

Current physiotherapy practice in Greek intensive care units: a national study

Anna Christakou, Athina Seitaridi, Euaggelia Koutsioumba, Souzanna Papaioannou, Arietta Spinou, Eirini Anaouni, Konstantinos Grigoriadis, Pasxalina Mpempeletsi, Eleni Rekliti & Eirini Patsaki

To cite this article: Anna Christakou, Athina Seitaridi, Euaggelia Koutsioumba, Souzanna Papaioannou, Arietta Spinou, Eirini Anaouni, Konstantinos Grigoriadis, Pasxalina Mpempeletsi, Eleni Rekliti & Eirini Patsaki (2018): Current physiotherapy practice in Greek intensive care units: a national study, European Journal of Physiotherapy

To link to this article: <https://doi.org/10.1080/21679169.2018.1523459>



Published online: 26 Oct 2018.



Submit your article to this journal



View Crossmark data



ORIGINAL ARTICLE

Current physiotherapy practice in Greek intensive care units: a national study

Anna Christakou^{a,b}, Athina Seitaridi^c, Euaggelia Koutsioumba^d, Souzanna Papaioannou^e, Arietta Spinou^f, Eirini Anaouni^g, Konstantinos Grigoriadis^{b,h}, Paschalina Mpempeletsiⁱ, Eleni Rekliti^j and Eirini Patsaki^{a,b}

^aFirst Critical Care Department, General Hospital "Evangelismos", University of Athens, Athens, Greece; ^bDepartment of Physiotherapy, University of Western Attica, Athens, Greece; ^cPediatric Private Physiotherapy Clinic, Athens, Greece; ^dGeneral University Hospital of Larisa, Larisa, Greece; ^eGeneral Ogkologiko Hospital of Kifissia, Athens, Greece; ^fHealth, Sports and Bioscience, University of East London, London, UK; ^gPrivate Hospital "Ygeia", Athens, Greece; ^hGeneral University Hospital of Attikon, Athens, Greece; ⁱGeneral University Hospital of Alexandroupoli, Alexandroupoli, Greece; ^jGeneral Hospital Nosematon Thorakos "Sotiria", Athens, Greece

ABSTRACT

Background: The purpose of the study was to investigate the responsibilities and frequency of clinical procedures that physiotherapists perform within the intensive care unit (ICU) in Greece, along with the level of education and training of these physiotherapists.

Methods: Physiotherapists who work in general ICUs of hospitals were invited to complete a developed questionnaire. The questionnaire consisted of 83 items, of closed and opened-ended format. Items for service provision and physiotherapists' employment were included, along with participants' involvement in respiratory care, early mobilisation and the use of the ICU equipment.

Results: One hundred forty physiotherapists completed the questionnaire. Seventy-three respondents (52%) reported working in ICU in Athens and 67 (48%) in other cities of Greece. Almost all the physiotherapists performed early mobilisation and respiratory techniques; although the frequency of procedures and use of equipment were variable. Sixty-one (44%) and 70 (50%) respondents participated in the weaning procedure and mobilised the patient whilst using the ventilator, respectively.

Conclusion: The physiotherapists are from ICUs all over Greece. The results reflect the differences among the procedures that physiotherapists perform, regarding early mobility and respiratory physiotherapy. The results indicate the need for a national up-to-date job description of the physiotherapy services in ICUs in Greece.

Abbreviations: CU: Intensive Care unit; MIP: Maximum Inspiratory Pressure; MEP: Maximum Expiratory Pressure; NIV: Non-Invasive Ventilation; V/Q: ventilation/perfusion ratio; PFIT: Physical Function ICU Test; FSS-ICU: Functional Status Scorefor the ICU; Cpax: Chelsea Critical Care Physical Assessment tool

ARTICLE HISTORY

Received 13 April 2018

Revised 30 August 2018

Accepted 8 September 2018

Published online 24 October 2018

KEYWORDS

Intensive care unit;
physiotherapy; respiratory;
mobilisation; exer-
cise; Greece

Introduction

The intensive care unit (ICU) is a special hospital department that provides intensive treatment and continuous monitoring of severe and life-threatening illnesses and injuries. Immobility, systemic inflammation, poor nutritional status, exposure to neuromuscular blocking agents and corticosteroids are some of the main factors of critical illness involved in the ICU-acquired weakness [1,2]. Bed rest has significant and deleterious physiologic contribution to clinical presentations including atelectasis, pneumonia, joint contractures, thromboembolic disease and insulin resistance [3]. However, the evolution of intensive care medicine combined with the close collaboration of the multidisciplinary team has led to an increase in the number of surviving patients.

Physiotherapy is an integral part of the multidisciplinary team and the increased use of physiotherapy services in the ICU has been recommended [4]. The role of physiotherapists includes detailed assessment, formulating treatment goals

and applying the appropriate physiotherapy techniques. Physiotherapists are particularly involved in the patient's respiratory care and early mobilisation [5–9]. They play an important role in the prevention and treatment of complications coming from the respiratory system, ICU-acquired weakness and functional impairments [10]. Physiotherapy management involves the use of respiratory techniques, such as bronchial hygiene and suction of airway secretions, lung expansion, positioning of the patient, mobilisation and respiratory muscle training [11,12]. Moreover, providing physiotherapy to patients in the ICU could reduce the duration of mechanical ventilation, facilitate weaning, improve functional independence at hospital discharge [8] and contribute to the patient's overall well-being [9,13,14].

European and Australian physiotherapists in ICUs reported that their primary responsibility was to perform respiratory physiotherapy, including airway clearance techniques, postural drainage and weaning from mechanical ventilation [4]. Variations in practice and differences in staffing and training

between countries and regions exist in ICUs all over the world [15,16]. Therefore, there is a need to develop a better understanding of the role of physiotherapists in European ICUs, by defining and standardising the role and the tasks of physiotherapists across Europe [4].

Despite the evidence suggesting that physiotherapy may be beneficial in the care of critical illness, the role of physiotherapy in Greek ICUs remains ambiguous. Currently, the Health Care Professions Council in Greece does not report whether physiotherapists are allowed to perform a variety of procedures in the ICU. The role of Greek physiotherapists in the adjustment of mechanical ventilation, supervision of weaning from mechanical ventilation, extubation, implementation and supervision of non-invasive mechanical ventilation (NIV), techniques of early mobilisation on intubated patients, and other important aspects are still unclear. Evidence about the pragmatic extent and frequency of Greek physiotherapists' involvement in ICU clinical procedures are scattered. A Greek study by Grammatopoulou et al. [17] reported that all physiotherapists ($n=103$) conducted airway clearance techniques and progressive mobilisation, specifically 89% of physiotherapists were involved in the extubating process, 99% of them performed exercises of passive and active range of motion, and 59% of them mobilised patients (walking). However, the questionnaire used in this study had few questions regarding the main physiotherapy services provision. There is a lack of research exploring the physiotherapy procedures currently conducted in ICU settings. The procedures that take place in the ICU are not only a question of theoretical importance but also one of high clinical relevance. This knowledge could help Greek physiotherapists promote the clinical application, recognition, research and education of ICU physiotherapy according to international guidelines. The purposes of the present study were to examine Greek physiotherapists' self-reported provision of services, specific procedures, clinical duties and their frequency of performance in ICU; thus to provide an up-to-date description of the current ICU physiotherapy work in Greece.

Methods

Sample and setting

Participants were recruited from January to May 2015. Hospitals with ICU were identified using the Greek ICU Society's database; all Greek cities were included. Named physiotherapists working in the ICUs were identified from the Pan-Hellenic Physiotherapists' Association and recruited via email and telephone communication. In order for the participants to be included in the study, they had to have at least three months of working experience within a hospital ICU. One questionnaire, a participant information leaflet and a consent form, were distributed to each participant via email and/or post. The corresponding period was set at three months, and reminders were used as appropriate. The respondents were not required to complete any personal data such as sex, age, education level. All participants provided a written informed consent and data were kept confidentially at all times. The study was approved by the

Research Ethics Committee of the Pan-Hellenic Physiotherapists' Association.

The Pan-Hellenic Physiotherapists' Association is the principal membership organisation which safeguards, represents and promotes the profession of physiotherapy in Greece. In 2014, it established the Scientific Section of Cardiovascular and Respiratory Physiotherapy-Rehabilitation, which aims to promote the development, application, education and research of cardiovascular, pulmonary and ICU physiotherapy practice. For this reason, the Scientific Section of Cardiovascular and Respiratory Physiotherapy-Rehabilitation has published two studies regarding the role of physiotherapy in the ICU in Greek Journals [18,19]. For the purposes of the present study, five experienced ICU physiotherapists developed a new questionnaire. The item generation was based on: (a) recommendations of European Respiratory Society and European Society of Intensive Medicine Task Force on physiotherapy for critically ill patients [9], (b) basic requirements for ICUs [20] and (c) a literature review identifying relevant questionnaires and systematic reviews [21]. Consequently, a panel of six experts (1 physician and 5 experienced physiotherapists in the ICU) examined the content validity of the questionnaire and a pilot study was conducted. In the pilot, a sample of five different physiotherapists who work in the ICUs were asked to identify any unclear items, grammatical and syntax modifications or other changes required. Minor amendments were made and the panellists reached consensus on the final version of the questionnaire ([Supplementary Material](#)).

Data collection

The questionnaire consisted of 83 closed and opened-ended short-form questions. It included data about the hospital, such as the name of the ICU, the working rotation basis, the shifts and services, the number of beds and experience in ICUs, and the type of physiotherapists' employment. It also examined the participants' involvement in respiratory care, early mobilisation and the usage of appropriate equipment. Responses involved: 'yes', 'no', 'I can't answer' and if the answer was 'yes', then the following question was about the frequency of performance, using a 6-point Likert scale: 1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = almost always and 6 = always.

With regards to specific clinical procedures, 18 of the questions referred to suctioning and the frequency of performing procedures such as: 'Have you been asked to perform suction of bronchial secretions of patients using artificial airways?' 'Have you been asked to do all of the performed suctions for tracheal or nasopharyngeal non-intubated patients?'. Four questions were about nebulisation (for humidification and for bronchodilators) and the frequency of using it. For example, 'Have you been asked to use specific equipment for humidification therapy?'. Thirteen questions were about the weaning process and the frequency of physiotherapists taking part in it. For example, 'Do you know the process of weaning from your patient's ventilator?', 'Do you know the measurements that are required by this weaning

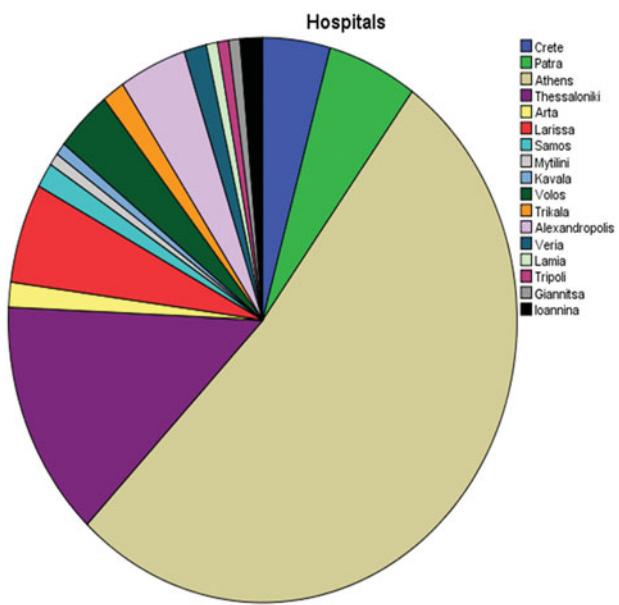


Figure 1. Pie chart presenting the number of questionnaire respondents per city, Greece.

protocol from the ventilator?'. Eighteen questions were about the mobilisation of the patient. For example, 'Have you been asked to mobilise your patients out of bed to the chair?', 'Have you been asked to help the mobilisation of a patient on mechanical ventilation?'. Seven questions referred to following clinical guidelines and the frequency of using them, such as 'Do you know the guidelines of early mobilisation?', 'Do you follow a particular method of assessment of mobility/functional status of your ICU patients?'. Also, the questionnaire contained: (a) seven questions about the operation of humidification equipment, (b) five questions about their knowledge on using the ventilator, (c) five questions about non-invasive mechanical ventilation, (d) two questions about postural drainage, (e) two questions about the usage of ankle dorsiflexion splints, (f) four questions about deep venous thrombosis, (g) one question about ventilator-associated pneumonia, (h) three questions about professional development, (i) two questions about respiratory care, and (j) two questions about the participation of physiotherapists in recommending hospital supplies (*Supplementary Material*). The Statistical Package for Social Sciences (SPSS, Version 24, IBM Inc.; Armonk, NY) was used for descriptive and frequency analysis, firstly to examine the frequency of each physiotherapy procedure for all respondents, and secondly to investigate the frequency of performing physiotherapy procedures of those physiotherapists who permanently worked in ICU vs. those working in ICU occasionally.

Results

The ICUs in public hospitals provided responses, 19 located in Athens, eight in Thessaloniki, four in Crete, three in Patra, one in Larissa, one in Tripoli, one in Volos, one in Lamia, one in Ioannina, one in Alexandropolis, one in Trikala, one in Kavala, one in Giannitsa, one in Veria, one in Mytilini, one in Samos and one in Arta (**Figure 1**). One-hundred and fifty

Table 1. Frequencies of the physiotherapists' characteristics of the ICU (f).

| | F | % |
|------------------------------------|----|------|
| ICU work | | |
| Frequent | 42 | 30.0 |
| Permanent | 30 | 21.4 |
| ICU rotation | | |
| Yes | 79 | 56.4 |
| No | 57 | 40.7 |
| PT/day | | |
| 1 | 56 | 40.0 |
| 2 | 37 | 26.4 |
| 3 | 25 | 17.9 |
| Afternoon shifts | | |
| Yes | 58 | 41.4 |
| No | 41 | 29.3 |
| Public holiday | | |
| Yes | 98 | 70.3 |
| No | 41 | 29.3 |
| ICU PT referral from the physician | | |
| Yes | 47 | 33.6 |
| No | 90 | 64.3 |
| Training/duration | | |
| Yes | 83 | 59.3 |
| No | 53 | 37.9 |
| Duration of training | | |
| 1 month | 30 | 21.4 |
| 2 months | 11 | 7.9 |
| 3 months | 9 | 6.4 |
| 1 week | 8 | 5.7 |
| Method of training | | |
| Colleague | 52 | 37.1 |
| Alone | 9 | 6.4 |
| Colleague & alone | 23 | 16.4 |

PT: physiotherapist; ICU: Intensive Care Unit; PT/day: the number of physiotherapists who work daily in the ICU.

volunteered physiotherapists participated in the study. Data from 10 physiotherapists were removed due to incomplete information or failure in sending back the questionnaires. Complete responses were given from 140 physiotherapists working in 39 ICUs. Seventy-three respondents (52.0%) reported working in ICUs in Athens and 67 (48.0%) in other Greek cities. Thirty respondents (21.0%) were exclusively working in the ICU and 109 (78.0%) were working in this setting on a rotational basis. Although the physiotherapists were working on a rotation basis in the ICU, some of the respondents worked exclusively in the ICU at the time of responding. Fifty-six respondents (40.0%) reported that only one physiotherapist works daily in their ICU, and noted that ICU capacity ranged from 4 to 40 beds. Ninety respondents (64.3%) did not work with a referral from the physician. Eighty-three respondents (59.3%) reported that they receive relevant training before entering the ICU and 52 (37.1%) received internal training from a colleague (**Table 1**).

Respiratory physiotherapy

The involvement of the ICU physiotherapists in respiratory care is presented in **Table 2**. Also, we report frequencies of the physiotherapy procedures of those who work permanently in ICU vs. those who work occasionally in this setting. With respect to the performance of specific procedures, 60 respondents (42.8%) always used postural drainage positions on the bed to facilitate airway clearance, but only 40 respondents (28.6%) always performed suctioning after

Table 2. Frequencies of the physiotherapy services in respiratory care.

| Physiotherapy services | f | % |
|--|-----|------|
| Suctioning from endotracheal tube/tracheostomy | | |
| Never | 31 | 22.1 |
| Always | 45 | 32.1 |
| Often | 16 | 11.4 |
| Suctioning from mouth /nose | | |
| Never | 53 | 37.9 |
| Always | 13 | 9.3 |
| Often | 13 | 9.3 |
| Suctioning following respiratory care | | |
| Yes | 88 | 62.9 |
| No | 52 | 37.1 |
| Always | 40 | 28.6 |
| Never | 36 | 25.7 |
| Almost always | 20 | 14.3 |
| Cultivation of bronchial secretions | | |
| Never | 68 | 48.6 |
| Always | 24 | 17.1 |
| Use of physiological saline on suctioning | | |
| Never | 51 | 36.4 |
| Often | 27 | 19.3 |
| Always | 13 | 9.3 |
| Mask of oxygen therapy | | |
| Never | 71 | 50.7 |
| Often | 24 | 17.1 |
| Always | 8 | 5.7 |
| Nebulizer for humidification | | |
| Never | 88 | 62.9 |
| Often | 17 | 12.1 |
| Always | 4 | 2.9 |
| Administer bronchodilators | | |
| Never | 103 | 73.6 |
| Rare | 16 | 11.4 |
| Always | 1 | 0.7 |
| Assess MIP/MEP | | |
| Never | 112 | 80 |
| Always | 1 | 0.7 |
| Participate in weaning procedure | | |
| Never | 64 | 45.7 |
| Often | 22 | 15.7 |
| Always | 6 | 4.3 |
| Modulate ventilator's settings | | |
| Never | 118 | 84.3 |
| Rare | 8 | 5.7 |
| Always | 1 | 0.7 |
| NIV | | |
| Never | 94 | 67.1 |
| Rare | 19 | 13.6 |
| Often | 13 | 9.3 |
| Always | 1 | 0.7 |
| Guidelines for prevention of VAP | | |
| Yes | 48 | 34.3 |
| No | 82 | 58.6 |

MIP: Maximal Inspiratory Pressure; MEP: Maximal Expiratory Pressure; NIV: Non Invasive Ventilation; VAP: Ventilator - Associated Pneumonia.

respiratory physiotherapy. In particular, 13 respondents (43.3%) who work permanently in the ICU reported that they always used drainage positions on the bed in comparison with only four respondents (13.3%) of those who work sometimes in the ICU. Fourteen respondents (46.7%), who work permanently in the ICU reported that they always performed suctioning after respiratory physiotherapy in contrast to five respondents (17.2%) who work sometimes in the ICU. Sixty-eight respondents (48.6%) never performed bronchial secretion clearance to patients using artificial airway (endotracheal tube or tracheostomy tube) in order to perform cultivation of bronchial secretions. Nine respondents (30.0%) who work permanently in the ICU reported that they always used cultivation of bronchial secretions in contrast to only three

respondents (10.3%) who sometimes work in the ICU. Seventy-one respondents (50.7%) never applied oxygen masks as a therapy to patients, i.e. venture mask, tracheostomy mask, t-piece connection, etc., more specifically, six respondents (20.0%) of those who work permanently in the ICU in contrast to one respondent (3.4%) who works sometimes in the ICU. Also, 88 (62.9%) and 103 (73.6%) respondents did not use humidification to enable mobilisation of thick secretions, nebulisers with bronchodilators, respectively. One-hundred and three respondents (73.6%) were unaware of the terms maximum inspiratory and expiratory pressure (MIP, MEP; respectively). Seven (23.3%) and one respondent (3.3%), who work permanently in the ICU, reported that they are able to assess MIP/MEP sometimes and always, respectively. On the contrary, 23 (79.3%) and three respondents (10.3%) who work sometimes in the ICU, never or rarely performed this procedure, respectively. Seventy-nine respondents (56.4%) did not know what the weaning procedure was. Only nine respondents (30.0%) who work permanently in the ICU reported that they had never participated in the weaning procedure in comparison to 16 respondents (55.2%) who had sometimes worked in ICU. Fifty-eight respondents (41.4%) reported that there was no specific protocol at their hospital about the process of weaning from the ventilator and 85 respondents (60.7%) did not know the measurements that are required by this 'weaning protocol'. Only 51 respondents (36.4%) knew a little regarding the function of ventilators. Also, only 15 respondents (50.0%) who work permanently in the ICU reported that they never used NIV in comparison with 21 respondents (72.4%) who worked sometimes in the ICU. Eighty-two respondents (58.6%) did not know the guidelines for the prevention of ventilator-associated pneumonia (VAP). In particular, 14 respondents (46.9%) who work permanently in the ICU knew the guidelines of prevention of VAP in contrast to two respondents (6.9%) who work sometimes in the ICU. One-hundred-one respondents (72.1%) reported that they never set up or change settings on the humidification and heating filter which is connected to the ventilator.

Musculoskeletal physiotherapy

The involvement of the ICU physiotherapists in early mobilisation is presented in **Table 3**. Also, we reported the frequencies of physiotherapy procedures of those who permanently work in the ICU in contrast with those who work occasionally in this setting. Seventy respondents (50.0%) knew the mobilisation guidelines, but only 27 (19.0%) reported using them often. In particular, 17 (56.7%) and eight (26.7%) respondents, who work permanently in the ICU, they knew the guidelines of early mobilisation and never followed them, in contrast to six (20.7%) and 14 (48.3%) respondents who work sometimes in the ICU, respectively. Fifty-six respondents (40.0%) did not use a valid scale (in Greek) or a standardised questionnaire to assess patient's functional ability. Twelve respondents (40.0%) who work permanently in the ICU reported that they always used an evaluating method of functional ability in comparison

Table 3. Frequencies of the physiotherapy services involved in mobilisation.

| Physiotherapy services | f | % |
|---|----|------|
| Guidelines of early mobilisation | | |
| Never | 51 | 36.4 |
| Often | 27 | 19.3 |
| Almost always | 25 | 17.9 |
| Evaluating method of functional ability | | |
| Never | 56 | 40.0 |
| Often | 18 | 12.9 |
| Almost always | 20 | 14.3 |
| Sit over the edge of the bed | | |
| Often | 45 | 32.1 |
| Sometimes | 26 | 18.6 |
| Almost always | 15 | 10.7 |
| Walk with ventilator | | |
| Never | 70 | 50.0 |
| Rare | 27 | 19.3 |
| Sometimes | 13 | 9.3 |
| Often | 13 | 9.3 |
| Walk with tracheostomy mask | | |
| Never | 65 | 46.4 |
| Sometimes | 22 | 15.7 |
| Rare | 20 | 14.3 |
| Often | 14 | 10.0 |
| Use of compression stockings | | |
| Never | 39 | 27.9 |
| Often | 33 | 23.6 |
| Sometimes | 20 | 14.3 |
| Always almost | 20 | 4.3 |
| Use of intermittent compression devices | | |
| Never | 91 | 65.0 |
| Often | 17 | 12.1 |
| Sometimes | 10 | 7.1 |

with only one respondent (3.4%) who sometimes worked in the ICU. Twenty respondents (67.4%), who work permanently in the ICU, sat the patient over the edge of the bed always and often, in contrast to 9 respondents (31.0%) who sometimes work in ICU and sometimes performed this procedure. Also, only eight respondents (26.7%) who work permanently in the ICU reported that they never walked a patient with tracheostomy mask in comparison with 16 respondents (55.2%) who worked sometimes in the ICU. Forty-five respondents (32.0%) often put over-the-counter ankle-foot orthoses to promote ankle dorsiflexion to their patients and ten respondents (33.3%) who permanently work in the ICU always put orthoses, in contrast to two respondents (6.9%) who sometimes work in the ICU. Ninety-six respondents (68.6%) were informed about professional updates in ICU physiotherapy from abroad; particularly, 27 respondents (90.0%) who work permanently in the ICU in contrast to 11 respondents (37.9%) who work sometimes in the ICU.

Discussion

The purpose of the present study was to investigate the physiotherapy procedures in Greek ICUs in order to reflect the current job description of the ICU physiotherapist. According to the results, 21% of the physiotherapists are working exclusively in the ICU, whereas in Europe 75% of the ICUs have physiotherapists exclusively working in this setting [4]. The physiotherapists who work in a Greek ICU perform both early mobilisation and respiratory physiotherapy techniques. Our results show that only 29% of the physiotherapists perform airway suctioning after respiratory

physiotherapy, when the international guidelines mention that airway suctioning may assist secretion clearance and oxygenation, and may improve alveolar recruitment and ventilation to perfusion (V/Q) matching [9]. Although Denehy and Berney [22] reported that ICU physiotherapists may use ventilator hyperinflation or non-invasive mechanical ventilation, the majority of Greek physiotherapists do not make use of it. Also, we showed that the majority of physiotherapists did not know what MIP and MEP were and they had never participated in weaning procedures. These results are in contrast to the findings from other countries [5,14]. The potential role of physiotherapy in the weaning procedure includes techniques such as cough assistance, respiratory muscular training, examining MEP, possible use of NIV, etc., that are based on expertise and knowledge.

Regarding the musculoskeletal physiotherapy, almost all participants reported performing passive or assisted kinesiotherapy in bed. These results are in agreement with the guidelines by Gosselink et al. [9], which recommend active or passive mobilisation to be used for preserving joint mobility and skeletal muscle atrophy in patients unable to move spontaneously. However, only 32% of physiotherapists mobilise their patients to the sitting position over the edge of the bed. Also, 50% and 46% of physiotherapists never walked patients with tracheostomy/endotracheal tube connected to mechanical ventilation or with high-flow oxygen systems, respectively. Our results are in agreement with the percentage of patients that were mobilised while on mechanical ventilation in Germany [16]. However, 40% of respondents do not use a specific Greek valid scale or questionnaire to assess functional ability. Christakou et al. [23] have previously reported that the use of functional outcome measures is necessary to assess and improve the functional ability of a patient. Functional assessment as an outcome measure is crucial for choosing the best rehabilitation scheme and its evaluation. Currently, in Greece there are only a few culturally validated scales, such as the Barthel Index and the Functional Independence Measure, and further investigations should focus on cross-cultural validation in the Greek population, of instruments such as Physical Function ICU Test (PFIT), Functional Status Score for the ICU (FSS-ICU), and Chelsea Critical Care Physical Assessment tool (CPax).

Furthermore, we showed that those who permanently work in ICU settings perform physiotherapy procedures in respiratory and musculoskeletal care more frequently than those who work occasionally in the ICU. A possible explanation for this is that those who permanently work in the ICU obtain relevant experience, update their knowledge and show higher confidence. More research should be conducted to investigate any differences in ICU physiotherapy services related to physiotherapist's sex and years of working in the ICU.

In Europe, 12% of the respondents reported that physiotherapists play an active role in the adjustment of mechanical ventilation, 22% in weaning from the mechanical ventilation, 25% in the extubation procedure and 46% in the

implementation of non-invasive mechanical ventilation [4]. Similarly to our study, physiotherapists in Sweden, Netherlands and Switzerland are rarely involved in the weaning of the patients from mechanical ventilation [4]. On the contrary, more than 50% of physiotherapists in Belgium and Portugal participated in weaning procedures [4]. In Germany, larger proportions of patients were mobilised out of bed in community hospitals than in university and university-affiliated hospitals [24]. Our study involved both community and university hospitals. Australian physiotherapists were more involved in exercise rehabilitation than in respiratory physiotherapy [25]. Canadian physiotherapists reported ambulation as an intervention 56% of the time [26]. Malone et al. [15] showed that 2.320 physiotherapists, who worked in academic hospitals in the USA, believed that they were more likely to be involved in the care of patients and were more likely to perform higher intensity mobilisation, such as transfers out of bed and ambulation, than those who worked in community hospitals.

In order to be in harmony with the rest of the European countries, Greek authorities should update their legislation with regards to the physiotherapy services in the ICU. Significantly, current legal and occupational rights and obligations applied to Greek physiotherapists obstruct the performance of specific procedures, such as suctioning. Also, it is necessary to increase the staff number of physiotherapists in hospital ICUs, in order to offer high-quality physiotherapy services. For example, the National Institute for Health and Care Excellence in Great Britain points out that the suggested staffing levels are one physiotherapist to four ICU beds. In Greece, most hospitals provide staffing of one physiotherapist to 20 ICU beds.

There are several strengths and limitations to our study. This is the first complete and up-to-date recording of the role of physiotherapists in Greek ICUs. Our questionnaire included a variety of items regarding the physiotherapy procedures in the ICU and the service setting and provision. It is important to stress that the Greek ICU physiotherapy services may vary greatly between units of different hospitals in the same country due to the educational level of the staff, training, expertise, and the type of the ICU (academic, public or private). The level of education of physiotherapists working in the ICU should also be investigated, as according to the European report of Norrenberg and Vincent [4], 43% of the ICU physiotherapists have a Master's degree in respiratory therapy and 29% in ICU therapy and 72% of the ICU physiotherapists attend relevant seminars. Public hospitals were included in our study and further research in Greece should examine any differences in the physiotherapy services between university, public and private hospital ICUs. Future research is needed to investigate physiotherapy services in private hospitals and rehabilitation centres with high dependency units. Additionally, although our sample was large, the number of respondents from each ICU was unequal. Additional research should investigate demographic influences on the provided physiotherapy services, such as sex, age and training.

The clinical practice seems to vary across countries and this study can inform physiotherapists for the procedures and services currently provided in Greece. It is of high importance to identify the appropriate procedures regarding our profession and support continuous professional development, aiming at the ultimate improvement of patient outcomes. The Scientific Section of Cardiovascular and Respiratory Physiotherapy-Rehabilitation of the Pan-Hellenic Physiotherapists' Association aims to promote the physiotherapy ICU clinical practice and training with clinical workshops, seminars and other educational activities.

Disclosure statement

No potential conflict of interest was reported by the authors.

References

- [1] Gosselink R, Clerckx B, Robbeets C. Physiotherapy in the Intensive Care Unit. *J Crit Care*. 2011;15:125–132.
- [2] Schweickert WD, Hall J. ICU-acquired weakness. *Chest*. 2007;131: 1541–1549.
- [3] Brower RG. Consequences of bed rest. *Crit Care Med*. 2009;37: S422–S428.
- [4] Norrenberg M, Vincent JL. A profile of European intensive care unit physiotherapists. *Intensive Care Med*. 2000;26:988–994.
- [5] Ambrosino N, Janah N, Vagheggi G. Physiotherapy in critically ill patients. *Rev Port Pneumol*. 2011;17:283–288.
- [6] Bissett MB, Leditschke IA, Neeman T, et al. Inspiratory muscle training to enhance recovery from mechanical ventilation: a randomized trial. *Thorax*. 2016;71:812–819.
- [7] Elkins M, Dentice R. Inspiratory muscle training facilitates weaning from mechanical ventilation among patients in the intensive care unit: a systematic review. *J Physiotherapy*. 2015;61:125–134.
- [8] Hodgson LC, Tipping JC. Physiotherapy management of intensive care unit-acquired weakness. *J Physiother*. 2017;63:4–10.
- [9] Gosselink R, Bott J, Johnson M, et al. Physiotherapy for adult patients with critical illness: recommendations of the European Respiratory Society and European Society of Intensive Care Medicine Task Force on Physiotherapy for Critically ill Patients. *Intensive Care Med*. 2008;34:1188–1199.
- [10] Gosselink R, Langer D. Recovery from ICU-acquired weakness do not forget the respiratory muscles!. *Thorax*. 2016;71:779–780.
- [11] Castro AAM, Calil SR, Freitas ABO, et al. Chest physiotherapy effectiveness to reduce hospitalization and mechanical ventilation length of stay, pulmonary infection rate and mortality in ICU patients. *Respiratory Med*. 2013;107:68–74.
- [12] Castro-Avila AC, Serón P, Fan E, et al. Effect of early rehabilitation during intensive care unit stay on functional status: systematic review and meta-analysis. *PLoS One*. 2015;10:e0130722.
- [13] Sommers J, Engelbert RHH, Detting-Ihnenfeld D, et al. Physiotherapy in the intensive care unit: an evidence – based, expert driven, practical statement and rehabilitation recommendations. *Clin Rehabil*. 2015;29:1051–1063.
- [14] Stiller K. Physiotherapy in intensive care: an updated systematic review. *Chest*. 2013;144:825–847.
- [15] Malone D, Ridgeway K, Nordon – Craft A, et al. Physical therapist practice in the intensive care unit: results of a national survey. *Phys Ther*. 2015;95:1335–1344.
- [16] Bakr RN, McWilliams D, Wiebe DJ, et al. Variations in practice and differences in staffing and training between countries and regions exist in ICUs all over the world. *Annals Ats*. 2016;13: 1527–1537.
- [17] Grammatopoulou E, Charmpas TN, Strati EG, et al. The scope of physiotherapy services provided in public ICUs in Greece: a pilot study. *Physiother Theory Pract*. 2017;32:138–146.

- [18] Christakou A, Grigoriadis K, Zampkara N, et al. Translation to Greek language physiotherapy for adult patients the critical illness. Recommendations of the European Respiratory Society and European Society of Intensive Care Medicine Task Force on Physiotherapy for critically ill patients. *Physiotherapy*. 2015;8: 14–49.
- [19] Mpempeletsi P, Christakou A, Patsaki I, et al. Physiotherapy in the intensive care unit. *Pneumon*. 2015;28:352–362.
- [20] Valentin A, Ferdinand P. ESICM working group on quality improvement recommendations on basic requirements for intensive care units: structural and organizational aspects. *Intensive Care Med*. 2011;37:1575–1587.
- [21] do Nascimento JP, Módolo NS, Andrade S, et al. Incentive spirometry for prevention of postoperative pulmonary complications in upper abdominal surgery. *Cochrane Database Syst Rev*. 2014;2: CD006058.
- [22] Denehy L, Berney S. Physiotherapy in the intensive care unit. *Phys Ther*. 2006;11:49–56.
- [23] Christakou A, Papadopoulos E, Patsaki I. Functional assessment scales in a general intensive care unit. A review. *Hospital Chron*. 2013;8:159–166.
- [24] Nydahl P, Ruhl AP, Bartoszek G, et al. Early mobilization of mechanically ventilated patients: a 1-day point-prevalence study. In Germany. *Crit Care Med*. 2014;42:1178–1186.
- [25] Berney S, Haines K, Denehy L. Physiotherapy in critical care in Australia. *Cardiopulm Phys Ther J*. 2012;23:19–25.
- [26] King J, Crowe J. Mobilization practices in Canadian critical care units. *Physiother Can*. 1998;50:206–211.