Effectiveness of Supine Cycling Plus Early Mobility Interventions Versus Early Mobility Interventions Alone for Patients in the ICU: A Systematic Review.

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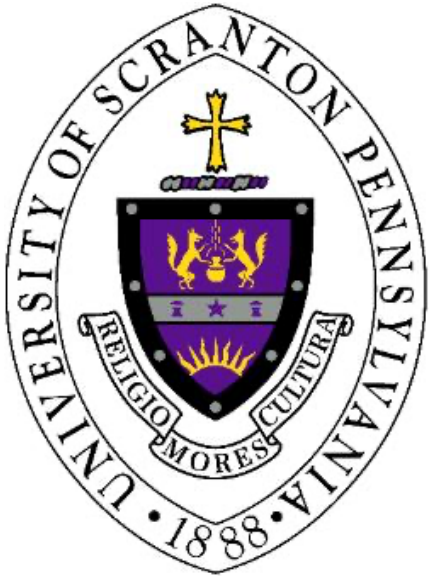


Overview


Background and Purpose


Methods


Results


Adverse Events


Conclusion


Clinical Relevance

Objectives

Understand how the available evidence does not currently support the addition of supine cycling to traditional early mobility programs.

Understand the need to focus on using skilled functional mobility interventions to promote improved outcomes for adults in the Intensive Care Unit (ICU).

Bed Rest/ Immobility

- Bed rest and immobility are common for patients in the ICU.[1]
- Risk for developing ICU-acquired muscle weakness[2-4]
- Commonly lead to:[5]
  - Acute complications
  - Increased length of stay in the ICU and hospital
  - Increased mortality and morbidity rates

Bed Rest/ Immobility

- Rapid reductions in muscle mass, bone mineral density, and impairments in other body systems[6]
- Extent of impairments are further exacerbated in individuals with critical illnesses.[6]
- Early physical rehabilitation may help address impairments.[7]

Early Mobility

- "The initiation of a mobility program when the patient is minimally able to participate with therapy, hemodynamically stable, and receiving acceptable levels of oxygen".[5]
- Early mobility may prevent consequences of bed rest and improve patient outcomes.[8, 9]
- Protocols include interventions such as bed active assisted exercises, dynamic sitting, standing, mobility, transfers, ambulation, and stair negotiation.[10, 11]
- Has been found to be safe and feasible in patients who are critically ill.[8,9,12,13]

Benefits of Early Mobility

- Potential benefits of early mobility:
  - Improved physical functioning[8,14]
  - Decreased duration of mechanical ventilation[8,14]
  - Decreased intensive care and hospital stay[8,14,15]
  - Increase discharge to home[15]
  - Reduced medical costs[9,15]
  - Reduced skin lesions[14]

Barriers to Early Mobility

- Possible barriers:
  - Endotracheal tube[11]
  - Sedation[11,16]
  - Open abdomen[11]
  - Physiological instability[11,16]
  - Equipment[11]
  - Insufficient Staffing[11,16]
  - Pain or fatigue [11]
  - Agitation [11]

Supine Cycling

- Performed actively, active-assisted, or passively
- Functional electrical stimulation assisted
- MOTOMed Letto 2 Cycle commonly used
- In the ICU, supine cycling has been demonstrated to be safe and feasible.[17-22]

Supine Cycling

- Cycling has demonstrated improved muscle strength, physical functioning, and quality of life.[18]
- Passive-cycling in sedated ICU patients was associated with decreased muscle protein loss.[20]
- Cycling sessions in patients status post coronary artery bypass grafting resulted in non-significantly longer walking distance at hospital discharge.[23]

FES-Assisted Cycling

https://pdf.medicalexpo.com/pdf/restorative-therapies/sage-stimulator/86357-149079.html

MOTOMed Letto 2 Cycle

https://www.medimotion.co.uk/motomed-movement-therapy/letto/

Purpose

- To determine the effectiveness of supine cycling plus early mobility compared to early mobility interventions alone for adults in the ICU.

Methods

Databases: Cochrane Library, PubMed, EBSCO Discovery Services, and ProQuest

Search terms: (“Physical Therapy” OR Physiotherapy OR PT) AND (“supine cycling” OR “in-bed cycling”) AND (ICU OR “Intensive Care Unit”)

Search limits: peer reviewed, English, years 2011-2021, humans

Selection Criteria

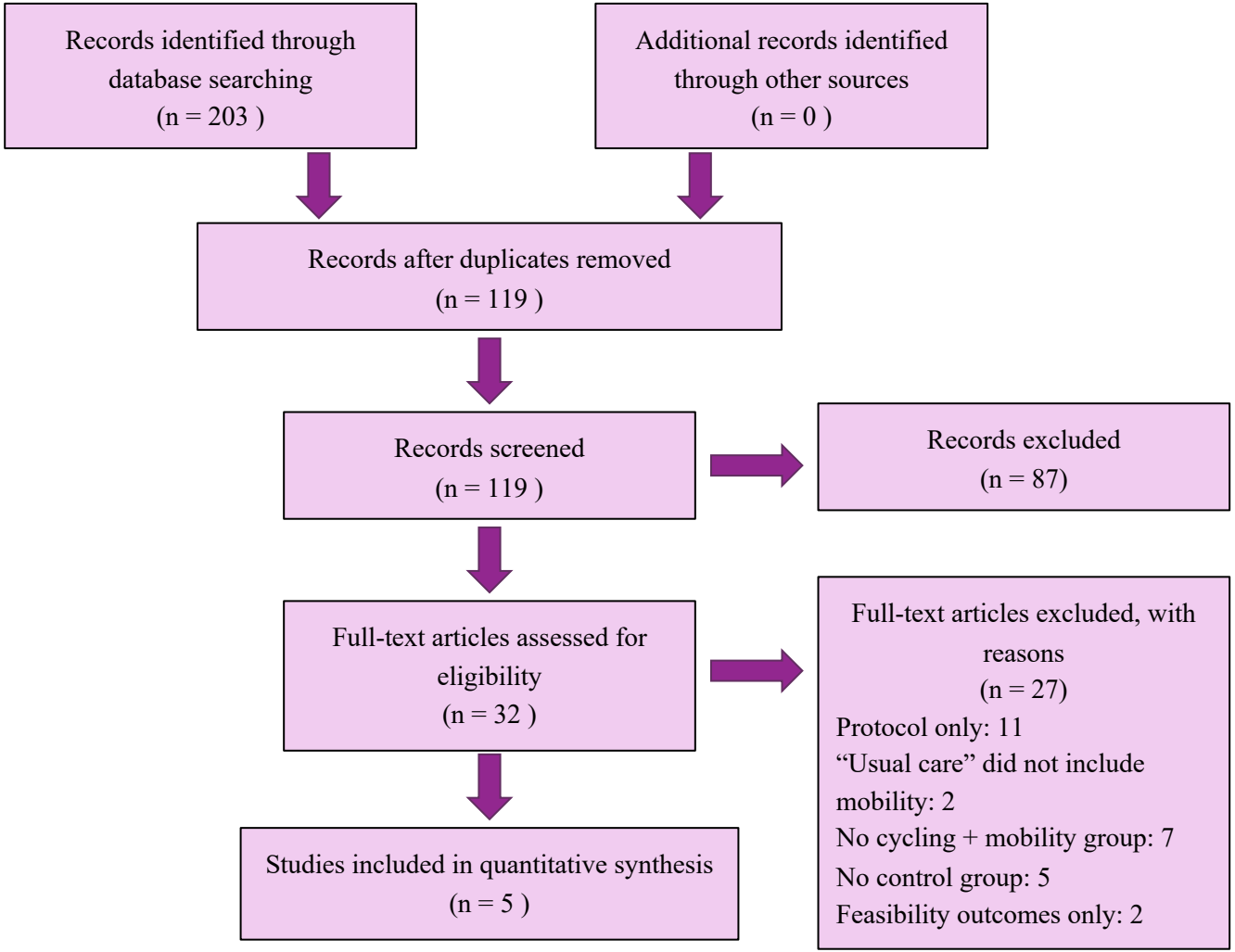
Sample Population: Adults 18+ in the ICU

Interventions: Supine cycling plus early mobility compared to early mobility alone

Outcome: Any PT-related outcome measures

Study Designs: No restrictions

Results


Records identified through database searching (n = 203)
Additional records identified through other sources (n = 0)
Records after duplicates removed (n = 119)
Records screened (n = 119)
Records excluded (n = 87)
Full-text articles assessed for eligibility (n = 32)
Full-text articles excluded, with reasons (n = 27)
Protocol only: 11
“Usual care” did not include mobility: 2
No cycling + mobility group: 7
No control group: 5
Feasibility outcomes only: 2
Studies included in quantitative synthesis (n = 5)

Article Scoring

Study	OCEBM (2009) Level	Study Design
Berney S, Hopkins RO, Rose JW, et al. (2021)[24]	2b	Randomized Control Trial
Nickels MR, Aitken LM, Barnett AG, et al. (2020)[25]	1b	Randomized Control Trial
Fossat G, Baudin F, Courtes L, et al. (2018)[10]	2b	Randomized Control Trial
Eggmann S, Verra ML, Luder G, Takala J, Jakob SM. (2018)[26]	2b	Randomized Control Trial
Kho ME, Molloy AJ, Clarke F, et al. (2019)[27]	2b	Randomized Control Trial

Cycling Intervention Parameters

Study	Type	Frequency and Intensity	Time
Berney S, Hopkins RO, Rose JW, et al. (2021)[24]	Type: FES-assisted cycling	≥ 5 days/week Intensity not defined	Up to 60 minutes per day
Nickels MR, Aitken LM, Barnett AG, et al. (2020)[25]	Supine cycling using MOTOmed Letto2	Once daily, up to 6 days/week Intensity not defined	Up to 30 minutes per session
Fossat G, Baudin F, Courtes L, et al. (2018)[10]	-Supine cycling using MOTOMed Letto 2 -Electrical stimulation applied to quadriceps muscle at a different time than cycling	5 days/week Intensity not defined	-15 minutes per cycling session -50 minutes of electrical stimulation to quadriceps muscle
Eggmann S, Verra ML, Luder G, Takala J, Jakob SM. (2018)[26]	Supine cycling using MOTOmed Letto2	Up to 3 times per day, 5 days/week 20 cycles per minute (passive cycling), motor assisted and active intensities not defined	Between 20-60 minutes, depending on participation level
Kho ME, Molloy AJ, Clarke F, et al. (2019)[27]	Supine cycling using RT300 supine cycle	5 days/week 5 revolutions per minute for first minute. Continued with passive, active-assisted, or active cycling for the next 29 minutes, according to level of participation	30 minutes per session

Outcome Measures

Strength	Functional Mobility	Endurance
• Medical Research Council Score • Handgrip Strength	• Physical Function in ICU Test Scored • Functional Status Score for ICU • Short Physical Performance Battery • Katz Index of Independence in Activities of Daily Living • ICU Mobility Score • Functional Independence Measure	• 6-Minute Walk Test

Results

- Improvements in outcome measures were seen.[10,24,25]
- However, there were no statistically significant between-group differences across the outcome measures.[10, 24-27]

Adverse Events

Adverse events occurred in <1% of all participants (4/5).

Adverse events not attributable to supine cycling, occurred in slightly greater than 1% of all participants (1/5).

Conclusion

Supine cycling may be an option when early mobility is not possible.

Early mobility and supine cycling have been found to be beneficial.

Available evidence does not currently support the addition of supine cycling to traditional early mobility programs.

Limitations

- Variability in severity of illness
- Variability of interventions, protocols, and outcome measures
- Inability of blinding of physical therapists and patients
- Lack of standardization across research of “usual care”
- Did not examine possible benefits for patients with altered levels of consciousness

Future Research

- Standardization of cycling intervention parameters
- Focus on common ICU diagnoses (ICU acquired weakness, cardiac pathologies, neurological deficits, etc.)
- Examine supine cycling when early mobility is not possible

Clinical Relevance

Continue to focus on using skilled functional mobility interventions.

Supine cycling can be used in early rehabilitation before a patient can follow a command.[25]

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Questions?