub>          | <input type="checkbox"/> Criteria: < 0.6<br><input type="checkbox"/> .....  |
| <input type="checkbox"/> PEEP                      | <input type="checkbox"/> Criteria: < 10 cm H <sub>2</sub> O<br><input type="checkbox"/> .....   |
| <input type="checkbox"/> Respiratory frequency     | <input type="checkbox"/> Criteria: < 40 breaths/min<br><input type="checkbox"/> .....   |
| <input type="checkbox"/> Temperature               | <input type="checkbox"/> Criteria: 36–38.5°<br><input type="checkbox"/> .....   |
| <input type="checkbox"/> Review of medical history | <input type="checkbox"/> Criteria: no recent complications or changes in cardiovascular or respiratory system and medication taken does not affect mobilization<br><input type="checkbox"/> ..... |
| <input type="checkbox"/> Intracranial pressure     | <input type="checkbox"/> Criteria: < 20 cm H <sub>2</sub> O<br><input type="checkbox"/> .....   |
- Other:

- On the basis of which criteria you decide to terminate a physiotherapy mobilization session? (Please tick the boxes below, you can choose more than one option. Please write the range if it differs from the criteria below)

- | Factors                                   | Range  |
|---|--|
| <input type="checkbox"/> Blood pressure   | <input type="checkbox"/> .....<br><input type="checkbox"/> Criteria:<br><input type="checkbox"/> SBP > 180 mm Hg<br><input type="checkbox"/> > 20% decrease in SPB/DBP; ortho-static hypotension<br><input type="checkbox"/> MAP < 65 mm Hg; > 110 mm Hg |
| <input type="checkbox"/> Heart rate       | <input type="checkbox"/> .....<br>Criteria:<br><input type="checkbox"/> > 70% APMHR<br><input type="checkbox"/> > 20% decrease in resting HR<br><input type="checkbox"/> < 40 beats/min; > 130 beats/min   |
| <input type="checkbox"/> SpO <sub>2</sub> | <input type="checkbox"/> .....<br>Criteria:<br><input type="checkbox"/> > 4% decrease<br><input type="checkbox"/> < 88–90%   |

- Level of consciousness .....  
 Criteria:  
 Patient sedation or coma: RASS  $\leq$  -3  
 Patient agitation requiring addition or escalation of sedative medication: RASS > 2  
 Patient c/o intolerable DOE  
 Patient refusal  
 .....
- Normal ECG  
 Criteria:  
 New onset dysrhythmia  
 .....
- Mechanical ventilator  
 Criteria:  
 FiO<sub>2</sub>  $\geq$  0.60  
 PEEP  $\geq$  10  
 Patient-ventilator asynchrony  
 MV mode change to assist-control  
 Tenuous airway  
 .....
- Respiratory frequency  
 Criteria:  
 5 breaths/min; > 40 breaths/min  
 .....
- Review of medical history  
 Criteria:  
 New anti-arrhythmia medication  
 New cardiac enzymes  
 Presence of vasopressor medication; new vasopressor or escalating dose of vasopressor medication
- Other:

8. Do you mobilize patients with ventilator support?  
 Yes  
 No
9. What type of assessment will you carry out in ICU patients before mobilization? (Please tick the boxes below, you can choose more than one option)  
 Observation (oedema, muscle atrophy, contracture, deformities, bed sores, decubitus, wound)  
 Consciousness  
 Cooperation  
 Range of motion  
 Muscle strength  
 Muscle tone  
 Sensation  
 Bed mobility  
 Exertion  
 Other:
10. In your practice, early mobilization in ICU in respiratory disease patients involves: (Please tick the boxes below, you can choose more than one option. Please tick the frequency of the exercises involved in your practice)

Exercise	Always	Usually	Some- times	Rarely	Never
<input type="checkbox"/> AAROM					
<input type="checkbox"/> AROM					
<input type="checkbox"/> Sitting					
<input type="checkbox"/> Balance					
<input type="checkbox"/> Functional task training					
<input type="checkbox"/> Ambulation					
<input type="checkbox"/> Gait training					
<input type="checkbox"/> Active cycling					
<input type="checkbox"/> Resisted exercises					
<input type="checkbox"/> Bed mobility					
<input type="checkbox"/> Marching on spot					
<input type="checkbox"/> Other:					

11. Please state the frequency, intensity, duration and type of early mobilization exercises that you practise, on the basis of the exercises that you selected in the question above (Please tick the boxes below, you can choose more than one option)

Exercise	Frequency	Intensity	Duration	Type (if applicable)
<input type="checkbox"/> AAROM				
<input type="checkbox"/> AROM				
<input type="checkbox"/> Sitting				
<input type="checkbox"/> Balance				
<input type="checkbox"/> Functional task training				
<input type="checkbox"/> Ambulation				
<input type="checkbox"/> Gait training				
<input type="checkbox"/> Active cycling				
<input type="checkbox"/> Resisted exercises				
<input type="checkbox"/> Bed mobility				
<input type="checkbox"/> Marching on spot				
<input type="checkbox"/> Other:				

12. What are the outcome measures you record after the treatment? (Please tick the boxes below, you can choose more than one option)  
 Muscle strength  
 Functional mobility  
 Quality of life  
 Patient symptoms  
 The length of ICU stay  
 Duration of mechanical ventilation  
 Other:
13. What are the factors that influence your clinical decision to perform early mobilization? (Please tick the boxes below, you can choose more than one option)  
 Protocols or guidelines provided  
 Equipment provided for early mobilization  
 Physical space  
 Assistance from other staff  
 Clinical experience in early mobilization  
 Knowledge or training about early mobilization  
 Safety concerns about early mobilization  
 Patient's medical stability  
 Amount of sedation used in the patient  
 Catheter location  
 Patient body weight  
 Cognitive level  
 Endotracheal intubation  
 Other:

The end  
 Thank you for participating in this survey!