EARLY MOBILISATION IN ICU

Megan Whelan
Physiotherapy Department
Chris Hani Baragwanath Academic Hospital
Early Mobilisation in ICU

- ICU Acquired Weakness (ICUAW)
- Benefits
- How do we measure its effectiveness?
- How is it done?
- Barriers, Safety and Feasibility
Introduction

• Critically ill patients in the intensive care unit often require prolonged mechanical ventilation and have typically been placed on STRICT bed rest in the past (Bailey et al 2007; Adler & Malone 2012)

• Known complications of bed rest include:
  – Respiratory tract infections
  – Pneumonia
  – Constipation
  – UTI
  – DVT
  – Contractures
  – Pressure sores
  – Line sepsis
  – Weakness
ICU Acquired Weakness

• Results in:
  – Prolonged duration of mechanical ventilation
  – Longer ICU stay
  – Longer hospital stay (Truong et al 2009)

• Catabolic muscle wasting is inevitable in bedridden patients (Coakley et al 1998)
  – Acute phase = massive accumulation of oedema (Coakley et al 1998)
  – Oedema masks muscle wasting
  – As oedema subsides, the muscle wasting becomes apparent (Coakley et al 1998)
ICU Acquired Weakness

• Specific pathological processes associated with weakness include:
  – Critical illness neuromyopathy
  – Critical illness polyneuropathy
  – Critical illness myopathy

(Coakley et al 1998)
ICU Acquired Weakness

• Results in:
  – Poor long term physical outcomes
  – Functional limitations
  – Poor quality of life

ICU Acquired Weakness

Figure 1: Mechanisms and outcomes of neuromuscular weakness in critical illness

(Truong et al 2009)
Early Mobilisation

• “Early mobilisation is a pattern of increasing activity beginning with passive/active range of motion exercises progressing to ambulation”  (Bailey et al 2009, p429)

• This is normally performed within 24-48 hours of admission into ICU or upon relative haemodynamic or respiratory stabilisation  
  (Bailey et al 2007)
Benefits of Early Mobilisation

- Reduced hospital length of stay
  (Morris et al 2008, Needham et al)

- Vast improvement in functional outcomes
  (Adler and Malone 2012)

- Improved muscle strength
  (Adler and Malone 2012)

- Reduced airway complications
  (Dean 1994, Clark et al 2013)
Benefits of Early Mobilisation

• Airway complications include:
  – Ventilation/perfusion mismatch
  – Reduced lung compliance
  – Reduced secretion clearance
  – Increased work of breathing
  – Atelectasis

• Early mobilisation results in reduced incidence of pulmonary embolism
  – Patients are less likely to develop DVT
    (Dean 1994, Clark et al 2013)
Safety and Feasibility

• Multiple studies show that early mobilisation is safe and effective provided that a well trained MULTIDISCIPLINARY TEAM is involved in the process (Hodgson et al 2013)

• Ambulation with patients who have endotracheal tubes is safe (Clarke et al 2013, Bailey et al 2007)
Barriers

- Haemodynamic instability
- Respiratory instability
- Unstable fractures
- Continuous sedation
- Restraints
- Dialysis
- Lack of “mobile ventilators”
- Poor premorbid mobility
- Pain
- Patient lines

(Leditschke et al 2012, Hodgson et al 2013)
How is it done?

- Passive ROM exercises
- Active ROM exercises
- Roll from side to side
- Bridge
- Lie to sit
- Supported/unsupported sitting
- Sit to stand
- Supported/unsupported standing
- Transfer to chair
- Stepping
- Ambulation
Early activity is feasible and safe in respiratory failure patients

*Critical Care Medicine* 35(1):139-145

- Prospective study

- 103 participants mechanically ventilated >4 days in a respiratory ICU

- *Early Activity Protocol* was initiated as soon as the patients were deemed to be physiologically stable
  - Able to participate neurologically
  - Maintain BP when upright
  - Maintain adequate oxygen saturation during activity

- Aim of the protocol was to ambulate >100 feet on discharge from the RICU
Multidisciplinary team

How is it done

Barriers, safety and feasibility
Each activity event required:
- Break in sedation
- Removal of restraint

Full co-operation of the multidisciplinary team
- Physiotherapist
- (Respiratory therapist)
- Nurse
- Critical care technician

Early activity is feasible and safe in respiratory failure patients

Early activity is feasible and safe in respiratory failure patients


- Activity events identified:
  - Sit on the edge of the bed unsupported
  - Transfer from bed to chair
  - Ambulate

- Activities were progressed accordingly

- Patients received bidaily treatment sessions

- FiO2 was increased by 0.2 at the start of activity initiation for intubated patients
Early activity is feasible and safe in respiratory failure patients


• 1449 activity events in total were performed
  – 16% included sitting on the edge of the bed
  – 31% had patients out of bed
  – 53% of the activities involved ambulation

• 41% of activity events were performed in intubated patients of which 42% included ambulation

• Number of adverse events was low and none of these events were serious
• None of the adverse events resulted in:
  – Extubation
  – Complications that required additional medical treatment
  – Complications that required additional costs to the unit
  – Longer hospital stay

• Majority of the patients were able to ambulate > 100 feet on discharge from RICU

Early activity is feasible and safe in respiratory failure patients

According to the algorithm created, patients can be divided into 3 categories.

On admission into the ICU, the patient is screened and evaluated for treatment “stability” using preset criteria.

A patient specific mobilisation programme with objectives and measurable outcomes is then developed with input from all members of the MDT depending on which category the patient is placed into.


*Clinical Rehabilitation* 25(9):771-787
• **Category A:**
  Unconscious patient
  – Nursing the patient in a head up position
  – 2 hourly position changes
  – Passive ROM of upper and lower limbs
  – Once patient is awake refer to Category B

The development of a clinical management algorithm for early physical activity and mobilization of critically ill patients: synthesis of evidence and expert opinion and its translation

*Clinical Rehabilitation* 25(9):771-787
The development of a clinical management algorithm for early physical activity and mobilization of critically ill patients: synthesis of evidence and expert opinion and its translation


• **Category B:**
  Patient is awake (within first 5 days of admission)
  – Criteria for consideration of active mobilisation include:
    • Pulmonary reserve
    • Cardiovascular reserve
    • Other factors
  – If patient does not meet the criteria, refer back to category A
Progressive mobilisation occurs depending on how well the patient copes.

This will include upper and lower limb strengthening exercises especially if the patient is unable to mobilise out of bed.
• **Category C:**
**Deconditioned patient**

– Specific exercises targeting weak muscle groups of upper limbs, lower limbs and trunk

– Low resistance with multiple repetitions (eg. 3 sets of 8-10 reps at 50-70% of repetition maximum)

– Exercises intensity should be considered between 11-13 on the Borg Scale of Perceived Exertion
How do I know that my treatment is effective?

HOW AND WHAT DO I MEASURE?
Outcome Measures in ICU

• Muscle strength
  – MRC Scale
  – Oxford scale

• Function
  – Functional independence measure (FIM)
  – Physical Function ICU Test (PFIT)
  – Chelsea Critical Care Physical Assessment Tool (CPAx)
Intensive care unit acquired weakness: measuring recovery from critical illness

Corner EJ (2012)
*JICS* 13(3):216-220

The Chelsea Critical Care Physical Assessment Tool (CPAx): validation of an innovative new tool to measure physical morbidity in the general adult critical care population; an observational proof-of-concept pilot study

*Physiotherapy* 99:33-41

Construct validity of the Chelsea Critical Care Physical Assessment Tool: an observational study of recovery from critical illness

Corner EJ, Soni N, Handy JM & Brett SJ (2014)
*Critical Care* 18 R55
• ‘Easy to use’ outcome measure

• Composed of 10 commonly assessed functional components

• Component scores (0-5) range from complete dependence to independence

• Total overall score of 50
  – 0 represents total dependence
  – 50 represents full independence
1. Respiratory function
2. Cough
3. Moving within the bed
4. Supine to sitting on the edge of the bed
5. Dynamic sitting
6. Standing balance
7. Sit to stand
8. Transferring from bed to chair
9. Stepping
10. Grip strength
Why CPAx??

• Tool identifies specific areas for improvement

• Treatment is goal orientated

• Patients can actively participate in goal setting

• Progress is easily identified by everyone including the patients
Conclusion

• Early mobilisation
  – Improves strength
  – Improves functional outcome
  – Improves quality of life
  – Reduces ICU and hospital length of stay
  – Saves money for the unit

WIN – WIN!
References


