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COMMENT

Rehabilitation and physiotherapists in the critical care medicine

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The rehabilitation process is effective care with physical approach for several highly prevalent clinical conditions with associated disability, estimating that over 2 billion people worldwide would benefit from it.¹ Examinations performed in ICU survivors after severe acute respiratory failure have clearly demonstrated that exercise performance and cognitive status might result in impairment up to 5-years later, the patients having higher complex needs which may incur greater health-care costs.² The demographic shift together with economic constraints urge reassessment of the trajectory of care for old or very old critically ill patients.³ Moreover, intermediate unit and specialized respiratory intensive care units have been consequently implemented to assist very disabled patients under prolonged weaning and with tracheostomy.⁴

Indeed, as also shown by the recent COVID-19 pandemic,⁵ the goal of the ICU care is not only to avoid immediate death, but also to maintain an acceptable functional autonomy in survivors both after discharge and in the long term.

Since immobilization and subsequent muscle weakness are among the principal causes and consequences of critical

illness, and therefore indication for early (day-1) rehabilitation has been discussed,⁶ a step-by-step mobility protocol has been tested as feasible and safe in patients admitted to ICU, in order to promote an earlier recovery and discharge.⁷

The first randomized controlled trial conducted in 104 sedated patients when mechanically ventilated in ICU demonstrated that a strategy for whole-body rehabilitation was safe and associated with less delirium and more ventilator-free days at 1 month compared with controls under standard therapy.⁸ In addition, the rate of patients returning to independent functional status (i.e. ability to perform six activities of daily living and to walk independently) at hospital discharge was higher in the intervention group (59%) compared with controls (35%).⁸ Other single-center⁹ and multi-center¹⁰ studies conducted in a similar setting did not confirm the results in terms of increased survival and reduced disability when compared with standard care. However, programs and outcomes were not fully comparable throughout these trials to derive firm conclusions on the true role of early physical therapy.

Overall, the accumulated evidence to date has suggested that physical rehabilitation in the ICU improves function and reduces ICU and hospital length of stay but it does not appear to impact other stronger outcomes.¹¹

Very recently, a systematic review including 15 trials from 2073 participants and comparing active mobilization versus

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usual care in critically ill adults concluded that early physiotherapy did not have an adverse effect on days living nor physical function from leaving hospital to 6-month later; in particular, authors reported a 95% probability that the intervention improved an individual's physical function, as well as a 75% probability that increased days alive after discharge.¹² More interestingly, the same authors were then able to show, by systematically reviewing 67 trials from 7004 ICU patients, that implementation of mobilization was associated with less than 3% chance of adverse events with no increased risk of mortality.¹³ This should definitively reassure clinicians and health care professional in the critical care area about safety when performing an early rehabilitative approach.

Intensive and critical care more often requires a global approach to patients. However, in only a few countries do national documents guide recommendations on the staffing levels in ICU, including allied health professionals such as therapists, psychologist, and dieticians. More frequently, there are no guidelines on how to structure the staffing levels in critical care areas; for example, in countries such as Australia and New Zealand.¹⁴ In UK, physiotherapists are provided most frequently, while other specialists of core therapies such as occupational therapists and psychologists are still under-represented in the ICU multi-professional staff.¹⁵ As a whole, higher staffing ratios are associated with higher levels of satisfaction in completing professional roles and responsibilities.¹⁴

Saying that the physical approach in the critical care area may provide measurable benefits to patients and produces no major adverse events even in the long term,^{12,13} physiotherapists play a key role in delivering appropriate care therapies to patients admitted with acquired and/or increased disability following acute episodes.

Early in the new millennium, a study conducted in 17 western European countries reported that almost 25% of ICUs surveyed had no exclusive physiotherapists working in the allocated staff, with substantial differences across countries¹⁶; unlike North America. In more recent years, exclusive dedication of physiotherapists in ICU is still reported as insufficient in the same world area.¹⁷ In Switzerland 50% of surveyed ICU reported having a specialized physiotherapy team regularly using a rehabilitation approach with early mobilization protocols.¹⁸

So far, one additional problem in Europe may depend on the lack of a common educational profile of physios employed in the critical care area across different countries.¹⁹ These professionals, indeed, are still marginally involved in the implementation of more modern practices such as noninvasive ventilation to treat acute respiratory failure or to assist the intubation/extubation process in ICU.¹⁶

However, European Respiratory Society (ERS) and European Society of Intensive Care Medicine (ESICM) jointly published recommendations for optimal practices for physios treating critically ill adults both in terms of respiratory and physical early approach.²⁰

More recently, evidence-base recommendations of a safe assessment and intervention strategies for physiotherapists in ICU have been developed to guide frequency, intensity, type, and time of intervention in northern European countries.²¹

The academic programs leading to the bachelor's degree in physiotherapy also diverge in different countries worldwide and generally mainly focus on the assessment and treatment of musculoskeletal and neurological diseases, rather than address the acquisition of round-the-clock skills to manage disabilities whenever they occur in human beings. However, minimum clinical standards to practice as autonomous physiotherapists in ICU have been established with substantial agreement in very different contexts.²²⁻²⁶ At present, the ERS-HERMES (Harmonised Education and Training in Respiratory Medicine for European Specialists) exist as a specific post-graduate program of education and training aimed at developing advanced skills and knowledge for physiotherapists working in the clinical area of cardiorespiratory disorders and critical care.²⁷ The exact percentage of specialized physiotherapists is however not available. In Portugal, 54% of graduate physios acquired specific cardiorespiratory post-graduate skills, but only 15% of them is employed in the field.²⁸ In Italy, a nationwide web-survey showed that only 18% were working with acute COVID-19 patients.²⁹

Future directions include determining the optimal modality to deliver physiotherapy and whole rehabilitation in ICU, including all those co-interventions related to the patients' need.³⁰ Understanding trajectories of patient recovery and determining subgroups that may be of maximum benefit³¹ is the goal to address and implement the optimal allocation of resources of health care professionals; these are still scarce. Physiotherapists should constitute an essential although minimal workforce to speed up the recovery of the individual person admitted to critical care.

Conflict of interest

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Consent to publish data

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References

1. Cieza A, Causey K, Kamenov K, Hanson SW, Chatterji S, Vos T. Global estimates of the need for rehabilitation based on the Global Burden of Disease study 2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet*. 2021;396(10267):2006–17.

2. Herridge MS, Tansey CM, Matté A, Tomlinson G, Diaz-Granados N, Cooper A, et al. Functional disability 5 years after acute respiratory distress syndrome. *N Engl J Med.* 2011;364(14):1293–304.
3. Guidet B, Vallet H, Flaatten H, Joynt G, Bagshaw SM, Leaver SK, et al. The trajectory of very old critically ill patients. *Intensive Care Med.* 2024;50(2):181–94.
4. Polverino E, Nava S, Ferrer M, Ceriana P, Clini E, Spada E, et al. Patients' characterization, hospital course and clinical outcomes in five Italian respiratory intensive care units. *Intensive Care Med.* 2010;36(1):137–42.
5. Vitacca M, Carone M, Clini EM, Paneroni M, Lazzeri M, Lanza A, et al. ITS-AIPO, ARIR and SIP/IRS. Joint statement on the role of respiratory rehabilitation in the COVID-19 crisis: the Italian position paper. *Respiration.* 2020;99(6):493–9.
6. Schaller SJ, Anstey M, Blobner M, Edrich T, Grabitz SD, Gradwohl-Matis I, et al. International Early SOMS-guided mobilization research initiative. Early, goal-directed mobilisation in the surgical intensive care unit: a randomised controlled trial. *Lancet.* 2016;388(10052):1377–88.
7. Morris PE, Goad A, Thompson C, Taylor K, Harry B, Passmore L, et al. Early intensive care unit mobility therapy in the treatment of acute respiratory failure. *Crit Care Med.* 2008;36(8):2238–43.
8. Schweickert WD, Pohlman MC, Pohlman AS, Nigos C, Pawlik AJ, Esbrook CL, et al. Early physical and occupational therapy in mechanically ventilated, critically ill patients: a randomised controlled trial. *Lancet.* 2009;373(9678):1874–82.
9. Fossat G, Baudin F, Courtes L, Bobet S, Dupont A, Bretagnol A, et al. Effect of in-bed leg cycling and electrical stimulation of the quadriceps on global muscle strength in critically ill adults: a randomized clinical trial. *JAMA.* 2018;320(4):368–78.
10. TEAM Study Investigators and the ANZICS Clinical Trials Group. early active mobilization during mechanical ventilation in the ICU. *N Engl J Med.* 2022;387(19):1747–58.
11. Wang YT, Lang JK, Haines KJ, Skinner EH, Haines TP. Physical rehabilitation in the ICU: a systematic review and meta-analysis. *Crit Care Med.* 2022;50(3):375–88.
12. Paton M, Chan S, Tipping CJ, Stratton A, Serpa Neto A, Lane R, et al. The effect of mobilization at 6 months after critical illness - meta-analysis. *NEJM Evid.* 2023;2(2):EVIDoA2200234.
13. Paton M, Chan S, Serpa Neto A, Tipping CJ, Stratton A, Lane R, et al. Association of active mobilisation variables with adverse events and mortality in patients requiring mechanical ventilation in the intensive care unit: a systematic review and meta-analysis. *Lancet Respir Med.* 2024;12(5):386–98.
14. Thomas P, Chaseling W, Marais L, Matheson C, Paton M, Swanepoel N. Physiotherapy services in intensive care. A workforce survey of Australia and New Zealand. *Aust Crit Care.* 2023;36(5):806–12.
15. Twose P, Terblanche E, Jones U, Bruce J, Firshman P, Highfield J, et al. Therapy professionals in critical care: a UK wide workforce survey. *J Intensive Care Soc.* 2023;24(1):24–31.
16. Norrénberg M, Vincent JL. A profile of European intensive care unit physiotherapists. *European Society of Intensive Care Medicine.* *Intensive Care Med.* 2000;26(7):988–94.
17. Ramalho F, Oliveira A, Machado A, Azevedo V, Gonçalves MR, Ntoumenopoulos G, Marques A. Physiotherapists in intensive care units: Where are we? *Pulmonology.* 2024. S2531-0437(24)00016-3.
18. Tomonaga Y, Menges D, Yebo HG, Fumeaux T, Heise A, Wesch C, et al. Early mobilisation and rehabilitation in Swiss intensive care units: a cross-sectional survey. *Swiss Med Wkly.* 2022;152:w30125.
19. Nava S, Ambrosino N. Rehabilitation in the ICU: the European phoenix. *Intensive Care Med.* 2000;26(7):841–4.
20. Gosselink R, Bott J, Johnson M, Dean E, Nava S, Norrénberg 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(7):1188–99.
21. Sommers J, Engelbert RH, Dettling-Ihnenfeldt D, Gosselink R, Spronk PE, Nollet F, van der Schaaf M. Physiotherapy in the intensive care unit: an evidence-based, expert driven, practical statement and rehabilitation recommendations. *Clin Rehabil.* 2015;29(11):1051–63.
22. Twose P, Jones U, Cornell G. Minimum standards of clinical practice for physiotherapists working in critical care settings in the United Kingdom: a modified Delphi technique. *J Intensive Care Soc.* 2019;20(2):118–31.
23. Idris I, Awotidebe AW, Mukhtar NB, Ativie RN, Nuhu JM, Muhammad IC, Danbatta AS, Adedoyin RA, Mohammed J. Expert consensus on the minimum clinical standards of practice for Nigerian physiotherapists working in intensive care units: a modified Delphi study. *Afr J Thorac Crit Care Med.* 2021;27(3):10.7196.
24. Skinner EH, Thomas P, Reeve JC, Patman S. Minimum standards of clinical practice for physiotherapists working in critical care settings in Australia and New Zealand: A modified Delphi technique. *Physiother Theory Pract.* 2016;32(6):468–82.
25. Takahashi T, Kato M, Obata K, Kozu R, Fujimoto T, Yamashita K, Ando M, Kawai Y, Kojima N, Komatsu H, Nakamura K, Yamashita Y, Patman S, Utsunomiya A, Nishida O. Minimum standards of clinical practice for physical therapists working in intensive care units in Japan. *Phys Ther Res.* 2020;24(1):52–68.
26. World Physiotherapy. Physiotherapist education framework. London, UK: World Physiotherapy; 2023 Nov 3. Available from <https://world.physio/what-we-do/education> Date last accessed: March 26, 2024.
27. Troosters T, Tabin N, Langer D, Burtin C, Chatwin M, Clini EM, et al. Introduction of the harmonised respiratory physiotherapy curriculum. *Breathe.* 2019;15(2):110–5.
28. Marques A, Oliveira A, Machado A, Jácome C, Cruz J, Pinho T, et al. Cardiorespiratory physiotherapy as a career choice - perspective of students and physiotherapists in Portugal. *Physiother Theory Pract.* 2019;35(11):1094–116.
29. Vitacca M, Lazzeri M, Guffanti E, Frigerio P, D'Arosca F, Gianola S, et al. Italian suggestions for pulmonary rehabilitation in COVID-19 patients recovering from acute respiratory failure: results of a Delphi process. *Monaldi Arch Chest Dis.* 2020;90(2).
30. Parry SM, Nydahl P, Needham DM. Implementing early physical rehabilitation and mobilisation in the ICU: institutional, clinician, and patient considerations. *Intensive Care Med.* 2018;44(4):470–3.
31. Jones JRA, Berney S, Berry MJ, Files DC, Griffith DM, McDonald LA, Morris PE, Moss M, Nordon-Craft A, Walsh T, Gordon I, Karahalios A, Puthuchery Z, Denehy L. CRITICALConnect Study Investigators. Response to physical rehabilitation and recovery trajectories following critical illness: individual participant data meta-analysis protocol. *BMJ Open.* 2020;10(5):e035613.