Physiological response to exercise testing in critically ill patients

INTERNATIONAL EARLY MOBILIZATION NETWORK

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Physiological response to exercise testing in critically ill patients.

A prospective, observational multicenter study

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M. van der Schaaf, PT, PhD

Deventer hospital
E. Klooster, PT, MSc
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Important for the preparation of the FITT criteria in ICU patients

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Evidence statement for physical therapy in the ICU

Physiotherapy in the intensive care unit: an evidence-based, expert driven, practical statement and rehabilitation recommendations

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Difficulties regarding FITT criteria in ICU patients
Objective

- To evaluate the feasibility of cardiopulmonary exercise testing (CPET) in ICU patients
- To describe the physiological response to exercise
- To compare the physiological response with healthy people
Methods

• **Inclusion criteria:**
  – ICU patients > 48 hours intubated
    • University Hospital Amsterdam or Deventer hospital
  – No contra-indication for mobilization or activation

• **Bedside cycling CPET**
  – Active group > CPET following a ramp-like protocol
    • N=28
  – Passive group > 20 min of continuous passive exercise
    • N=9
Bedside cycle CPET
Methods

• **Outcome:**
  - Physiological response to exercise
    - Heart rate; Blood pressure, VO$_2$; VCO$_2$; RER
  - Applicability of the protocol
  - Occurrence of adverse events
# Results

## Patients characteristics

<table>
<thead>
<tr>
<th><strong>Patiënten</strong></th>
<th><strong>Total N = 37</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td></td>
</tr>
<tr>
<td>Age (years) [IQR]</td>
<td></td>
</tr>
<tr>
<td>ICU stay to inclusion (days) [IQR]</td>
<td></td>
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<tr>
<td>Mech. vent. days to inclusion [IQR]</td>
<td></td>
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<tr>
<td>Apache II [IQR]</td>
<td></td>
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<tr>
<td><strong>Physical function</strong></td>
<td></td>
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<tr>
<td>Mobility (DEMMI 0-100) [IQR]</td>
<td></td>
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<tr>
<td>Muscle strength (MRC 0-60) [IQR]</td>
<td></td>
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<tr>
<td><strong>Respiratory parameters</strong></td>
<td></td>
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<tr>
<td>Mechanical ventilation N = 18</td>
<td></td>
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<tr>
<td>Canopy N = 19</td>
<td></td>
</tr>
</tbody>
</table>

Mechanical ventilation N = 18

Canopy N = 19
Results
Active cycling n = 28

• Significant changes
  – Haemodynamic parameters
    • Heart rate
    • Bloodpressure
  – Respiratory parameters
    • VO$_2$
    • VCO$_2$
    • Rf
Results
Physiological response to exercise active cycling n = 28

<table>
<thead>
<tr>
<th>Cardiovascular response</th>
<th>Rest</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart rate [IQR] beats/ min</td>
<td></td>
<td></td>
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<tr>
<td>Systolic Blood Pressure [IQR] mmHg</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Gas exchange**

| VO$_2$ [IQR] ml/min                           |      |            |
| VCO$_2$ [IQR] ml/min                          |      |            |
| Respiratory frequency [IQR] breaths/min       |      |            |
Results
Passive cycling n = 9

• No significant changes
  – Haemodynamic
  – Respiratory
Results

Applicability

- One minor adverse event
  - HF \(\downarrow\) after finishing the exercise test
Discussion

response to exercise

VO2 ml/min
Discussion

• A different response to exercise between ICU patients and healthy people
Conclusion

CPET in critically ill patients is Feasible and Safe

Response to active cycling

FITT criteria:
- Can not translate to ICU patients
- Indicators for performing safe exercise