

Effects of critical illness are:

- ▶ Multifactorial
- ▶ Physical
- ▶ Non-physical
- ▶ Long-term (“chronic critical illness”)

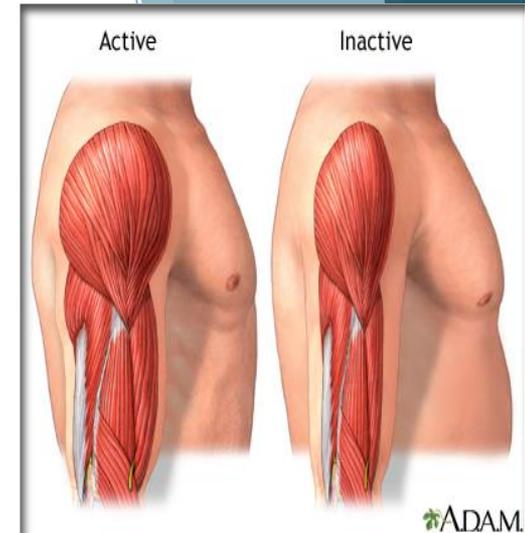
“Surviving critical illness is not the happy ending that we imagined for our patients” Herridge (2014)

Physical effects

- ▶ ICU survivors are often perceived to undergo rapid convalescence and recover to previous capabilities, but a significant number continue to have ongoing physical and non-physical problems and reduced health-related quality of life
- ▶ Global and persistent muscle wasting and weakness are prominent, functional disabilities can last for up to 5 years - severity correlating with length of ICU stay and time on IMV
- ▶ For ICU survivors, mortality is higher in the first 3 months than at any other point in the year after discharge

Prolonged bed rest and inactivity are harmful and can result in:

- ▶ skin ulceration
- ▶ compression neuropathies
- ▶ deep venous thrombosis
- ▶ osteoporosis
- ▶ deconditioning (reduced muscle size, strength, coordination, balance, endurance, and functioning)
- ▶ associated low mood.



Muscle mass decreases at a rate of 2-4% per day during first 2 weeks of Critical Care.

Up to 26% loss of Rectus Femoris CSA in first 10 days. (Puthuchery 2017)

Scale of muscle wastage correlates to the severity of organ failure and of acute lung injury.

Critical illness causes acute changes in muscle quality (myofibre necrosis) as well as mass i.e. different to just disuse/unloading

Bone failure - ARDS patients 20% higher risk of # than normal, 5 years after critical illness

- ▶ “Syndrome of generalised weakness that develops while the patient is critically ill and for which there is no alternative explanation other than critical illness itself” (Fan et al 2014)
- ▶ Neuromuscular organ failure - loss of muscle thickness most dramatic in first 2-3 weeks
- ▶ Significant complication in at least 25% of patients
- ▶ Typically symmetrical, predominantly proximal limb and respiratory muscles (facial/ocular muscles often spared)
- ▶ Associated with failure to wean
- ▶ Independently associated with a reduction in physical functioning at 6 months, an increase in post-ICU mortality, and a legacy of frailty
- ▶ Complete functional recovery only occurs in 68% of patients, with persistent severe disability in 28%.

ICU- Acquired Weakness (ICU-AW)

- ▶ No effective or preventative therapeutic strategy to date, apart from: early mobilisation (and minimising sedation) and avoidance of known risk factors
- ▶ Risk factors: SIRS; MOF; high severity of illness on admission; hyperglycaemia; prolonged immobilisation; systemic inflammation; ?corticosteroids/ NMBA's. Yosef-Brauner et al 2015)
- ▶ Muscle atrophy is a result of increased proteolysis (breakdown of protein), decreased protein synthesis, and increased apoptosis (programmed cell death) during critical illness - alterations in muscle protein homeostasis
- ▶ Unique genetic molecular features - increased collagen fibres and deposition at 6 months post ICU discharge i.e. fibrosed (? secondary to inflammation)
- ▶ Post ICU d/c - normalised proteolysis and autophagy, but ongoing impaired muscle regrowth (? decreased hypertrophic and/or regrowth capacity) - ongoing persistent muscle atrophy. (Batt et al 2017)

ICU-AW cont..

The presence of 1, 2, 5, and either 3 or 4 from:

1. Weakness developing after the onset of critical illness
2. The weakness being generalized (involving both proximal and distal muscles), symmetrical, flaccid, and generally sparing the cranial nerves (e.g. facial grimace is intact)
3. Muscle power assessed by the Medical Research Council (MRC) sum score of <48 (or a mean score of <4 in all testable muscle groups) noted on >2 occasions separated by >24 h
4. Dependence on mechanical ventilation
5. Causes of weakness, not related to the underlying critical illness, have been excluded.

Diagnosis of ICU-AW

POST INTENSIVE CARE SYNDROME (PICS)

- ▶ Disability that remains in the survival of critical illness
- ▶ Lingering consequences of sepsis and critical illness - especially if pre-morbid chronic conditions
- ▶ Persistent inflammatory state
- ▶ Impairment in cognition, psychological health and physical function; fatigue; sleep disturbances
- ▶ Increased dependency/Institutionalisation/burden on others
- ▶ N.B long term effects on family/caregivers - 30% experience stress, anxiety, depression, and complicated grief

RISK FACTORS FOR PICS:

- ▶ Cognitive impairment (up to 75% of patients) e.g. memory problems; poor concentration; slow mental processing: - duration of delirium; acute brain dysfunction (stroke, alcoholism); hypoxia; hypotension; glucose dysregulation; prolonged mechanical ventilation; severe sepsis; ARDS
- ▶ Psychological illness (up to 60% of patients) e.g. anxiety, depression, PTSD: as above, plus female gender; lower education level; pre-existing disability; sedation and analgesia use in ICU
- ▶ Physical impairment: ICU-AW (>25% of patients) - prolonged mechanical ventilation; sepsis; multi organ failure; prolonged duration of bed rest; deep sedation

Evidence shows:

- ▶ Physical activity, mobilization, and exercise therapy have been consistently shown to be safe and achievable within the ICU
- ▶ Physio and OT to encourage ambulation decreases duration of delirium; increases ventilator free days; improves functional status and 6MWT; improves subjective feeling of well-being. (Zhang et al 2018; Fan et al 2014)
- ▶ Patients with ICU-AW who received physical rehabilitation were more frequently discharged home than to a rehab facility. (Fan et al 2014)
- ▶ Early rehab significantly benefits patients in Critical Care who also have chronic disease - at 6 months and 1 year follow-up
- ▶ Significant strength improvement with intensive therapy group vs controls, and shorter ICU and hospital LOS (Pang et al 2019; Yosef-Brauner et al 2015)
- ▶ Rehab team - early and enhanced rehab for pts at high risk for prolonged ICU and hospital stays: improved mobility levels at discharge; reduced ICU and hospital LOS; reduced IMV days (McWilliams et al 2018)

Early Physio Rehabilitation may consist of:

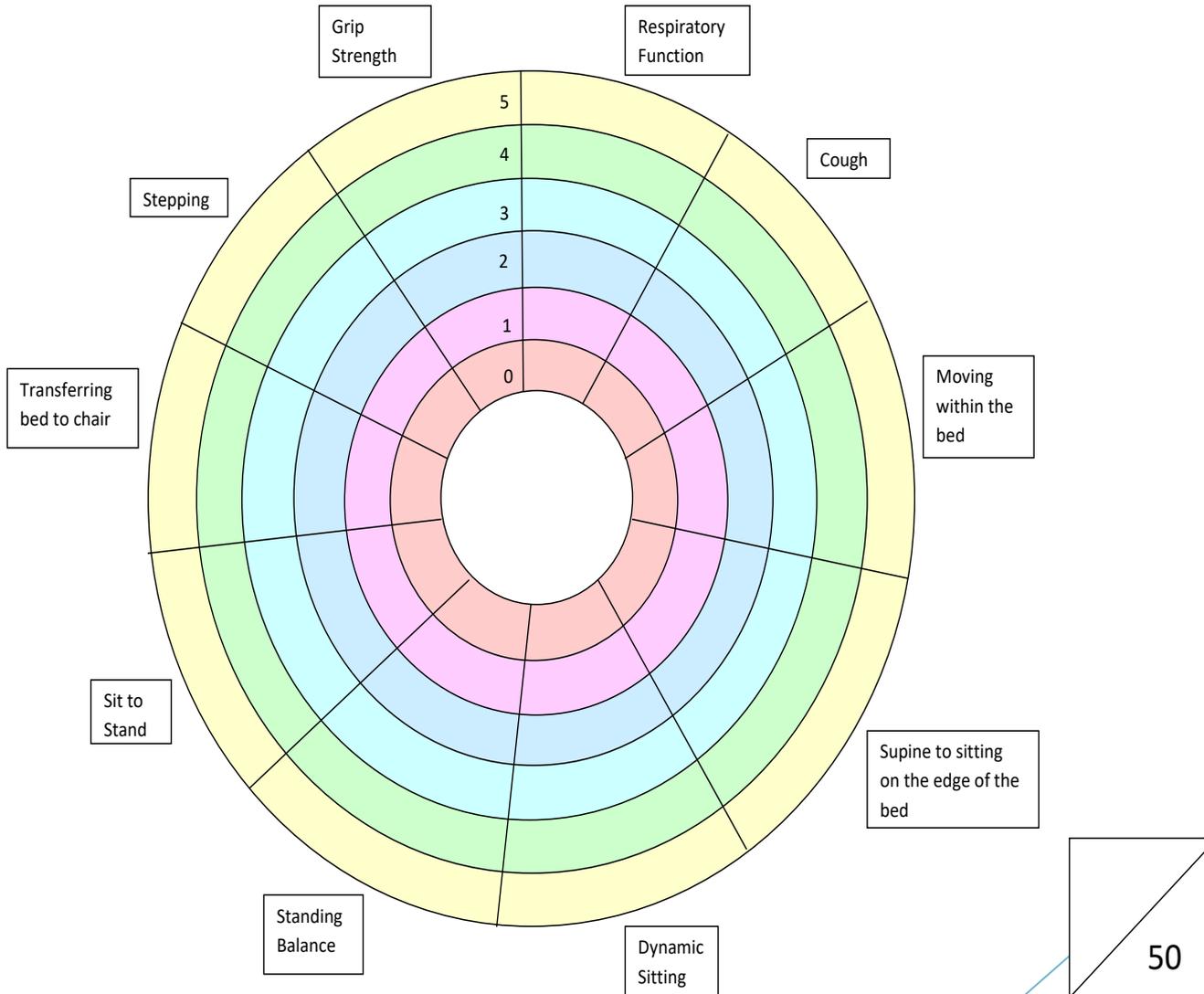
- ▶ Passive movements/stretchers/splinting/positioning
- ▶ Assisted/active/resisted bed exercises and involvement in functional tasks (rolling/washing etc)
- ▶ Bed cycle ergometry
- ▶ Sitting on edge of bed (static/dynamic)
- ▶ Sitting out of bed (patslide/hoist/standing hoist/transfers)
- ▶ Passive standing - tilt table (Sara Combiliser)
- ▶ Standing
- ▶ Marching
- ▶ Walking
- ▶ Trips outside



Mindful of ventilatory support, oxygen reserve, weaning status, CVS status/orthostatic tolerance, fatigue, sleep, nutrition, other tasks for the day e.g. trip to CT

CPAx:

The Chelsea Critical Care Physical Assessment (CPAx) is designed to measure functional recovery from critical illness.



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Check your understanding...

Q1.

Name four effects of prolonged inactivity and bed rest?

Q2.

Name 4 risk factors for Post ICU Syndrome?

Q3.

How can we all help minimise risk of developing PICS?

Answers

Q1.

Name four effects of prolonged inactivity and bed rest?

Reduced muscle mass, strength, coordination, and endurance

Reduced balance

DVT

Skin ulceration

Compression neuropathy

Osteoporosis

Low mood/poor self-esteem/cognitive processing delays/delirium

Cardiac deconditioning

Respiratory effects - atelectasis, sputum retention

Q2.

Name 4 risk factors for Post ICU Syndrome?

Delirium

Hypoxia

Sedation

Prolonged mechanical ventilation

Severe sepsis

Duration of bed rest

Q3.

How can we all help minimise risk of developing PICS?

Sedation holds

Spontaneous breathing trials

Sleep hygiene - day and night differentiation; noise reduction; lighting

Delirium management

Early physical rehab - sitting out of bed, standing/weight-bearing; active exercise

Involve in functional tasks

Know patients' normal likes/dislikes/hobbies and interests