



Early mobilisation with a bed bicycle

According to an internationally recognised guideline, early mobilisation is mobilisation that begins within 72 hours of admission to the intensive care unit [1]. Other studies conclude that the definition of early mobilisation is not clear from the literature [3,17]. Early mobilisation after an acute event often poses a challenge to healthcare professionals.

There are two parameters that are fundamental to early rehabilitation: staff and equipment. Successful early mobilisation is therefore always based on concepts tailored to the specific needs of the clinic, which promote interaction between patient, clinic and equipment [7]. The use of a bed bicycle is therefore a good way of easing the strain on staff while still implementing the requirements of early mobilisation. This kind of mobilisation unit can also be performed by one person alone, as it requires little time and causes minimal physical strain.

In times of short-staffing, a bed bicycle supplementary to classical therapeutic mobilisation is a key tool for ensuring compliance with the guideline recommendations. It is also safe and practical for both patients and the treatment team [8,14]. Out of over 500 cases of mobilisation using the bed bicycle, only one safety-relevant event occurred [8].

This not only applies to acute care, but can also be seen in rehabilitation, where the mobilisation of severely affected patients is also of fundamental importance. The requirements and reasons for early mobilisation differ in these two core areas of intervention.

Early mobilisation in the acute care clinic

The risks of intensive care patients remaining immobile are clear. Patients show “deconditioning”, consisting of general weakness, rapid fatigue, increasing atrophy of the respiratory and skeletal muscles, psychocognitive deficits, reduced haemodynamic responsiveness as well as position-related skin and soft tissue damage [1]. The mortality rate also increases considerably [11].

Early mobilisation contributes to a higher Barthel index, a higher probability of discharge and greater functional independence (SF36), in addition to a positive influence on the duration of ventilation. It is important for all intensive care patients for whom there are no exclusion criteria for mobilisation [1].

The German guideline therefore recommends that intensive care patients be mobilised at the latest within 72 hours of admission. This should take place twice daily for at least 20 minutes [1]. Mobilisation is divided into three stages: passive, active-assisted and active. The use of the bed bicycle is recommended in all stages [1]. The versatility of bed bicycles allows training of the arms as well as the legs. The bed bicycle has been shown to be an effective training method in particular when the patient is not yet able to perform active exercises [2,10]. It can also make an important contribution to the prevention of restricted movement and thrombosis.

Oxidative stress and high levels of nitric oxide in the blood are thought to be partly responsible for the ageing process and reduced life expectancy. The passive use of the bed bicycle can influence these factors and have a positive effect on the organism [16]. The functional status of the patient improves, which has a positive effect on their further recovery [2]. Another positive effect is the improved recovery of functional training capacity. Supplementing therapy with a bed bicycle is also associated with a significant increase in the rate of strength gain [10], which is key to rehabilitation and the return to independence.

One of the most common acute organ dysfunctions during intensive care treatment is delirium. This is a neuro-psychiatric syndrome involving states of confusion, which affects 80% of ventilated and 50% of non-ventilated patients [9]. Studies show that the one-year probability of survival decreases by 10% with each day of delirium [12].

It was shown that the duration of delirium could be significantly reduced when using the bed bicycle in combination with functional electrical stimulation. The use of a bed bicycle also enables patients to walk earlier and faster [13].

It is therefore essential to mobilise intensive care patients from day one. In the long term, early rehabilitation is beneficial not only for the patient, but also for the health system: Early rehabilitation can reduce length of stay and lay the foundations for independent living without the support of nursing services / homes, which contributes to reduced treatment costs [1,6,7].

Rehabilitation of severely affected patients

In the rehabilitation of severely affected patients, in contrast to acute care, the focus is not on stabilising important life parameters but on promoting activity. Rehabilitation is an active learning process aimed at coping with disability, minimising impairments / activity limitations or fully restoring them [4]. According to ICF, rehabilitation is about maintaining or improving body functions, body structures, activity and participation. Patients themselves often express goals at the everyday level, such as regaining walking ability, physiological food intake or maintaining social activities. It is therefore the task of the treatment team to formulate intermediate goals and derive a treatment strategy from them [15].

The motion cycles during walking and cycling are comparable. In both activities, the same muscles are addressed in the same coordination sequence, which is why cycling with a bed bicycle is a good additional therapy for the restoration of walking ability in severely affected patients. Therapy with a bed bicycle can also be seen as preparation for further rehabilitation.

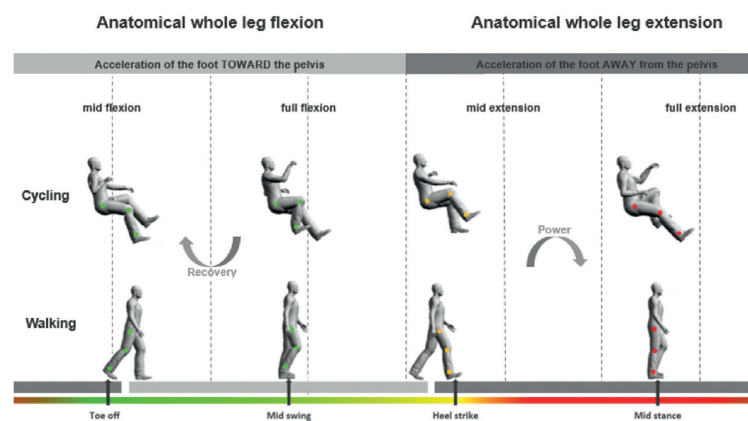


Figure 1: Comparison of gait cycles in walking and cycling
 (Source: own illustration according to Zehr EP et al. (2016))

On a functional level, muscle strength, flexibility and endurance are positively influenced and the cardiovascular system is stabilised. The training also improves respiratory function and activates bowel activity. This not only has positive effects on the metabolism, but also shortens the length of stays.

The complementary use of a bed bicycle in the context of early mobilisation can therefore have a significant influence on walking ability. According to studies, the use of a bed bicycle increases the likelihood of being able to walk independently again. Walking distance may also be increased [2].

In summary, as many studies confirm, patients reap notable benefits from the use of bed bicycles. This applies to both acute care and rehabilitation. One great advantage of bed bicycles is that they can be used to accompany and support patients in their recovery process.

Bibliography

- [1] Bein T et al.** (2015). S2e Leitlinie: 'Lagerungstherapie und Frühmobilisation zur Prophylaxe oder Therapie von pulmonalen Funktionsstörungen', AWMF (accessed: 01/08/2019).
- [2] Burtin C et al.** (2009). Early exercise in critically ill patients enhances shortterm functional recovery, in: *Journal of Critical Care Med*, 37, P. 24992505.
- [3] Clarissa C et al.** (2019). Early mobilisation in mechanically ventilated patients: a systematic integrative review of definitions and activities, in: *Journal of Intensive Care*, 7, P. 119.
- [4] Flachendecker P et al.** (2019). Rehabilitation bei Multipler Sklerose: multimodal, interdisziplinär, wirksam, in: *Neurologie up-2date*, 2/2019, P. 171.
- [5] Hodgson C et al.** (2013). Clinical review: Early patient mobilization in the ICU, in: *Critical Care*, 17, P. 17.
- [6] Hodgson C et al.** (2014). Expert consensus and recommendation on safety criteria for active mobilization of mechanically ventilated critically ill adults, in: *Critical Care*, 18, P. 19.
- [7] Intensive Care NSW** (2017). Clinical guideline: Physical activity and movement: A guideline for critically ill adults, Chatswood NSW: AGENCY FOR CLINICAL INNOVATION.
- [8] Kho ME et al.** (2015). Feasibility and safety of inbed cycling for physical rehabilitation in the intensive care unit, in: *Journal of critical care*.
- [9] Luetz, A et al.** (2012) Das Delir auf Intensivstationen. *Med Klin Intensivmed Notfmed* 107, 289-300.
- [10] Machado A et al.** (2017). Effects that passive cycling exercise have on muscle strength, duration of mechanical ventilation, and length of hospital stay in critically ill patients: a randomized clinical trial.
- [11] Morris PE, Goad A, Thompson C et al.** (2008). Early intensive care unit mobility therapy in the treatment of acute respiratory failure.
- [12] Nessizius S, Rottensteiner C, Nydahl P** (2017). Frührehabilitation in der Intensivmedizin – Interprofessionelles Management, P. 90-174.
- [13] Parry SM** (2014) Functional electrical stimulation with cycling in the critically ill: a pilot case-matched control study. *J Crit Care*.
- [14] Ringdal M et al.** (2018). Inbed cycling in the ICU; patient safety and recollections with motivational effects, in: *Acta anaesthesiologica Scandinavica*, 5, P. 658665.
- [15] Schupp W** (2016). Was die Rehabilitation für Schlaganfall für den Langzeitverlauf leisten kann, in: *Der Neurologe & Psychiater*, 11/2016, P. 2228.
- [16] Tenório de França E** (2017). Oxidative stress and immune system analysis after cycle ergometer use in critical patients.
- [17] Thomas S et al.** (2016): Evidenzbasierte Konzepte der motorischen Frührehabilitation, in: *Neurologie & Rehabilitation*, 22, P. 209216.
- [18] Zehr EP et al.** (2016). Neuromechanical interactions between the limbs during human locomotion: an evolutionary perspective with translation to rehabilitation. *Exp Brain Res* 234:3059-3081.