Marc Nickels[1,2,3], Leanne Aitken[4,5,6,] James Walsham[6,7,] Adrian Barnett[2,] Steven McPhail[2,3]
1 Physiotherapy Department, Princess Alexandra Hospital, Metro South Health, Brisbane, Australia,
2 Institute of Health and Biomedical Innovation and School of Public Health & Social Work, Brisbane, Australia,
3 Centre for Functioning and Health Research, Metro South Health, Brisbane, Australia,
4 School of Health Sciences, City, University of London, London, United Kingdom,
5 Menzies Health Institute Queensland, Griffith University, Brisbane, Australia,
6 Intensive Care Unit, Princess Alexandra Hospital, Metro South Health, Brisbane, Australia,
7 School of Medicine, University of Queensland, Brisbane, Australia

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.