WANDERCRAFT

Benefits of early mobilization in ICU

An overview of key clinical evidence

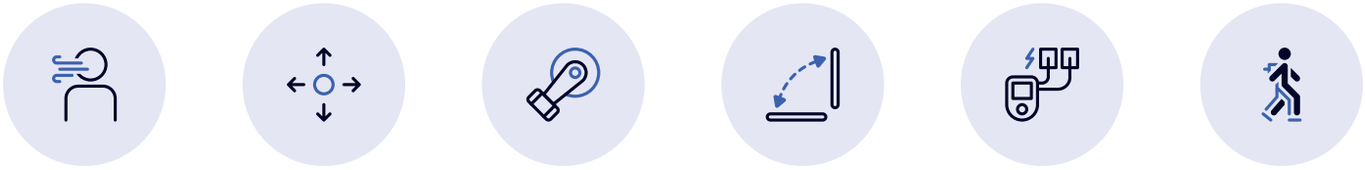
Intensive care units (ICU) receive critical patients requiring constant monitoring and care mainly due to respiratory, neurological and post-surgical conditions.[1] Robotic exoskeletons can be used in an intensive care unit (ICU) to assist in early mobilization.[2] Let's explore the current early mobility practices and their anticipated benefits.

The consequences of immobility are substantial[3,4]...

- ICU-acquired weakness (ICU-AW) equivalent to 40% loss of muscle strength in one week of immobility
- Delirium
- Hospital-acquired pressure injuries (HAPI)
- Prolonged mechanical ventilation is associated with ICU-AW
- Infection
- Reduced exercise tolerance

How to limit those consequences on patients?

We read and analyzed the research, so you don't have to: Long-term clinical evidence of 15 years. Recent clinical practice guidelines begin to give us a better understanding of various ICU interventions that may limit the health impacts of immobility[5]:



Respiratory exercises | **Passive/active mobilization** | **In-bed cycling** | **Tilt tables** | **Electrical muscle stimulation** | **Early mobilization**

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4. Cameron S, et al. Early mobilization in the critical care unit: A review of adult and pediatric literature. J Crit Care. 2015;30(4):664-672. doi:10.1016/j.jcrc.2015.03.032
5. Paton M, 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):386-398. doi:10.1016/S2213-2600(24)00011-0

Early mobilization is safe and can improve clinical outcomes[5-7]

- A recent meta-analysis found no significant impact of early mobilization on adverse events or mortality[5]
- Positive effects on muscle strength, respiratory muscle strength, ventilator-free days, quality of life, and ICU length of stay (LOS)[8,9]
- Significantly lower ICU (21-40%) and hospital length of stay (23%)[10–12]

ICU Mobilization Risk of Adverse Events[5]
< 3%

What role can robotic exoskeletons play in mitigating barriers to early mobilization?

A 2024 pilot study demonstrated safe and feasible implementation of the robotic exoskeleton Atalante in a neuro ICU setting[2]

- 17 patients, completing 39% of intended sessions
- 100% of patients completing Atalante sessions reported high satisfaction and desired to complete subsequent training sessions
- Minor adverse events (mild orthostasis)

The self-balancing Atalante X exoskeleton enables ambulation without the need for crutches. In patients with severe motor impairments, it may facilitate safe and effective mobilization, including sit-to-stand exercises, gait and balance training.

Potential barriers to the use of robotics for early mobilization:

- Staffing
- Knowledge/Skills
- Available resources
- Interdisciplinary buy-in
- Medical stability

Implementation of ICU mobilization and rehabilitation can be challenging. A multidisciplinary approach incorporating these various techniques can significantly enhance patient recovery and overall health. Additional training will be required to adopt new technologies with the end goal of making early mobilization feasible for a wider patient population.

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7. Zhang L, et al. Early mobilization of critically ill patients in the intensive care unit: A systematic review and meta-analysis. PLoS One. 2019;14(10). doi:10.1371/journal.pone.0223185
8. Kayambu G, et al. Physical Therapy for the Critically Ill in the ICU A Systematic Review and Meta-Analysis*. CriticalCareMedicine. 2013;41(6):1543-1554.
9. Wang YT, et al. Physical Rehabilitation in the ICU: A Systematic Review and Meta-Analysis*. CriticalCareMedicine. 2022;50(3):375-388.
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