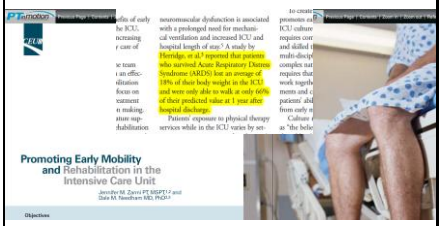
Early Mobility in the ICU: Safe and Necessary?

Danielle Keenan, PT, DPT
The University of Kansas Hospital
Rehabilitation Services

Potential Complications of Immobility

"The scientific evidence we reviewed is indisputable," said Carol Ewing Garber, Ph.D., FAHA, FACSM, chair of the writing committee. "When it comes to exercise, the benefits far outweigh the risks. A program of regular exercise – beyond activities of daily living – is essential for most adults."



neuromuscular dysfunction is associated with a prolonged need for mechanical ventilation and increased ICU and hospital length of stay.5 A study by Herridge, et al.6 reported that patients who survived Acute Respiratory Distress Syndrome (ARDS) lost an average of 18% of their body weight in the ICU and were only able to walk at only 66% of their predicted value at 1 year after hospital discharge.

Patients' exposure to physical therapy services while in the ICU varies by set-

Promoting Early Mobility and Rehabilitation in the Intensive Care Unit

Jennifer M. Zanni PT, MSPT,1,2 and Dale M. Needham MD, PhD1,3

Objectives

Literature Shows Increased Early Mobility Leads to…

- Fewer days on the ventilator
- Fewer days in the ICU
- Decreased length of stay
- Improved functional mobility following discharge
- Decreased incidence of pressure sores
- Decreased delirium

What is ICU-Acquired Weakness?

- ICU-Acquired Weakness (ICUAW): umbrella term for neuromuscular disease in the critically ill patient
- It's a term that includes 2 specific diagnoses: critical illness polyneuropathy (CIP) and critical illness myopathy (CIM)

This is the patient the patient that requires prolonged wean from mechanical ventilation AND/OR has profound muscle weakness (and other causes have been ruled out)

Scheickert, WD and Hall, J. *Chest* (2007) 131:1541-1549

Recommendations to Lower Risk for ICUAW

- tight glycemic control
- optimal nutrition
- early limb mobilization
- avoidance of risk factors such as excessive sedation, high-dose steroids, and paralytics

Scheickert, WD and Hall, J. *Chest* (2007) 131:1541-1549

Fan et al.

Objective: longitudinal study of muscle weakness, physical function and health-related quality of life and their associations with critical illness and ICU exposures

Design: Multisite prospective study with longitudinal follow-up at 3, 6, 12 and 24 months

Setting: 13 ICUs from 4 academic teaching hospitals

Patients: 222 survivors

Results: >1/3 survivors had objective evidence of muscle weakness at discharge, with most improving within 12 months. Patient continued to have impairments in physical function and health-related quality of life at 24 months. Duration of bed rest during critical illness was consistently associated with weakness throughout 24-month follow-up. Cumulative dose of systematic corticosteroids and use of neuromuscular blockers in ICU were not associated with weakness.

Conclusions: Evidence-based methods to reduce the duration of bed rest during critical illness may be important for improving these long-term impairments

Fan et. al.

TABLE 2. Multivariable Predictors of Muscle Weakness in Acute Lung Injury Survivors[a]

	Time Since Discharge				
Variable	Discharge, %	3 Mo, %	6 Mo, %	12 Mo, %	24 Mo, %
Age (per 10 years)	**17 (3, 34)**	4 (−12, 23)	**19 (1, 41)**	15 (−5, 39)	**28 (2, 60)**
Sex (female vs male)	33 (−1, 79)	26 (−17, 91)	40 (−7, 109)	7 (−30, 64)	122 (24, 298)
Functional comorbidity (per functional comorbidity index point)	−9 (−20, 4)	9 (−8, 30)	8 (−8, 26)	7 (−10, 28)	13 (−10, 41)
Acute Physiology and Chronic Health Evaluation II score (per 5 points)	4 (−6, 15)	−2 (−13, 10)	−4 (−18, 11)	5 (−10, 22)	1 (−18, 25)
Proportion of ICU days septic (per 10% change)	−4 (−9, 1)	−3 (−10, 6)	−4 (−11, 4)	−2 (−11, 7)	−7 (−16, 3)
Mean blood glucose over ICU stay > 150 mg/dL (vs < 150)	48 (−3, 125)	0 (−43, 91)	−18 (−57, 54)	−22 (−59, 49)	−6 (−60, 121)
Need for dialysis (ever vs never)	68 (0, 181)	55 (−35, 274)	19 (−41, 139)	17 (−43, 139)	−24 (−71, 102)
Days on dialysis (per day)[b] (500 mg hydrocortisone)	−2 (−3, 0)	0 (−3, 4)	0 (−2, 2)	0 (−2, 3)	−3 (−5, 0)
Physical therapy in ICU (ever vs never)	−3 (−38, 51)	−27 (−62, 39)	−41 (−69, 14)	−59 (−79, −18)	−68 (−81, −2)
Days until physical therapy started (per 5 days)	7 (−5, 20)	3 (−16, 26)	2 (−13, 21)	7 (−9, 27)	70 (13, 157)
Duration of bed rest (per day)	**3 (0, 7)**	**4 (0, 8)**	3 (0, 7)	**7 (3, 12)**	**11 (4, 19)**

[a]Results presented as a conditional decrease both (95% CI) from the maximum attenuated composite Medical Research Council (MRC) score (i.e., 60) per unit change in the covariate of each time point. Using a generalized linear regression model, assuming a gamma distribution for the outcome (transformed attenuated composite MRC score) and log link function. A positive percent change represents a decrease in muscle strength, and a negative percent change represents an increase in muscle strength. For example, every additional day of bed rest in the ICU led to a 3% decrease in composite MRC score at hospital discharge.

[b]For patients who received dialysis in the ICU.

Values in bold represent statistically significant and consistent associations of exposure variables with muscle weakness (defined as those associations with $p < 0.05$ for at least 3 of the 5 time points evaluated).

Fan et al.

Indications and Contraindications

- Know the normal values (lab, vitals, etc.) BUT must be able to understand and decide what is acceptable for each individual patient
- General Indications:
  - Hemodynamically stable
  - Oxygenating Sufficiently
  - Able to follow commands (can participate in therapy or mobility)

> Even high-intensity exercises done in bed do not counteract the adverse effects of bed rest.

Perme and Chandrashekar. Am J Crit Care 2009;18:212-221

General criteria for progressing to next phase	Patient follows commands Hemodynamic status is stable[a] Oxygenation acceptable Patient stands with walker and tolerates prewalking activities, including • full standing posture • weight shifting on legs	Patient follows commands Hemodynamic status is stable[a] Oxygenation acceptable Patient transfers to chair with walker and assistance Patient safely tolerates walking reeducation with walker and assistance for limited distances	Patient follows commands Hemodynamic status is stable[a] Oxygenation acceptable Patient tolerates progressive walking program and increased levels of activity	
Ultimate goals	Have patient sit at edge of bed unsupported or with minimal assistance Initiate standing activities with walker and assistance Initiate prewalking activities if appropriate	Initiate transfer training with walker Initiate walking reeducation with walker	Initiate independent transfer training with walker Provide progressive walking reeducation	Promote progressive transfers and walking independence Promote independence of patient and patient's family members with exercises and mobility program

[a] Acceptable limits for stable hemodynamic status are heart rate <110/min at rest, mean arterial blood pressure between 60 and 110 mm Hg, and fraction of inspired oxygen ≤0.6. Supplemental oxygen is usually titrated to maintain saturations >88% with activity. Exceptions are determined by the physician on an individual basis.

Perme and Chandrashekar. Am J Crit Care 2009;18:212-221

Indications and Contraindications continued…

- Group of 23 professionals met (included 17 physiotherapists, 5 intensivists and 1 nurse)
- All were currently involved in research of early mobilization with adult ICU patients
- Systematic Review of the Literature

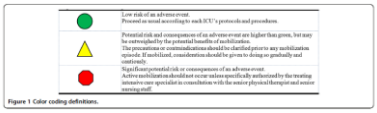


Figure 1 Color coding definitions.

Hodgson et al. *Critical Care* (2014) 18:658

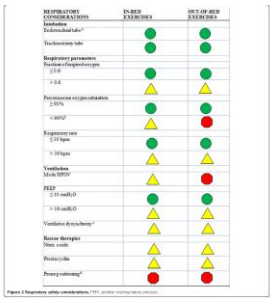


Figure 2 Respiratory safety considerations. PEEP, positive end-expiratory pressure.

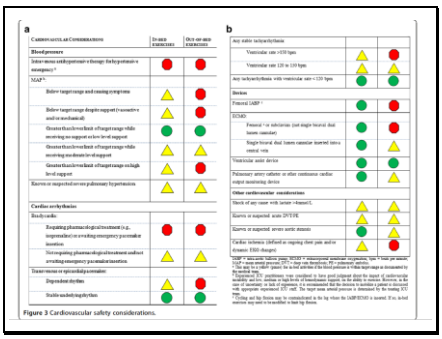
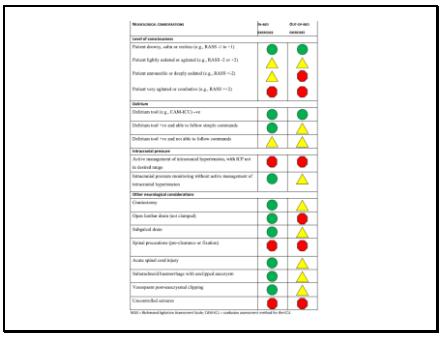


Figure 3 Cardiovascular safety considerations.



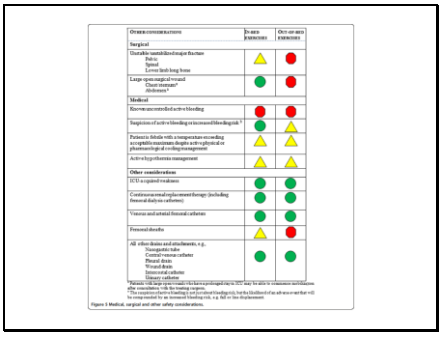


Figure 5 Medical, surgical and other safety considerations.

Other opportunities for mobility in the ICU

- Patient assists with all bed mobility (rolling and boosts up in bed)
- Perform daily grooming tasks at bed level as able (brush teeth, comb hair, mouths swabs, reach for drink of water and hold cup for self)
- Sitting on the side of the bed (to take a few medications, for bath, to assess skin, to brush teeth or comb hair)
- Up to bedside commode rather than using bedpan
- Sit in chair for meals, bath or when visitors arrive

Provide the patient (and nursing staff) with environment to be successful with mobility

- Patient/Family Education – set the expectation for mobility from the beginning
- Discuss with team regularly – address any barriers/concerns ASAP
- Prepare Patient for the "Event" – time medications, punt unnecessary trials/tests until later when able, address elimination needs, provide patient with proper attire, have equipment ready

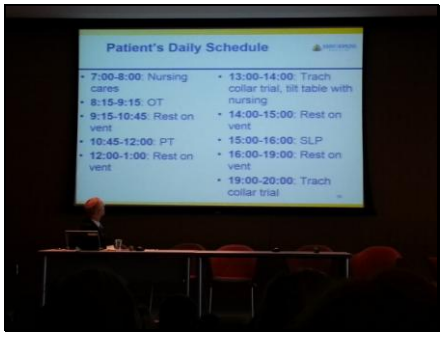
Prepare for the "EVENT"

PROPER ATTIRE & EQUIPMENT

- Additional gown or pants
- Brief- when in doubt have patient wear one
- Any additional brace/orthotic
- Gripper Socks or Shoes
- Assistive Device
- Gait Belt
- Glasses and Hearing Aids

Prepare for the "EVENT"

- The more people involved in assisting with mobility = the more coordination, preparation and flexibility required by all
- Vent weaning trial: Is first thing in the morning always the most appropriate?
- Can HD time be on a schedule
- If procedure/test interfering with scheduled mobility time – figure out PLAN B for mobility so it still happens for patient that day



Know your Plan B and C

- When mobilizing know your back-up plans for if things don't go as planned
  - -Knees Blocked
  - -Position of bed
  - -Extra Sheet in the chair
  - -2nd person standing by (or more)
  - -Wheelchair follow
- Make sure your patient knows the back-up plan
- Make sure everyone assisting knows the back-up plan

Case Study #1

52 year old male, transferred from OSH. Hx cirrhosis, ETOH, CKD, DM, morbid obesity, RLE cellulitis, c.diff., sepsis. 3 days prior to transfer PEA, 10 minutes of chest compressions. Transferred due to worsening renal failure. He was intubated at OSH. Norepinephrine gtt. Started on CRRT within 24 hours of transfer to us. Physical therapy orders placed approximately 48 hour after admission to our hospital. Now what?

CS #1 continued

CMV, 40% Fi02, PEEP 8, Set RR 22, Actual 25 at rest

Pulse 82

BP 107/86 (78)

Alert, calm, following commands for RN, able to write

Sister at bedside and able to provide patient's PLOF

ETT

OG tube

CRRT with access

right brachial PICC

left radial art line

urinary catheter

rectal tube

PT initiated on DAY 3

Key Things to Remember

- If your patient came walking into the hospital then the goal should be to get them up and moving as soon as safe to do so (usually within the first 24-48 hours)
- Cumulative Benefit
- Mobility has been proven to be safe and feasible in the ICU setting
- It takes teamwork to accomplish mobility in the ICU

QUESTIONS?

References