Early rehabilitation in the ICU:

**MOVE IT or LOSE IT**

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**MOVE IT or LOSE IT**

1. ROS
2. Bed rest
3. Inflammatory cytokines
4. Malnutrition

**Critical Illness (Pathophysiological mechanisms)**

- ROS
- Bed rest
- Inflammatory cytokines
- Malnutrition
- Muscular weakness = ICUAW

**Weaning failure**

- Emotional functioning
- Deconditioning, Inactivity
- +++ Sarcopenia: Low muscle mass, muscle strength, physical performance

MOVE IT or LOSE IT

Tricking Crit Care 2009;13(4):216
Hermans et al. AJRCCM 2014

ICUAW and clinical outcome

- Cumulative proportion weaned alive from MV
- Cumulative proportion discharged alive from ICU
- Cumulative proportion discharged alive from hospital

Hermans et al. AJRCCM 2014

ICUAW and survival

Herridge et al. NEJM 2011

Prolonged ICU stay often results in long term functional and cognitive impairment (5Y)
Physiotherapy in Intensive Care
An Updated Systematic Review

Early exercise (EEX)

Results: Fifty-five clinical and 98 nonclinical studies were reviewed. The evidence from randomised controlled trials evaluating the effectiveness of early exercise in critically ill patients is conflicting. Physiotherapy that comprises early progressive mobilisation has been shown to be feasible and safe, with data from randomised controlled trials demonstrating that it can improve function and shorten ICU and hospital length of stay.

Burtin et al. CCM 2009; 37:2499-2505

Critical care in critically ill patients enhances short-term functional recovery?

Chris Burtin, PT, MSc; Beatrice Bexx, PT; Christophe Robbeets, PT; Patrick Ferdinande, MD, PhD; Daniel Langer, PT, MSc; Thierry Troosters, PT, PhD; Greet Hermans, MD, Marc Decramer, MD, PhD; Rik Saseleit, PT, PhD

Crit Care Med 2009 Vol. 37, No. 9

Study design

Critically ill patient

- 5 days ICU and forecast of another 7 days at the ICU

Usual care: respiratory physiotherapy mobilisation

Cycle programme (passive/active)

- 20’ per day

In addition to ‘Usual’ care

Burtin et al. CCM 2009:37:2499-2505
The feasibility and safety of early physical therapy in ICU patients

Frequently researched in highly specialized (university) centers

Nevertheless there are still perceived ‘barriers’ to facilitate rehabilitation on the ICU

The Feasibility of Early Physical Activity in Intensive Care Unit Patients: A Prospective Observational One-Center Study

Contraindication to Rehabilitation Intervention (43% of ICU days)

Bourdin et al. Respir Care 2010: 55-405
Passive / active cycling

Is het mogelijk om met een gesedeerde patiënt te fietsen?

A: Ja
B: Nee

Solutions for barriers

- Other material (‘Be creative’)
- Team Work
- Change in mentality (worldwide)
- Mobility protocols

UZ LEUVEN ‘Start to move asap’ protocol

Last decade > development of different mobility protocols
(Morris et al. 2008, Schweickert et al. 2009)

UZ LEUVEN ‘start to move’ ASAP protocol (+/-2009)

The proposition of the protocol is discussed, adapted and evaluated by multidisciplinary team members.
6-level program

- deliver daily mobility or physical activity from day 2 after admission to the ICU
- each level is determined by assessment using objective measurements
- each level consists of a variety of body positions and modalities for physical training and early mobility

Is feeding another ‘barrier’?

What about underfeeding or overfeeding having deleterious consequences for critically ill patients?

How can we optimize objectively the benefits of exercise efforts in ICU-critical ill patients?

Are combined, nutrition and exercise interventions, potential strategies to prevent or attenuate ICUAW and associated functional impairments?

Energy expenditure in the critically ill performing early physical therapy

- REE (resting energy expenditure) determination is of high relevance to avoid both overfeeding and underfeeding
- Patients are mobilized early
- No Recommendations exists to improve nutrition when early mobilization is performed

Methods

prospective observational study
- 49 hemodynamically stable critically ill patients
- 15 healthy volunteers

Indirect Calorimetry (V02, VC02)

<table>
<thead>
<tr>
<th></th>
<th>Exercise at 0.3 or 6 Watt</th>
<th>Rest</th>
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</thead>
<tbody>
<tr>
<td>15min</td>
<td>30min</td>
<td>15min</td>
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Results: Energy Expenditure X Exercise

Blood lactate was A: yes B: not modified?

Conclusions (Hickmann)

- The critically ill have increased REE according to inflammation defined by CRP (C-reactive protein).
- Increased energy requirement for physical activity was only present for active exercise and seems to differ with healthy population.
- For the exercise duration and intensity tested, nutritional adjustment is not indicated (the total amount of consumed calories was limited).
- The impact of prolonged active mobilization should be further investigated.
Casus

Initialen: DM
Geslacht: vrouw
Leeftijd: 77 jaar
BMI: 17 kg/m2
14-22/8/17: opname omw. respiratoire klachten te Mol
23/8/17: transfer naar UZLEUVEN Gasthuisberg
Aantal ligdagen ITE: 45
Diagnose: mitralisklepplastie ikv endocarditis
Complicaties: cardiogene shock, pneumonie

RELEVANTE MEDISCHE VOORGESCHIEDENIS:
- diabetes mellitus
- alzheimer dementie
- osteoporose
- cachexie
- sarcopenia?

Casus

VALLEN:
- Aantal valincidenten afgelopen 12 maanden: 0
- Gekende valproblematiek: Neen
- Valangst: een beetje
- Veilig schoeisel: neen (open schoeisel met hak)
- Duizeligheid of draaierigheid: neen

Casus

ACTIVITEITEN VAN HET DAGELIJKS LEVEN: (ADL, KATZ-schaal)
* Wassen en kleden volledige hulp nodig
* Transfer en verplaatsen: volledig zelfstandig, zonder loophulpmiddel (rolloator die ze wel heeft)
* Toiletbezoek (verplaatsen, kleden, reinigen): zelfstandig
* Continentie: continent
* Eten: zelfstandig

Casus

BESLUIT:
Op basis van het geriatrisch assessment werden volgende geriatrische noden bij de patiënt bepaald:
- Risico op functionele achteruitgang
  * Ergo-evaluatie: zelfredzaam
  * Kiné in te schakelen ikv bepalen nood LHM
- Aanwezigheid cognitieve beperking
  * PT gekend met Alzheimer
  * Opvolging te Mol
- Aanwezigheid mogelijks problematische thuissituatie
  * Sociale dienst in te schakelen
Casus

HUIDIGE STATUS (07/10/'17):
Neurologisch: wakker, S5Q: 4/5, delier?
Hemodynamisch: stabiel, mits pacemaker
Nefro: AKI in recuperatie
EMG: CIPMP (ICUAW)
Tracheotomie op 15/09/2017

Respiratory assessment and training:
• Tracheakap / PSV
• MIP/Pimax
• (max.insp. pressure): 45% (normal value)


Inspiratory muscle training:
• 4 sets of 6-10 breaths
• 7 days/week
• 30-50%MIP
• 4-6 Borg Score – effort and dyspnea

Tapered flow resistive loading (POWERbreathe KH1)
Adequacy score

SCORE 5 QUESTIONS

A. Open and close your eyes
B. Look at me
C. Open your mouth and put out your tongue
D. Nod your head
E. Raise your eyebrows when I have counted up to five


Basic assessment

- Cardiorespiratory unstable
  - MAP < 60mmHg or
  - FiO2 > 60% or
  - PaO2/FiO2 < 200 or
  - RR > 30 bpm
- Neurologically unstable
- Acute surgery
- Temp > 40°C

Functional assessment

MRC-scale: 0-5 score

0 = No visible contraction
1 = Visible contraction without movements of the limbs
2 = Movements of the limbs but not against the gravity
3 = Movement against gravity over (almost) the full range
4 = Movement against gravity and resistance
5 = Normal

MRC total sumscore: 38/60

Score < 48/60: significant muscle weakness

Berg Balance score ‘Start to move asap’ protocol

Berg Balance score

SITTING TO STANDING
4 able to stand without using hands and stabilize independently
3 able to stand independently using hands
2 able to stand using hands after several tries
1 needs minimal aid to stand or stabilize
0 needs moderate or maximal assist to stand

STANDING UNSUPPORTED
4 able to stand safely for 2 minutes
3 able to stand 2 minutes with supervision
2 able to stand 30 seconds unsupported
1 needs several tries to stand 30 seconds unsupported
0 unable to stand 30 seconds unsupported

SITTING WITH BACK UNSUPPORTED BUT FEET SUPPORTED ON FLOOR OR ON A STOOL
4 able to sit safely and securely for 2 minutes
3 able to sit 2 minutes under supervision
2 able to sit 30 seconds
1 able to sit 10 seconds
0 unable to sit without support 10 seconds

Handgrip force (JAMAR®)

Handheld dynamometry, handgrip strength:

Isometric muscle testing (MicroFet®)
Handgrip force (JAMAR®)

Handgrip strength: 25% (normal value)

Enteral feeding: (swallowing disorder)

LEVEL 0
LEVEL 1
LEVEL 2
LEVEL 3
LEVEL 4
LEVEL 5

CLOSE TO FULL
DESIGNATION

PASSED BASIC ASSESSMENT
MRC scale ≥ 36
BBS Sitting ≥ 5
BBS Standing ≥ 5

UZLEUVEN 'START TO MOVE' ASAP
CLOSE TO FULL
COOPERATION
S5Q1 ≥ 4/5
PASSES BASIC ASSESSMENT
MRC scale ≥ 36
BBS Sitting ≥ 5
BBS Standing ≥ 5
**BODY POSITIONING**

- 2hr turning
- Passive transfer bed to chair
- Sitting out of bed
- Standing with assist (2 ≥ persons)

Jointly with nursing staff

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**LEVEL 0**

**LEVEL 1**

**LEVEL 2**

**LEVEL 3**

**LEVEL 4**

**LEVEL 5**

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**PHYSIOTHERAPY**

- Passive/Active range of motion
- Resistance training arms and legs
- Active leg and/or arm cycling in chair or bed
- Walking (with assistance/frame)

**MRES**

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NMES:

PHYSIO in combinationFEEDING
Walking > adjustment Involve
(Discontinuation feeding)
ADL > functional > eating, drinking
Logopedy > swallowing disorders for eating

LEVEL 0
LEVEL 1
LEVEL 2
LEVEL 3
LEVEL 4
LEVEL 5

PHYSIOTHERAPY
Passive/Active range of
Resistance training, arms and legs
Active leg and/or arm

BODY POSITIONING
2hr turning
Passive transfer bed to chair
Sitting out of bed
Standing with assist (≥2 pers)

CLOSE TO FINAL COOPERATION
PASS > 45+
MRCsum > 36+
BBS² Sitting = 0
BBS² Standing = 0
BBS² Sit to stand ≥ 1

≥ 4/5 PASSES BASIC ASSESSMENT

≥ 36 + BBS²

≥ 1
Conclusions I

Critical Illness is associated with short and long term morbidity (functional status, quality of life)

There is a variety of exercise modalities available for early stages of critical illness that facilitate functional outcome

Conclusions II

The role of physiotherapy and rehabilitation in early prevention and treatment of deconditioning during and after critical illness need much more attention

Research should be conducted to further establish the effectiveness of exercise modalities in patients with critical illness on muscle function, QOL and physical function

Conclusions III

Treatment should be administered jointly between medical, physical therapy and nursing staff.

The physical therapist should be responsible for implementing mobilization plans and exercise prescription and make recommendations for progression of these in conjunction with other team members.