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Impact of Indwelling Medical Equipment on Out-of-Bed Mobility for Critically Ill Children

Jessica M. LaRosa, MD 1, Razvan Azamfirei, MS 1; & Sapna R. Kudchadkar, MD, PhD 1,2,3
1 Department of Anesthesiology & Critical Care Medicine; 2 Department of Pediatrics; 3 Department of Physical Medicine & Rehabilitation
Johns Hopkins Hospital, Baltimore, Maryland, USA

INTRODUCTION

• Early mobility is an important strategy to reduce immobility-associated morbidity for survivors of pediatric critical illness.1
• Medical equipment has been identified as a barrier to early mobility for critically ill children.2
• Providers are concerned about the safety of mobilizing children with indwelling medical equipment.3
• No indwelling medical equipment is associated with an increased likelihood of having a safety event during PICU early mobility.4
• In adult ICU patients, increased indwelling medical equipment is associated with increased resources needed to perform mobility.5

OBJECTIVE

• The aim of this study is to determine the impact of indwelling medical equipment on out-of-bed (OOB) mobility for critically ill children.

METHODS

• The study is a secondary analysis of the PICU Up! multicenter stepped-wedge randomized control trial pilot study.
• The parent study is a evaluation of an early mobility intervention conducted in eight PICUS in the US.
• All children in the PICU who were hospitalized for at least 72 hours were eligible.

RESULTS

• 28,039 patient-days from 2363 individual patients were analyzed
• 32% of patient-days (9092/28039) included OOB mobility
• 75% of patient days (21182/28039) included indwelling medical equipment
• 64% of patient-days (5782/9092) in which a child was mobilized OOB included ≥ one piece of indwelling medical equipment (median 1; IQR 0-2)
• 85% of patient-days (15050/18436) in which a child was not mobilized OOB included ≥ one piece of indwelling medical equipment (median 2; IQR 1-4)
• For each 1 piece of indwelling medical equipment, there was an out-of-bed odds ratio reduction of 31% (P < 0.001). (Table 1)

| Table 1: Adjusted odds ratios for out-of-bed mobility *P < 0.001 |
|----------------|-----------------|
|                | Adjusted OR of OOB Mobility (95% CI) |
| Age Category   |                               |
| 3-6 years      | 1.1 (0.69-1.75)             |
| 7-12 years     | 0.57 (0.36-1.23)            |
| 13-17 years    | 1.52 (0.82-2.8)             |
| ≥ 18 years     | 2.2 (1.14-4.39)             |
| PRISM IV Score Category (vs. 0-4) |       |
| 5-9            | 0.73 (0.43-1.23)            |
| 10-14          | 0.4 (0.15-1.07)             |
| 15-18          | 1.8 (0.49-6.71)             |
| ≥ 19           | 0.78 (0.37-1.69)            |
| Baseline PCPC Score (vs. Normal) |       |
| Mild Disability| 1.22 (0.73-2.03)            |
| Moderate Disability | 0.58 (0.29-1.13) |
| Severe Disability | 0.27 (0.14-0.54)          |
| Very Severe Disability | 0.09 (0.01-0.53)       |
| Total number of indwelling medical equipment (per 1 increase) | 0.69 (0.60-0.81) |
| Any sedation in the last 24 hours (vs. none) | 0.37 (0.26-0.51) |
| Respiratory Support (v. room air) |       |
| Nasal Cannula | 1.04 (0.71-1.56)            |
| High Flow Nasal Cannula | 0.95 (0.63-1.47)          |
| Non-Invasive Positive Pressure | 0.52 (0.34-0.78)  |
| Mechanical Ventilation via endotracheal tube | 0.13 (0.08-0.21) |
| Mechanical Ventilation via tracheostomy | 0.37 (0.19-0.71)  |
| Tracheostomy collar | 0.3 (0.09-1.08) |
| Screened Positive for delirium (vs. negative) | 0.64 (0.48-0.85) |
| Family present at the bedside (vs. none) | 1.39 (0.92-2.09) |

CONCLUSIONS

• An increase in the number of medical devices decreased the likelihood that a critically ill child was mobilized out-of-bed, regardless of illness severity.
• Further training is required to increase the interprofessional team’s comfort mobilizing children with multiple medical devices.
Evaluating the musculoskeletal health of intensive care unit survivors: an interim analysis of the MSK-ICU cohort study

Owen Gustafson1,2, Elizabeth King1,2, Michael Schluscel3, Amy Arnold4, Carla Wade5, Philippe Nicol6, Matthew Rowland7, Helen Davies7, Mark A Williams1,2

1-3 Oxford University Hospitals / Oxford Brookes University / University of Oxford / Great Western Hospital / Milton Keynes Hospital / Royal Berkshire Hospitals / University of Exeter

Objectives

Long-term physical impairment, decreased health related quality of life and low rates of return to work are well-recognised post critical illness. However, musculoskeletal (MSK) complications and associated risk factors in this population remain largely unknown.

The aim was to characterise the MSK health state of intensive care (ICU) survivors six months following admission to ICU.

Methods

A UK based multicentre prospective cohort study of ICU survivors in ICU for >48 hours without MSK trauma or neurological insult. MSK health state was assessed at six months following admission to ICU via telephone questionnaire using the Musculoskeletal Health Questionnaire (MSK-HQ). MSK-HQ provides a score between zero and 56, where 56 indicates no MSK problem.

Follow-up physical assessments (e.g. strength, range of movement, pain) were undertaken in participants reporting a MSK problem. An interim analysis of the first 100 participants followed-up was undertaken.

The full study protocol has been published and is available from the QR code.

Results

61% (n= 61) reported an MSK problem at six months. The mean MSK-HQ score was 38 (SD 10.8).

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>n</th>
<th>100</th>
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</thead>
<tbody>
<tr>
<td>Female (%)</td>
<td>50</td>
<td>(50)</td>
</tr>
<tr>
<td>Age (mean, SD)</td>
<td>57.6 (16.7)</td>
<td></td>
</tr>
<tr>
<td>ICU Length of stay (mean, SD)</td>
<td>7.5 (6.9)</td>
<td></td>
</tr>
<tr>
<td>Clinical frailty score (mMID)</td>
<td>3 (2-4)</td>
<td></td>
</tr>
<tr>
<td>Functional mobility index (mMID)</td>
<td>1.5 (1-3)</td>
<td></td>
</tr>
<tr>
<td>Previous MSK problem (%)</td>
<td>13 (13)</td>
<td></td>
</tr>
</tbody>
</table>

The three most reported site for MSK problems were the shoulder (33/81, 54.1%), knee (16/81, 29.5%) and lower back (17/61, 27.9%). Participants without an MSK problem reported undertaking 30 minutes of physical activity on more days per week (med 4 days, IQR 2-5) than those with an MSK problem (med 0 days, IQR 0-3).

Only 23% (n= 23) received physical therapy after discharge from hospital.

Conclusion

Interim analysis demonstrates that the MSK health state six months following critical illness is poor.

MSK problems are highly prevalent and severe.

MSK problems were most prevalent at the shoulder but presented at multiple other locations.

Participants with an MSK problem are less physically active than those without.

Less than one quarter of participants had accessed physical therapy following hospital discharge.

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@OxfordICUPhysio

This study was approved by the North of Scotland Research Ethics Committee ref: 21/N5/014 and the protocol was registered (ISRCTN28898939).

Funded by

NIHR National Institute for Health Research

Oxford University Hospitals NHS Foundation Trust

Oxford Brookes University

NIHR Oxford Biomedical Research Centre

Oxford University Hospitals

NIHR Oxford BRC
Accidental ECMO Self-Decannulation Does Not Always Mean Death:
an interdisciplinary case study for an individual with COVID-19, ECMO, and BOLT

Madeline Powers Gilmore, PT, DPT, Demetrios Wilson, PT, M. Div, Lynette DeFranca, OTR/L

BACKGROUND

- Patients with severe COVID-19 are at risk for high mortality, decreased quality of life, and physical, psychological, and cognitive impairments. ECMO support followed by lung transplantation and interventional rehabilitation has been used for management of severe COVID-19 to optimize return to independence. Early rehabilitation for patients with critical illnesses, including those on VV ECMO, has been shown to improve functional outcomes, minimize morbidities, and facilitate home discharge.
- Multidisciplinary collaboration is critical for patient safety and optimization of outcomes.

OBJECTIVES

The purpose of this case study is to describe the rehabilitation of a patient with accidental ECMO self-decannulation and bilateral orthotopic lung transplantation (BOLT).

METHODS

Retrospective chart review of individual patient’s care study.

OUTCOME MEASURES & INTERVENTIONS

Outcome Measures:
- OT – AM-PAC Daily Activity, modified Barthel Index - Shain version (mBI-6), Montreal Cognitive Assessment (MoCA) Blend
- PT – Activity Measures for Post-Acute Care (AM-PAC) “6 Clicks”™ Patient Short Form Basic Mobility, John Hopkins – Highest Level of Mobility (JH-HLM) Scale

Interventions:
- OT – BUE volume reduction, BUE strengthening, activity tolerance, sitting balance, standing balance, sitting tolerance, functional transfers, and ability to self-perform ADLs; contracture prevention of 8% of R hand, thumb/wrist transfer, dynamic standing balance
- PT – Dynamic functional mobility level, mobility, transfers, seated to stand, gait training, therapeutic exercises (emphasis on proximal strengthening), BUE strengthening, balance training, gait re-education in sitting and standing, endurance training, use of safe patient handling equipment (KNEE cables) to facilitate upright, Base Stability for all to stand, diaphragmatic breathing, anxiety reduction, family training

RESULTS

- 55-year-old male with severe COVID-19: mechanical ventilation, and bilateral femoral VV-ECMO cannulation complicated by accidental ECMO self-decannulation, requiring BOLT.
- Length of stay was 108 days.
- Frequent communication between PT/OT, respiratory therapy nursing perfusion, and physicians occurred. 17 multidisciplinary communication occurrences were formally documented.
- An increase in the following scores were seen during the patient’s hospitalization: AM-PAC “6 Clicks” Basic Mobility (mBI-6), AADL (2 points), and JH-HLM (MDC-6).
- Patient was discharged to home with home health PT, OT, and use of a walker.

TIMELINE

RESULTS (Continued)

CONCLUSIONS

- Ongoing from inpatient (required reinforcement and dressing changes with physical therapists and nurses practitioners), Arthritis, participation, Nausea, Fatigue.
- Progress was somewhat limited pre-transplantation.

REFERENCES

Instantaneous change in AM-PAC “6 Clicks” Inpatient Short Form – Basic Mobility

Change in mBI-8

MoCA Blend 7.1 16/22

Change in MoCA Blend

Unable to flex 3/5 on volition during the day, patient’s voice sounds faint.
Sound Rounds in the Johns Hopkins Medical Intensive Care Unit: A Case Study

Ehizel Eyabi, BA 1; Autumn England, MM 2; Meagan Hughes, MA, LPMT, MT-BC 2; Dale Needham, MD, PhD 1; Megan Hoby, PhD 1 with the Johns Hopkins Hospital MICU Sound Rounds Team 1.

Outcomes After Critical Illness and Surgery (OACIS) Group and Pulmonary and Critical Care Medicine, School of Medicine, Johns Hopkins University, Baltimore, MD USA. 2Peabody Institute, School of Medicine, Johns Hopkins University, Baltimore, MD USA.

Background

- Approximately 50% of critically ill patients report anxiety.
- Peabody Sound Rounds Program – collaboration between Johns Hopkins Healthcare and the Peabody Institute (music conservatory).
- Introduced in Johns Hopkins Medical Intensive Unit (MICU) in April 2023.

Objectives

- To evaluate whether a Sound Rounds session is associated with lower anxiety and better vital signs in a critically ill patient.

Methods

- 56-year-old woman with multi-organ failure secondary to Hereditary Hemorrhagic Telangiectasia.
- 15 minute Sound Round session.
- 2 songs chosen by the patient; 2 songs chosen by the musician.
- Measures:
  - Visual Analog Scale (VAS-A).
  - Respiratory rate (RR) in breaths per minute.
  - Heart rate (HR) in beats per minute.
  - Qualitative feedback about her experience with the visit.

Results

The measured outcomes were lower post-Sound Rounds session compared to pre-session.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-Session</th>
<th>Post-Session</th>
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<tbody>
<tr>
<td>Visual Analog Scale – Anxiety (VAS-A)</td>
<td>50</td>
<td>12</td>
</tr>
<tr>
<td>Respiratory Rate (bpm)</td>
<td>20</td>
<td>16</td>
</tr>
<tr>
<td>Heart Rate (bpm)</td>
<td>103</td>
<td>99</td>
</tr>
</tbody>
</table>

Qualitative Feedback

- In an open-ended response, the patient reported that she felt calm after the visit.
- She also reported the session “filled her with joy and made her float”.
- She also reported that she felt some “good” sadness as the songs reminded her of meaningful moments in her life.

Conclusion

- Sound Rounds is feasible in the MICU.
- There might be clinical utility for patients experiencing anxiety.
- The patient experienced less anxiety after the Sound Rounds visit, as evidenced by patient-reported and objective physiological measures.
- More research is needed to determine if these outcomes are statistically significant and generalizable.

Scan QR code to watch the session.
Caregiver Education and Early Mobility in the Pediatric Intensive Care Unit
Kathleen Webb, OTD, OTR/L

Background and Setting
- Early mobilization refers to the initiation of rehabilitation services and engagement in mobility activities as soon as a patient has reached a predetermined level of hemodynamic and respiratory stability, often within the first 24-48 hours.
- Factors that may delay engagement in early mobility include patient age and presence of chronic medical conditions.

Setting
- Pediatric Critical Care Unit: a large tertiary care pediatric ICU with a 24/7 hospitalist to provide an intensive care unit.
- Ages of patients range from 3 months to 24 years.
- The hospital unit is an early mobility pathway protocol.
- Each mobility protocol is associated with a set of guidelines to ensure patient safety and adherence to the patient's pain management plan.

Population
- Caregivers of children admitted to the PICU
- Caregivers provide daily care to their children, often coordinating care between the hospital and home environment.

PICO Question
- Does early mobility education provide caregivers with the knowledge and skills necessary to engage in early mobilization activities and their promotion of caregiving?

Significance
- As early mobilization is shown to be feasible and safe throughout the literature, the need has been identified to improve caregivers' understanding and facilitation of early mobilization activities.
- The impact of mobilization on patient outcomes has been studied extensively, showing improved outcomes in terms of physical and mental well-being.
- This intervention has the potential to improve patient outcomes, reduce length of stay, and enhance the overall care experience.

Methods
- The research team conducted a PICU OT education session aimed at reducing patient distress and improving overall patient care.
- The team developed a self-reported pain scale to assess patient pain levels.
- The caregivers were trained in early mobilization techniques, including standing, walking, and simple stretching exercises.

Results
- Caregiver education was shown to:
  - Decrease caregiver stress levels and improve their ability to engage in early mobilization activities.
  - Provide psychological support and enhance the patient's overall well-being.
  - Increase caregiver knowledge and confidence in handling mobility-related tasks.

Discussion
- Caregiver education is essential for promoting early mobilization and ensuring patient safety.
- The implementation of early mobilization education provides caregivers with the necessary tools to support patient recovery.

Conclusion
- Early mobilization is crucial for promoting patient recovery and improving overall hospital outcomes.
- Caregiver education is a critical component in achieving early mobilization goals.

References
Progression of severity score:
- Stage 1: Independent, functional mobility
- Stage 2: Partially dependent, some aid for mobility
- Stage 3: Completely dependent, requires assistance
- Stage 4: Bedridden, no mobility
- Stage 5: Does not require assistance or supervision

**RESULTS**

![Graph showing the relationship between initial early mobility score and discharge early mobility score.](image)

**SUMMARY**

The PEMP developed at the Washington DC VA Medical Center was viewed positively by clinical staff. Factors in successful mobilization by the staff included PEMP implementation, nursing staff involvement, and adequate training. A more detailed analysis of the relationship between initial mobility and discharge mobility score is needed for further improvement.

**Importance of Members**

The early mobility initiative aimed to increase awareness of the importance of early therapeutic intervention in hospital patients with acute or chronic illness within the Veterans' Treatment Program. The development of the PEMP is an initial step in addressing the need for early mobility programs to be implemented by staff, identify potential barriers to implementation, and refine existing systems and care processes.