

Current insights in intensive & critical care nursing

The added value of physiotherapists in preventing pressure injuries in intensive care patients

Sabrina Eggmann^{a,*}, Anja M. Raab^b^a Department of Physiotherapy, Inselspital, Bern University Hospital, Bern, Switzerland^b Academic-Practice-Partnership of the School of Health Professions of Bern University of Applied Sciences and Insel Gruppe, Bern, Switzerland

Physiotherapists improve movement and function for people who experience challenges from aging, injury, illness, or the environment. They promote physical, psychological, emotional and social well-being through prevention, treatment, and rehabilitation (World Physiotherapy, 2023). Intensive care units (ICU) patients frequently struggle with limitations in physical function and activity rendering them at high risk for pressure injuries (PI). The development of PI is augmented by immobility, hypoperfusion, vasopressors, malnutrition, sweating and/or shearing force, whereby the increased pressure on prominent surfaces exceeds the capillary pressure of the underlying tissue resulting in tissue damage and ultimately necrosis (Nieto-García et al., 2021; Pickenbrock et al., 2017). This article discusses how physiotherapists with their specific knowledge can add value to prevent, treat or rehabilitate PI in ICU patients (Fig. 1).

Early mobilization

Physiotherapists are experts in countering immobility by progressing mobility from passive to active exercises, to functional activities, and walking (McWilliams et al., 2019). Compared to other health-care professionals, they mobilize patients to higher levels without an increase in adverse events (Garzon-Serrano et al., 2011). Early mobilization is an important component of the evidence-based ABCDEF-bundle that involves (A)wakening and (B)reathing, (C)oordination, (D)elirium monitoring, (E)arly mobilization and (F)amilies. A large, prospective cohort study (n = 1855) has recently shown that the implementation of the EC-components can significantly reduce immobility (95 % to 37 %) and PI (39 % to 23 %) which is accompanied with shorter duration of mechanical ventilation, length of stays and lower costs (Hiseh et al., 2019). Nevertheless, despite the obvious link between immobility and PI, there are only few studies focusing on the effect of early mobilization. A recent systematic review was unable to draw a conclusion due to low methodological quality, high heterogeneity, and poorly defined outcome measurements (Nieto-García et al., 2021). Moreover, despite its benefits on physical function, early mobilization remains poorly implemented in clinical practice (Nydahl et al., 2023). The addition of physiotherapists in ICU teams might counter some of the common barriers such as limited

staffing, knowledge gaps or lack of skill.

Positioning

Another important component of pressure injury prevention is regular positioning or frequent small body-shifts to redistribute pressure (European Pressure Ulcer Advisory Panel, 2019). Due to their musculoskeletal background, physiotherapists often have a different view on positioning that considers joint alignment. Notably, continuous malalignment can lead to joint dysfunction and pain (Gustafson et al., 2018). A novel method to position ICU patients is the “positioning in neutral” (LiN) that aims to offload exposed body-structures by distributing equal pressure across the body while keeping the joints in alignment to avoid excessive overstretching or abridging of muscles. Compared to conventional positioning, the LiN method seems to distribute pressure more equally across the body. Moreover, LiN positioning is perceived as more comfortable by patients and has been shown to improve range of motion (Pickenbrock et al., 2017). Comfort was associated with reduced pain and pressure in individuals with a spinal cord injury (Raab et al., 2014). Healthcare professionals are therefore advised to regularly assess patients for discomfort and pain from positioning. A low sedation strategy (ABCDEF bundle) might enable patients to provide feedback and to take an active role for their wellbeing thus further reducing harm from immobility (Hiseh et al., 2019; Nedergaard et al., 2018). Physiotherapists are well placed to conduct or support nurses in positioning to enhance joint protection and to minimize subsequent injuries. They can further use their treatment session to stimulate blood circulation and to diminish continuous pressure for example by repositioning patients through movement exercises. These exercises might also reveal early skin damage and allow targeted, timely measures to avoid worsening. Because physiotherapists commonly treat the same patient over several days, they can monitor skin continuously and are not dependent on handovers. Finally, physiotherapists enable patients to take back control over their body to reposition themselves for example by practicing in-bed exercises (Lehmkuhl et al., 2023).

* Corresponding author.

E-mail address: sabrina.eggmann@insel.ch (S. Eggmann).<https://doi.org/10.1016/j.iccn.2023.103582>

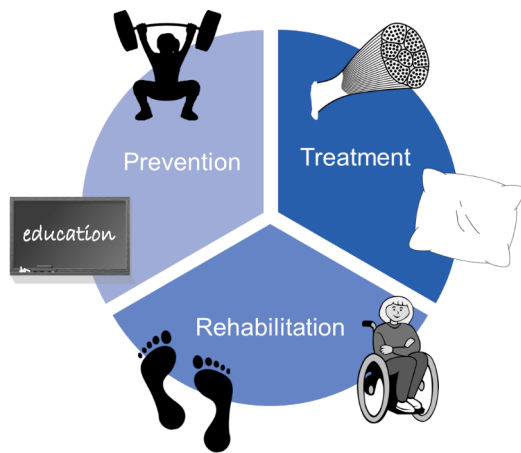


Fig. 1. Therapeutic interventions to prevent, treat and rehabilitate patients with PI comprehend education, early mobilization and exercise, positioning, strengthening, functional retraining and ambulation.

Assistive devices or equipment

Physiotherapists are competent using specialized assistive devices and equipment such as neuromuscular electrical stimulation (NMES), tilt-tables, specialist cushions or in-bed cycling. Bilateral NMES on the gluteus maximus muscles is safe and feasible in ICU patients and may prevent sacral PI (relative risk 0.15 [95 %-CI 0.05–0.40]) when randomly compared to standard care (Baron et al., 2022). NMES further appears to be an effective adjunctive therapy to accelerate and increase PI closure in spinal cord injury patients (Lala et al., 2016). Potential rationales for NMES are muscle thickening, pressure relief, and an increase of tissue oxygenation. Similarly, blood circulation may increase with in-bed cycling, whereby correct use and positioning is paramount to avoid PI from the hard pedals. Nevertheless, the use of in-bed cycling did not lead to an increase in PI in a randomized controlled trial (Eggmann et al., 2018). Other alternatives that should specifically be explored to treat or rehabilitate PI are tilt-tables or specialist cushions that will allow mobilization without an increase of pressure in the affected area. For example, a patient with a sacral PI may not be able to sit, but could be mobilized into a standing position, and even to walking, with the help of a tilt-table.

Interprofessional collaboration & education

Complex needs require complex care. Thus, close collaboration among healthcare professionals is especially important for ICU patients. Physiotherapists bring a large box of skills and experience to this complex environment. Their focus is thereby to make the (saved) live worth living and to start as early as possible with holistic care. To this end, they can contribute to multifaceted rehabilitation plans, encourage patients and their families for active participation, and educate other professionals in patient handling for example how transfers can be conducted with limited shearing force.

In summary, physiotherapists redistribute pressure through positioning, early mobilization, or functional exercise. They regularly inspect the skin and can recognize early damage. Additionally, they can advise on comfortable positioning, optimal transfer strategies or suitable

devices. Prevention is better than cure: the elements of the ABCDEF bundle, including physiotherapy should therefore be implemented in every ICU as early as possible.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

- Baron, M.V., Silva, P.E., Koepp, J., Urbanetto, J.S., Santamaria, A.F.M., Dos Santos, M.P., de Mello Pinto, M.V., Brandenburg, C., Reinheimer, I.C., Carvalho, S., Wagner, M.B., Miliou, T., Poli-de-Figueiredo, C.E., Pinheiro da Costa, B.E., 2022. Efficacy and safety of neuromuscular electrical stimulation in the prevention of pressure injuries in critically ill patients: a randomized controlled trial. *Ann. Intensive Care* 12 (1), 53. <https://doi.org/10.1186/s13613-022-01029-1>.
- Eggmann, S., Verra, M.L., Luder, G., Takala, J., Jakob, S.M., 2018. Effects of early, combined endurance and resistance training in mechanically ventilated, critically ill patients: A randomised controlled trial. *PLoS One* 13 (11), e0207428.
- European Pressure Ulcer Advisory Panel, National Pressure Injury Advisory Panel and Pan Pacific Pressure Injury Alliance. In: Haesler E, ed. *Prevention and Treatment of Pressure Ulcers/Injuries: Quick Reference Guide*. EPUAP/NPIAP/PPPIA; 2019. Online: <https://internationalguideline.com/static/pdfs/Quick-Reference-Guide-10Mar2019.pdf> Accessed: 17th of September 2023.
- Garzon-Serrano, J., Ryan, C., Waak, K., Hirschberg, R., Tully, S., Bittner, E.A., Chipman, D.W., Schmidt, U., Kasotakis, G., Benjamin, J., Zafonte, R., Eikermann, M., 2011. Early mobilization in critically ill patients: patients' mobilization level depends on health care provider's profession. *PM R* 3 (4), 307–313. <https://doi.org/10.1016/j.pmrj.2010.12.022>.
- Gustafson, O.D., Rowland, M.J., Watkinson, P.J., McKechnie, S., Igo, S., 2018. Shoulder impairment following critical illness: A prospective cohort study. *Crit. Care Med.* 46 (11), 1769–1774. <https://doi.org/10.1097/CCM.0000000000003347>.
- Hsieh, S.J., Otusanya, O., Gershengorn, H.B., Hope, A.A., Dayton, C., Levi, D., Garcia, M., Prince, D., Mills, M., Fein, D., Colman, S., Gong, M.N., 2019. Staged implementation of awakening and breathing, coordination, delirium monitoring and management, and early mobilization bundle improves patient outcomes and reduces hospital costs. *Crit. Care Med.* 47 (7), 885–893. <https://doi.org/10.1097/CCM.0000000000003765>.
- Lala, D., Spaulding, S.J., Burke, S.M., Houghton, P.E., 2016. Electrical stimulation therapy for the treatment of pressure ulcers in individuals with spinal cord injury: a systematic review and meta-analysis. *Int. Wound J.* 13 (6), 1214–1226. <https://doi.org/10.1111/iwj.12446>.
- Lehmkuhl, L., Dreyer, P., Laerkner, E., Tanghus Olsen, H., Jespersen, E., Juel, R.M., 2023. Getting the body back on track - Understanding the phenomenon of mobilisation when conscious and mechanically ventilated patients are mobilised in the intensive care unit. *Intensive Crit. Care Nurs.* 78, 103450. <https://doi.org/10.1016/j.iccn.2023.103450>.
- McWilliams, D., Snelson, C., Goddard, H., Attwood, B., 2019. Introducing early and structured rehabilitation in critical care: A quality improvement project. *Intensive Crit. Care Nurs.* 53, 79–83. <https://doi.org/10.1016/j.iccn.2019.04.006>.
- Nedergaard, H.K., Haberlandt, T., Toft, P., Jensen, H.I., 2018. Pressure ulcers in critically ill patients - Preventable by non-sedation? A substudy of the NONSEDA-trial. *Intensive Crit. Care Nurs.* 44, 31–35. <https://doi.org/10.1016/j.iccn.2017.09.005>.
- Nieto-García, L., Carpio-Pérez, A., Moreiro-Barroso, M.T., Alonso-Sardón, M., 2021. Can an early mobilisation programme prevent hospital-acquired pressure injuries in an intensive care unit?: A systematic review and meta-analysis. *Int. Wound J.* 18 (2), 209–220. <https://doi.org/10.1111/iwj.13516>.
- Nydahl, P., Fick, L.S., Eggmann, S., 2023. Break down barriers - Can point prevalence studies change mobilization practice in the intensive care unit? *Intensive Crit. Care Nurs.* 1 (80), 103537. <https://doi.org/10.1016/j.iccn.2023.103537>.
- Pickenbrock, H., Ludwig, V.U., Zapf, A., 2017. Support pressure distribution for positioning in neutral versus conventional positioning in the prevention of decubitus ulcers: a pilot study in healthy participants. *BMC Nurs.* 16 (16), 60. <https://doi.org/10.1186/s12912-017-0253-z>.
- Raab, A.M., Harvey, L.A., Baumberger, M., Frotzler, A., 2014. The effect of arm position and bed adjustment on comfort and pressure under the shoulders in people with tetraplegia: a randomized cross-over study. *Spinal Cord* 52 (2), 152–156. <https://doi.org/10.1038/sc.2013.150>.
- World Physiotherapy What is physiotherapy? Online: <https://world.physio/resources/what-is-physiotherapy> Accessed 2023 17th of September 2023.