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Title: Implementing in-Bed Cycle Ergometry for Mechanically Ventilated Patients Using the Rehabilitation Treatment Specification System

Authors and Affiliations:

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Author Questionnaire

- 1. Microscopy:** Does your protocol require the use of a dissecting or stereomicroscope for performing a complex dissection, microinjection technique, or something similar? **No**
- 2. Software:** Does the part of your protocol being filmed include step-by-step descriptions of software usage? **No**
- 3. Filming location:** Will the filming need to take place in multiple locations? **Yes**
If **Yes**, how far apart are the locations? Two locations, ICU
- 4. Testimonials (optional):** Would you be open to filming two short testimonial statements **live during your JoVE shoot**? These will **not appear in your JoVE video** but may be used in JoVE's promotional materials. **Yes**

Current Protocol Length

Number of Steps: 24

Number of Shots: 41

Introduction

Videographer: Obtain headshots for all authors available at the filming location.

Authors: Please note that **the questions will not appear on screen.** Please answer in **stand-alone full sentence with sufficient context**

Answers are slightly edited in accordance with the journal guidelines

INTRODUCTION:

~~REQUIRED:~~ Summarize your research focus and the main questions it aims to answer.

- 1.1. **Thomas Rollinson:** Our research focuses on in-bed cycle ergometry for critically ill patients, examining its safety, reliability, and application through step-by-step implementation during mechanical ventilation.
 - 1.1.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera **Videographer's NOTE: Use T 1**
 - 1.1.2.

~~Describe the research gap or limitation in existing methods and how this protocol addresses them.~~

- 1.2. **Thomas Rollinson :** Critical care rehabilitation interventions are complex. The Rehabilitation Treatment Specification System provides a specific framework for delivering interventions according to pre-specified targets.
 - 1.2.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera **Videographer's NOTE: Use T 1**

CONCLUSION:

~~What does this protocol allow researchers to study or measure?~~

- 1.3. **Thomas Rollinson:** This protocol allows researchers to replicate in-bed cycling procedures to inform future research studies and allows front-line ICU clinicians to translate research into an actionable clinical intervention.
 - 1.3.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera **Videographer's NOTE: Use T 2/3**

~~Describe the most important consideration or challenge when performing this protocol.~~

- 1.4. **Thomas Rollinson:** Clinical decision making is most important when applying in-bed cycle ergometry. Clinicians should make sure that they have identified a target of therapy and that they ensure patient safety.

- 1.4.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera **Videographer's NOTE: Use take 1**

~~How can future studies build on this work? Describe the questions or research directions that can be investigated next.~~

- 1.5. **Thomas Rollinson**: Future studies should determine optimal timing, dose, and duration of in-bed cycle ergometry and explore its integration with other therapies, guided by the RTSS framework.
- 1.5.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera **Videographer's NOTE: Use take 1. 2.0 half**

Videographer: Obtain headshots for all authors available at the filming location.

Testimonial Questions (OPTIONAL):

Videographer: Please capture all testimonial shots in a wide-angle format with sufficient headspace, as the final videos will be rendered in a 1:1 aspect ratio. Testimonial statements will be presented live by the authors, sharing their spontaneous perspectives.

- Testimonial statements will **not appear in the video** but may be featured in the journal's promotional materials.
- **Provide the full name and position** (e.g., Director of [Institute Name], Senior Researcher [University Name], etc.) of the author delivering the testimonial.
- Please **answer the testimonial question live during the shoot**, speaking naturally and in your own words in **complete sentences**.

What is the key takeaway you hope viewers remember after watching your video article?

- 1.6. **Thomas Rollinson, Manager of Physiotherapy, Austin Health**: (authors will present their testimonial statements live)

1.6.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera **Videographer's NOTE: Use take 1, last part**

How does the video format of your article help you to share your work with the broader scientific community?

- 1.7. **Luke McDonald, Senior ICU Physiotherapist, Austin Health**: (authors will present their testimonial statements live)

1.7.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera **Videographer's NOTE: T 1, 2 takes**

Title Card

All procedures included within this protocol reflect primary studies that adhered to local institutional ethical standards and guidelines. No specific ethical approval was required for this protocol

Protocol

Videographer: Please always record an audio slate while filming each shot mentioned in the shotlist.

NOTE: Videographer's notes are not clear and are handwritten in sign language.

2. Equipment Preparation and Patient Positioning

Demonstrator: Luke McDonald

- 2.1. To begin, review all lines and attachments connected to the equipment [1] and secure them away from moving components of the cycle ergometer [2]. **Videographer's NOTE:** 3 takes, 1 wide, 2 CU, 3Bng
 - 2.1.1. WIDE: Talent inspecting and pointing to all lines and attachments connected to the equipment.
 - 2.1.2. Talent repositioning lines and attachments away from the cycle ergometer.
- 2.2. Remove the foot of the bed if required [1] and position the in-bed cycle ergometer such that it can be aligned with the patient's midline [2].
 - 2.2.1. Talent removing the foot section of the bed.
 - 2.2.2. Talent positioning the in-bed cycle ergometer appropriately. **Videographer's NOTE:** 4.8.1 take 2
- 2.3. Secure the in-bed cycle ergometer to the bed [1] and apply the brakes depending on the model [2].
 - 2.3.1. Talent fastening the cycle ergometer to the bed frame. **Videographer's NOTE:** 4.7.1 take 1
 - 2.3.2. Talent engaging the brakes on the cycle ergometer. **Videographer's NOTE:** 4.7.2 take 2
- 2.4. Position the patient in a semi-recumbent supine posture with the head elevated and pelvis level [1]. Maintain patient dignity by covering the pelvic region with a towel [1].
 - 2.4.1. Talent adjusting the patient into a semi-recumbent supine position.

Videographer's NOTE: 2.4.1 and 2.4.2 were taken together

2.4.2. Talent placing a towel over the patient's pelvic region.

2.5. Place the patient's feet on the pedals [1] and secure them with straps [2].

2.5.1. Talent placing the patient's feet onto the pedals. . **Videographer's NOTE:** 4.7.1 take 1, the order of 2.5.2 and 2.5.1 may have been reversed, no clear notes

2.5.2. Talent fastening the pedal straps around the patient's feet. . **Videographer's NOTE:** 4.4.3 take 1

2.6. Provide additional padding as required using towels to protect the skin while positioned in the leg shells [1].

2.6.1. Talent inserting towels around the patient's legs within the leg shells. . **Videographer's NOTE:** 2.6.1 take 2

2.7. Confirm alignment by completing one full pedal revolution [1]. Avoid knee hyper-extension by allowing approximately 15 degrees of knee flexion and prevent excessive hip flexion greater than 100 degrees [2].

2.7.1. Talent rotating the pedals through one full revolution. . **Videographer's NOTE:** T2 was without pedal in BG

2.7.2. Close-up talent pointing to patient's leg alignment showing appropriate knee and hip angles. **Videographer's NOTE:** 2.6.1 take 1 AND 2.7.2. TAKE 1

2.8. Re-check all securing mechanisms including brakes and attachments to the bed [1].

2.8.1. Talent inspecting and confirming all locks and attachments on the cycle ergometer and bed. **Videographer's NOTE:** Breaks straps, take 1

3. Therapy and Patient Monitoring

3.1. Prescribe therapy according to the options available on the in-bed cycle ergometer model in use [1].

3.1.1. Display the therapy prescription interface on the cycle ergometer and navigate through available therapy options. *Videographer: The font and readings on the device display must be clearly visible in the video*

Videographer's NOTE: For steps 3.1 to 3.4, display screen was filmed in Take 1.
Use this.

Extra wide shots are there in take 2

- 3.2. Select the initial therapy mode from Passive, Active-assisted or Active, or Resisted based on patient ability [1]. Choose the duration for warm up, main therapy, and cool down within the specified ranges and typical values as tolerated [2].
 - 3.2.1. Show selection of therapy mode options and point to Passive, Active-assisted or Active, and Resisted on the display.
 - 3.2.2. Show the display with input fields for warm up, main therapy, and cool down durations being set on the device.
- 3.3. Then, select the target rate per minute within the range of 5 to 30 revolutions per minute ensuring a minimum of 5 revolutions per minute [1].
 - 3.3.1. Shot of the display with cadence or revolutions per minute setting being adjusted on the device.
- 3.4. Adjust the resistance for patients by beginning with low resistance of 0.6 Newton-meters and increasing in increments of 1 to 5 Newton meters in response to the patient's tolerance [1].
 - 3.4.1. Show resistance settings being adjusted from low to high incrementally on the device display.
- 3.5. Commence therapy once the prescription has been completed and checked [1]. Monitor observations and vital signs for breaches [2] of stopping criteria throughout the session [3].
 - 3.5.1. Talent initiating therapy on the cycle ergometer.
 - 3.5.2. Talent observing and pointing to patient monitors and assessing vital signs.

Videographer's NOTE: This is another screen, has 4.4.4 also
 - 3.5.3. LAB MEDIA: Table 2
- 3.6. Monitor all lines and attachments [1] and patient interaction during therapy [2].
 - 3.6.1. Talent checking lines and attachments connected to the patient. **Videographer's NOTE:** Wide T1
 - 3.6.2. Talent observing the patient's responsiveness and engagement.

3.7. Adjust therapy according to patient interaction [1] and any changes in observations and vital signs [2].

3.7.1. Talent adjusting settings on the cycle ergometer in response to patient condition.

3.7.2. LAB MEDIA: Figure 2

4. Progression and Termination Criteria

4.1. Encourage the patient using verbal cues [1]. Progress one variable at a time by increasing duration first and then resistance if able [2].

4.1.1. Talent speaking to the patient and providing verbal encouragement during cycling. **Videographer's NOTE: 4.1.1 AND 4.1.2 taken together**

4.1.2. Talent adjusting therapy settings on the cycle ergometer.

4.2. Increase the rate if participation is limited [1] and decrease the rate if patient participation is increasing [2].

4.2.1. Show the rate or revolutions per minute setting being increased on the device display.

4.2.2. Show the rate or revolutions per minute setting being decreased on the device display.

4.3. Adjust the duration of the session based on patient tolerance [1].

4.3.1. Show session duration being modified on the device interface. **Videographer's NOTE: take 2**

4.4. Immediately cease activity if [1] stopping criteria are met [2] and remove the patient's feet from the pedals [2]. Reassess vital signs immediately and notify the intensive care unit team if instability persists [3].

4.4.1. Talent stopping the cycle ergometer.

4.4.2. LAB MEDIA: Table 2

4.4.3. Talent removing the patient's feet from the pedals. **Videographer's NOTE: Has 2.5.2 as well**

4.4.4. Talent assessing patient vital signs. **Videographer's NOTE: Has 3.5.2 as well**

- 4.5. Otherwise, terminate the session once the desired duration has been reached or when the patient elects to stop [1].
 - 4.5.1. Patient signing to stop and talent ending the therapy session on the cycle ergometer. **Videographer's NOTE:** Wide over the shoulder- patient-talent
- 4.6. After stopping therapy, ensure the in-bed cycle ergometer has ceased movement [1].
 - 4.6.1. Talent pointing to confirm the cycle ergometer has fully stopped.
- 4.7. Disconnect all securing devices [1] and release the brakes [2].
 - 4.7.1. Talent unfastening straps and supports from the patient. **Videographer's NOTE:** 2.5.1 1 take 1
 - 4.7.2. Talent disengaging the brakes on the cycle ergometer. **Videographer's NOTE:** 2.3.2
- 4.8. Remove the in-bed cycle ergometer [1] and clean the cycle ergometer in accordance with local policy for shared patient equipment [2].
 - 4.8.1. Talent moving the cycle ergometer away from the bed. **Videographer's NOTE:** Inside 2.2.2
 - 4.8.2. Talent cleaning the surfaces of the cycle ergometer. **Videographer's NOTE:** T1/T2 one take
- 4.9. Finally, review the patient for the presence of any new pressure or shear injuries [1]. Document findings and inform the clinical team if injuries are present [2-TXT].
 - 4.9.1. Talent inspecting the patient's skin for signs of pressure or shear injury. **Videographer's NOTE:** Take 1 in air and take 2 on bed
 - 4.9.2. Talent recording findings and communicating with another clinical staff. **TXT:** Reassess observations and vital signs

Authors: As there are no result data in the manuscript, we are skipping the results section