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**Citation:** Nickels, M., Aitken, L. M. ORCID: 0000-0001-5722-9090, Walsham, J., Barnett, A. and McPhail, S. (2019). Early in-bed cycling versus usual care in the ICU on muscle atrophy and mobility: A randomized trial. *Critical Care Medicine*, 47(1), p. 47.

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### **Learning Objectives:**

Critically ill patients lose large amounts of skeletal muscle early during their ICU admission.

This muscle loss is associated with the development of weakness and functional impairments.

In-bed cycling initiated early in an ICU admission may reduce muscle atrophy, maintain muscle strength and promote recovery of mobility.

### **Methods:**

A two-arm (blinded assessment) randomized controlled trial (RCT) compared usual care versus early in-bed cycling (in addition to usual care). The setting was a tertiary mixed medical, surgical, trauma ICU. Participants included adult patients with expected duration of mechanical ventilation >48 hours. All participants received usual care while patients randomized to the intervention group received an additional daily intervention of 30 minutes of in-bed cycling. In-bed cycling participants were encouraged to cycle actively whenever possible whilst pre-specified safety parameters were observed. The in-bed cycling sessions could be passive, machine-assisted or active. The primary outcome was rectus femoris cross sectional area (RFCSA) measured by ultrasound (blinded ultrasonographers) at: Baseline, Days 3, 7, 10 (primary) post-study enrollment, as well as 7 days post-discharge from ICU. Other outcomes included manual muscle strength assessed by the Medical Research Council (MRC) Sum Score and distance in meters walked during the 6-minute walk test (6MWT) 7 days post-discharge from ICU.

### **Results:**

Seventy-four participants (mean (SD) age = 56 (17), 69% male) were recruited. There was a difference of 4% in median RFCSA atrophy at Day 10 (primary outcome) favoring the intervention group. Participants in the in-bed cycling group (n = 37) had a median (IQR) percent of RFCSA atrophy of -9.4% (-23.2%, 0.8%) in comparison to usual care participants (n = 37) -13.2% (-26.4%, -2.9%). During the 6MWT the in-bed cycling group walked median (IQR) 258 meters (30, 326) versus usual care participants median (IQR) 210 meters (25, 318). The median (IQR) MRC Sum Score 7-days post ICU discharge was similar in the intervention 58 (54, 60) and usual care 57 (53, 59) groups.

### **Conclusions:**

Outcomes following this pilot trial of daily in-bed cycling in addition to usual care were encouraging. In-bed cycling may reduce muscle atrophy and improve mobility post-critical illness. Further investigation in a larger multi-center RCT is warranted.