

Techniques de mobilisation du patient en USI

« Il ne suffit pas de sortir vivant le patient de réanimation »

S. Jaber

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Kinésithérapeutes

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Qu'est ce que la mobilisation précoce aux SI ?

- “the term **Early Mobilisation** remains undefined and include a range of heterogeneous interventions that have been used alone or in combination”



Patients à risques ?



- Clinically important muscle weakness has been reported in **25–65%** of subjects mechanically ventilated for at **least 5 days**, resulting in longer duration of **mechanical ventilation**

de Jonghe B, Bastuji-Garin S, Sharshar T, Outin H, Brochard L. Does ICU-acquired paresis lengthen weaning from mechanical ventilation. Intensive Care Med 2004;30(6):1117-1121

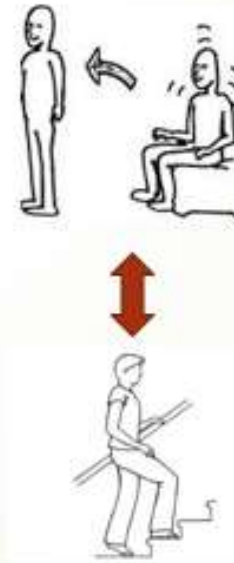
Quels sont les muscles atteints ?

“The weakness of **limb muscles** limits significantly activities and assistance for basic activities such as **sit** to **stand** or **sitting** and **standing** is oftentimes required”.

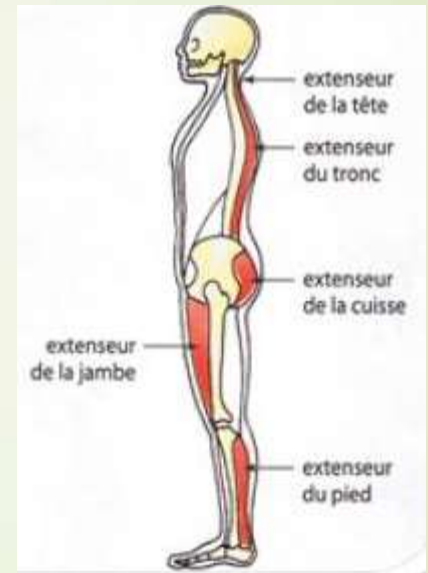


m. de la locomotion

Quadriceps, fessiers, triceps S.



Quadriceps

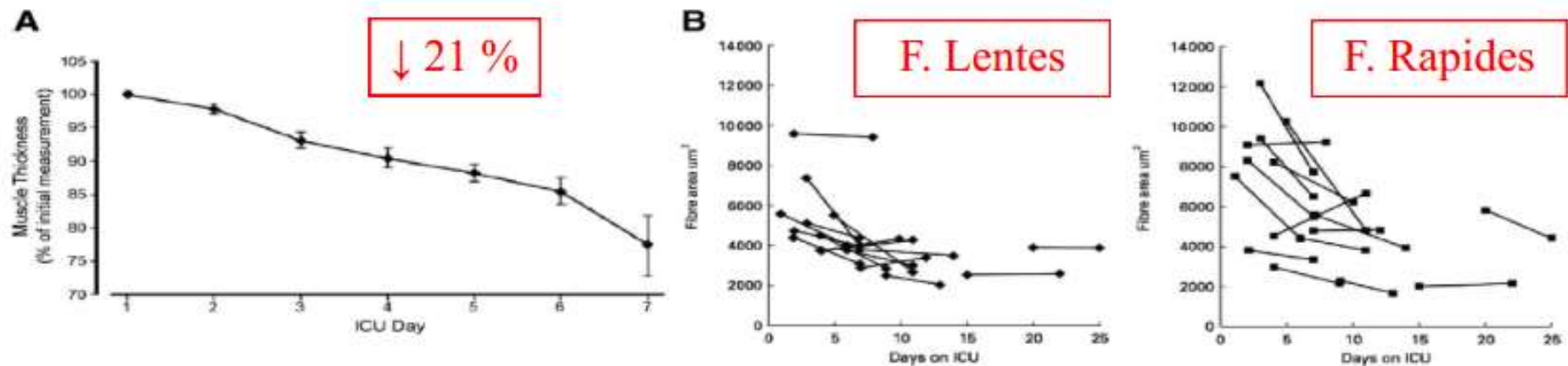


m. anti-gravitaires

Quels sont les types de fibres musculaires atteintes ?

Physical inactivity and muscle weakness in the critically ill

Melissa A. Chambers, PhD; Jennifer S. Moylan, PhD; Michael B. Reid, PhD



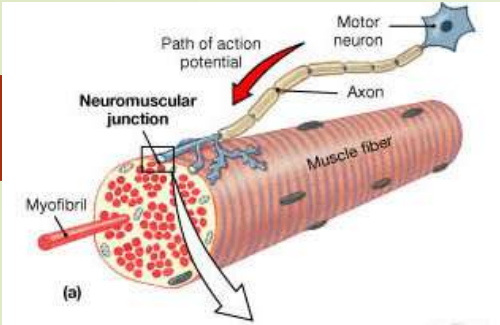
- Atrophie de 1-3 % par jour d'immobilisation complète
- Atrophie sélective des fibres de type 2 > type 1 selon certaines études

Éléments permettant diagnostic PNM ?



- Biopsie musculaire
- **Examen clinique**
- **Fatigue et faiblesse** musculaires
- (Nbre de jours de ventilation mécanique)





Quand commencer la mobilisation ?

Studies have demonstrated that the rate of muscle synthesis declines quickly (**ie, within 6 h**) after the onset of muscle inactivity, and reaches a new “lower” steady state of muscle protein synthesis **within 18–48 hours**

Studies have shown that skeletal muscle fiber area decreases by 2–4% per day in the ICU, with atrophy occurring within days of onset of critical illness.

There is growing evidence that physical rehabilitation in the ICU, when started as early as **1 or 2 days after initiating MV**, is feasible, safe, and beneficial

Powers SK, Smuder AJ, Criswell DS. Mechanistic links between oxidative stress and disuse muscle atrophy. Antioxid Redox Signal. 2011;15(9):2519-2528.

Griffiths RD. Muscle mass, survival, and the elderly ICU patient. Nutrition 1996;12(6):456-458.



En pratique: les bilans

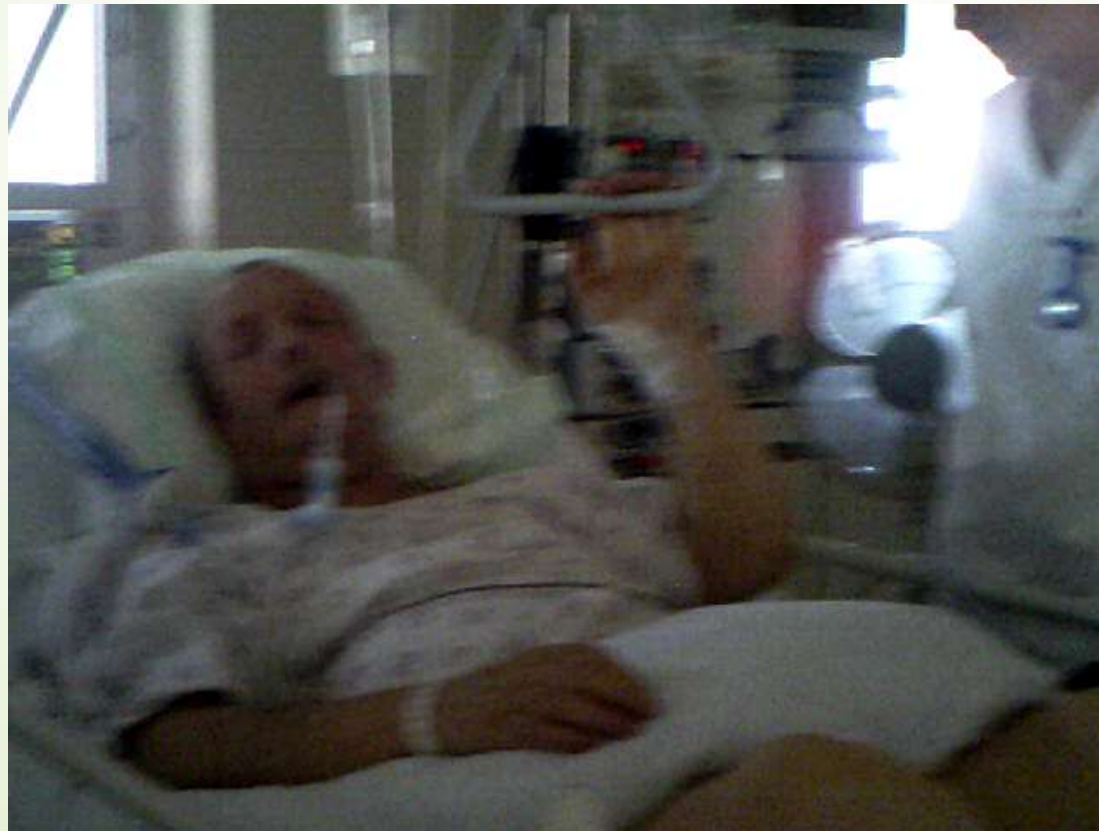
(idéalement en l'absence de sédation)

- **Au lit**
 - **Au fauteuil**
 - **Global**
- 

Bilans au lit ?



- Membres **supérieurs (av.bras+ main):**
 - Attraper la poignée de la potence et évaluer le temps de maintien (g, dr)



Ou de l'épaule...

Bilans au lit ?



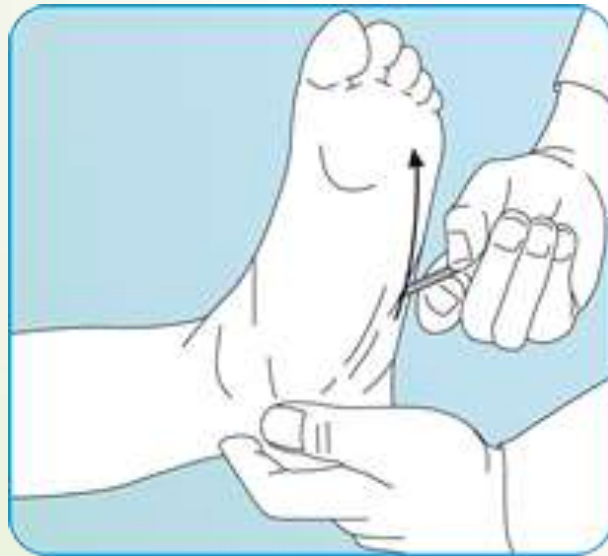
➤ Membres **inférieurs**

- Décoller talon du lit (genou en extension)



Bilans au lit ?

Stimulation cutanée-plantaire pour évaluer l'importance de la triple flexion du membre inférieur



Bilans au lit ?



➤ Membres **inférieurs**

**Leg press avec mesure
de la poussée à l'aide
d'une balance**



Bilans au lit ?



➤ Global

- Relever tronc (Mains accrochant la poignée de la potence)



Ou genoux fléchis décoller le Pelvis du plan du lit

Bilans au lit ?



- Autonomie lors du lever au fauteuil !!!!!



Bilans au fauteuil ?

- Flexion extension du genou



Bilans au fauteuil ?

- Test du lever de chaise autonome





Signes cliniques ?



Les plus fréquents

Signes cliniques

➡ Atrophie du Vaste interne



Les plus fréquents

Signes cliniques

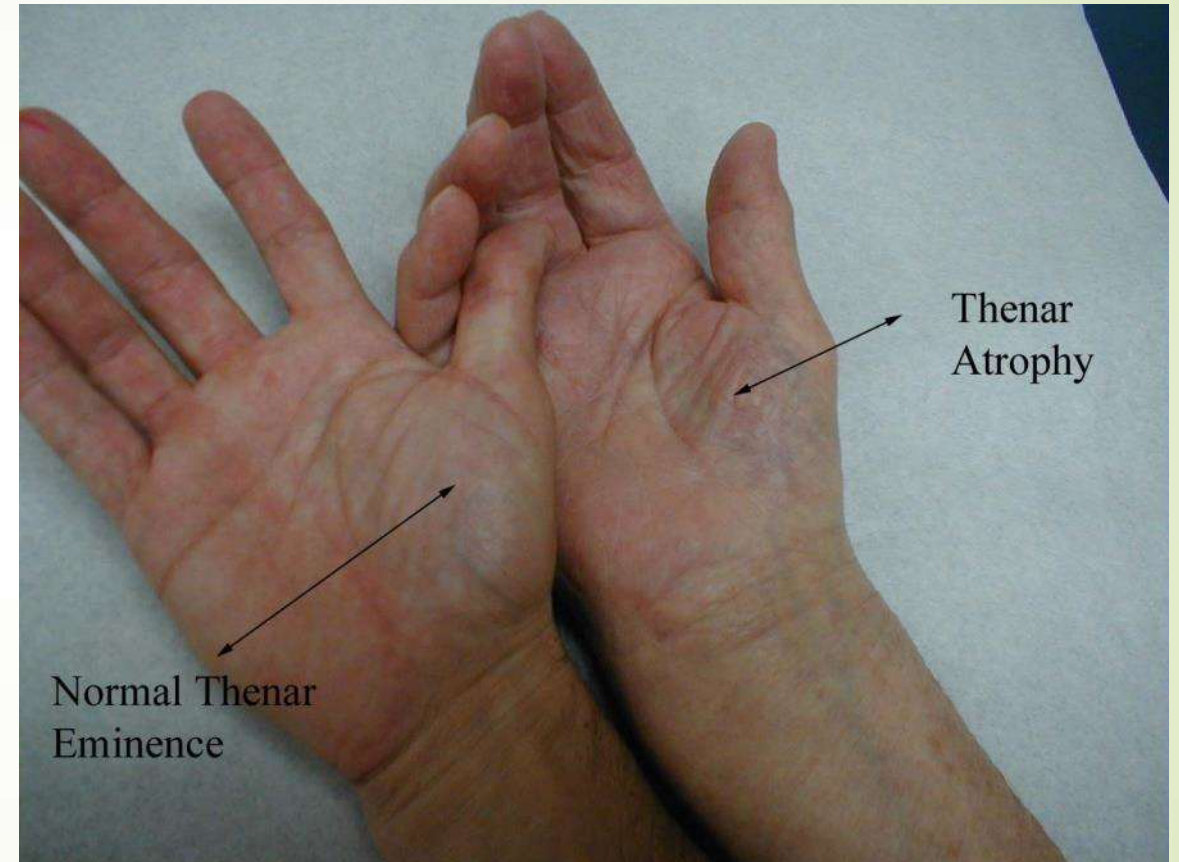
➡ Crête tibiale



Les plus fréquents

Signes cliniques

➡ Eminence Thénar



Barrières

Pour mobiliser les patients critiques

Organisation du service

Priorités des soins et
critères de prescription

Procédures des soins
« Equipe » de mobilisation
Quantité du personnel
Formation du staff
Matériel
Protocole de mobilisation

« Trop malade »



« Trop sédaté »



Facteurs liés aux patients

Instabilité:

Hémodynamique
Respiratoire
Neurologique

Ventilation mécanique
invasive Dispositifs Invasifs

Niveau de Sédation

Delirium

Faiblesse
Refus du patient

Barrières

Par discipline

Themes related to barriers to mobilisation identified by each focus group.

Major themes	Medical	Physiotherapy	Nursing
Culture			
Endotracheal tube	Yes	Yes	Yes
Sedation	No	Yes	Yes
Lines	No	Yes	Yes
Low priority	No	Yes	Yes
Communication			
Identifying and contacting the appropriate people	No	Yes	Yes
Lack of accountability	Yes	No	No
Not enough resources			
Staffing	Yes	Yes	Yes
Equipment	No	Yes	Yes
Training	No	Yes	Yes
Increased effort and burden	Yes	Yes	Yes

Themes related to facilitators to mobilisation identified by each focus group.

Major themes	Medical	Physiotherapy	Nursing
Organisational change			
Standard care	Yes	No	Yes
Mobility team	Yes	Yes	Yes
Liaising with medical teams	No	Yes	No
Multi-disciplinary team planning	Yes	Yes	Yes
Follow-up failures	Yes	No	No
Involving patient family	No	Yes	No
Leadership			
Mobility champion	Yes	No	No
Senior level support	Yes	Yes	Yes
Adequate resources			
Higher staffing levels	Yes	Yes	Yes
More equipment	No	Yes	Yes
More training	Yes	Yes	Yes

Barrières

par pays

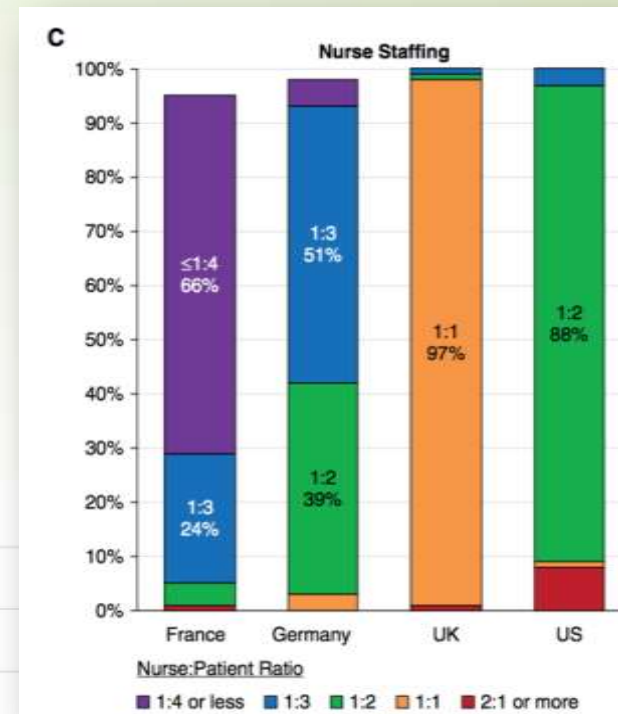
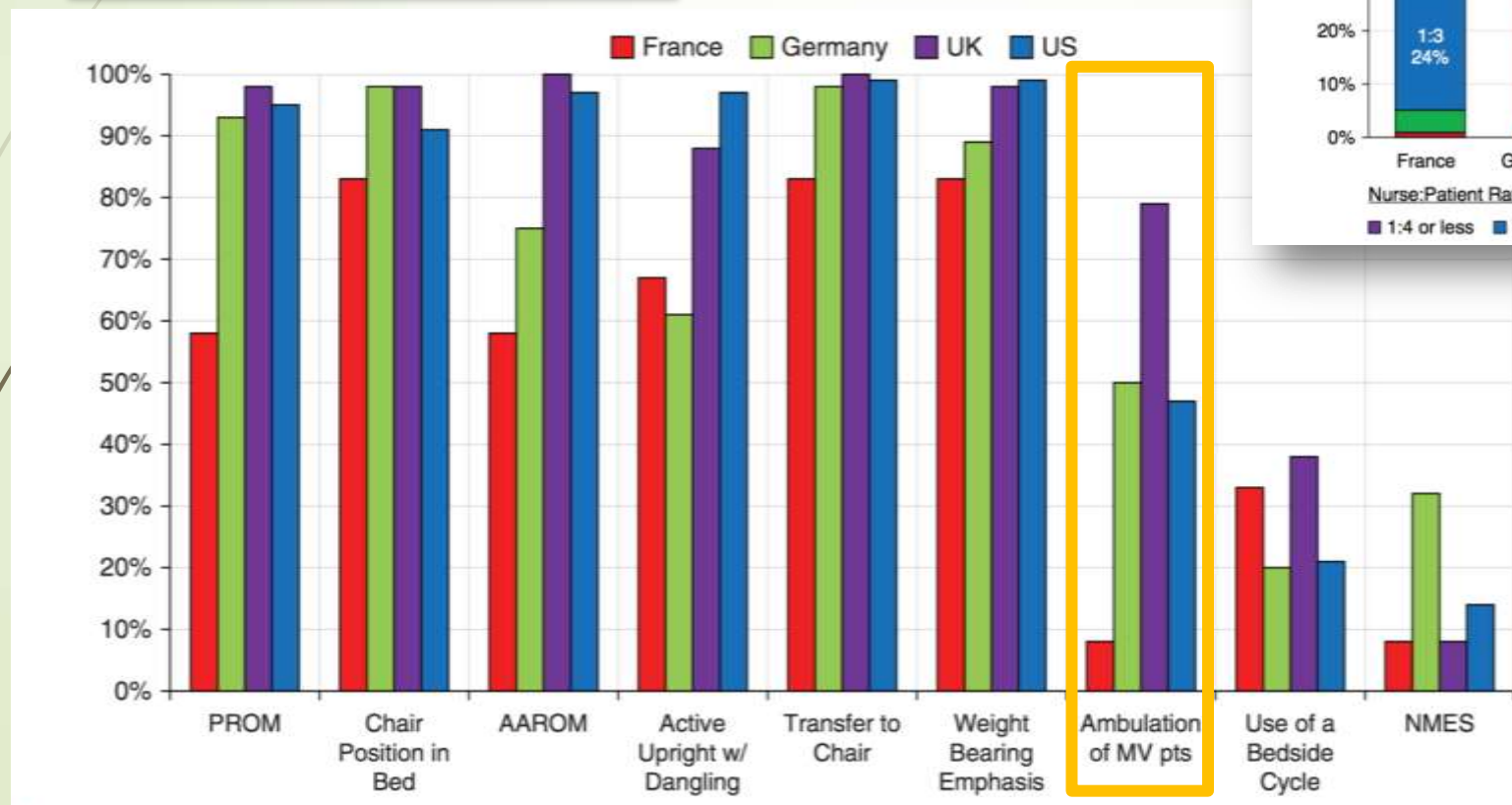
Enquête téléphonique USI

151 en France

150 en Allemagne

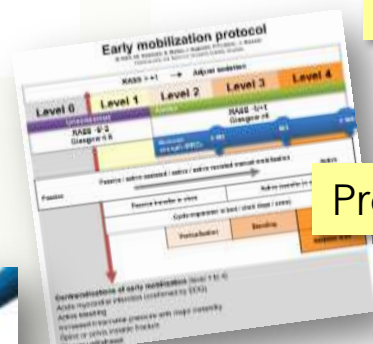
150 au Royaume uni

500 aux Etats unis





Feedback



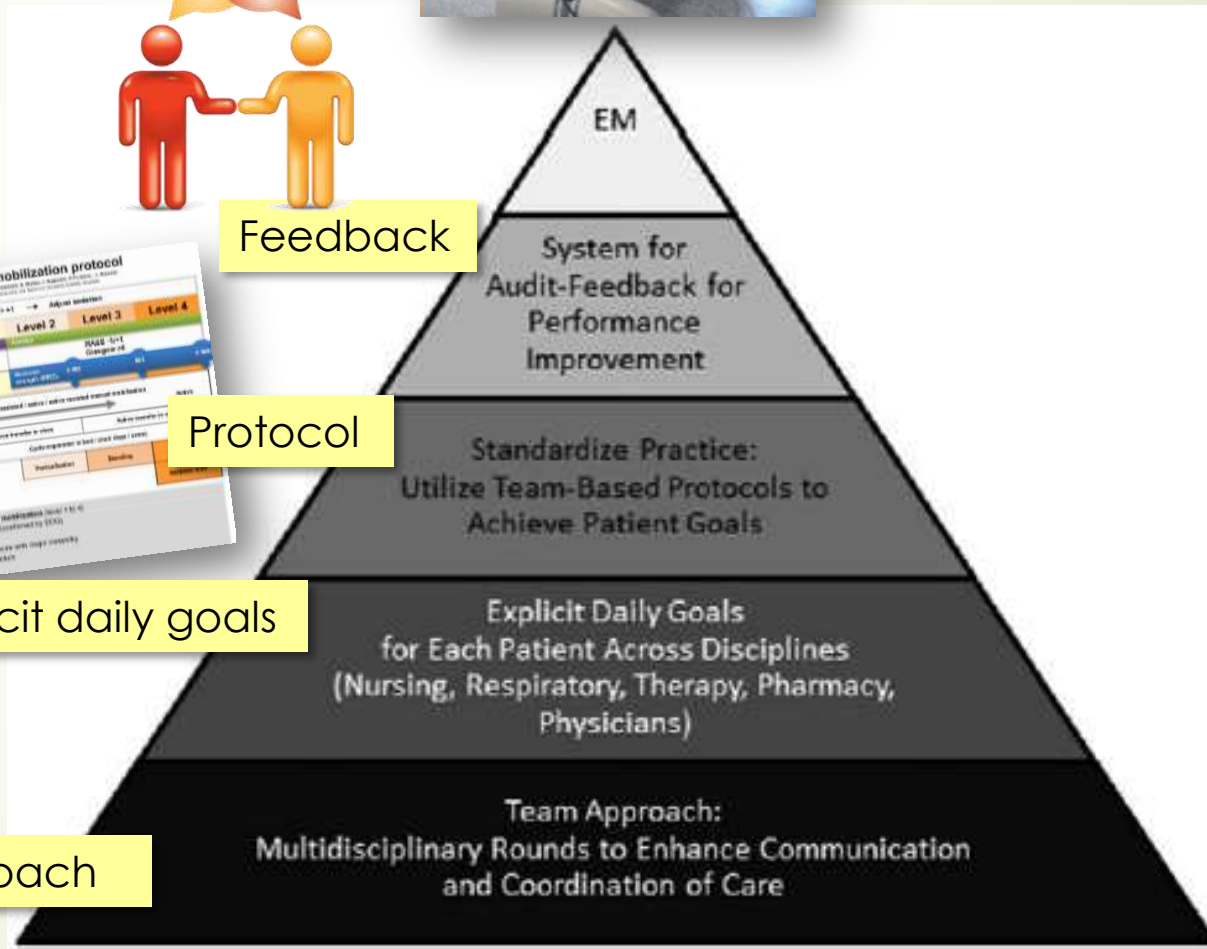
Protocol



Explicit daily goals



Team approach



RESEARCH

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Teamwork enables high level of early mobilization in critically ill patients

Cheryl Elizabeth Hickmann, Diego Castanares-Zapatero, Emilie Bialais, Jonathan Dugernier, Antoine Tordeur, Lise Colmant, Xavier Wittebole, Giuseppe Tirone, Jean Roeseler and Pierre-François Laterre*

How Early?
at 19 hours (IQR 15-23hours)

Table 2 Characteristics of mobilized and non-mobilized patients

	ICU patient-days	EM performed			No EM performed	
		Sitting in chair		In bed PTS+		
		All sitting in chair	PTS+	PTS-		
Total	709	527	337	190	83	99
Invasive mechanical ventilation (MV)	327	223 (68 %)	142 (43 %)	81 (25 %)	40 (12 %)	64 (20 %)
Severe sepsis/sepsis shock	241	166 (69 %)	102 (42 %)	64 (27 %)	28 (12 %)	47 (20 %)
Vasoactive drugs (VAD)	211	149 (71 %)	99 (47 %)	50 (24 %)	25 (12 %)	37 (18 %)
Renal replacement therapy (RRT)	115	76 (66 %)	59 (51 %)	17 (15 %)	11 (10 %)	28 (24 %)
Sedatives (SD)	260	193 (74 %)	122 (47 %)	71 (27 %)	22 (8 %)	45 (17 %)
MV + VAD	158	104 (66 %)	72 (46 %)	32 (20 %)	21 (13 %)	33 (21 %)
MV + VAD + RRT	77	46 (60 %)	38 (49 %)	8 (10 %)	8 (10 %)	23 (30 %)
MV + without SD	122	77 (63 %)	49 (40 %)	28 (23 %)	22 (18 %)	23 (19 %)
RASS -1 to +1	576	454 (79 %)	284 (49 %)	170 (30 %)	58 (10 %)	64 (11 %)
RASS >+1	25	21 (84 %)	18 (72 %)	3 (12 %)	1 (0.4 %)	3 (12 %)
RASS <-1	108	50 (46 %)	33 (31 %)	17 (16 %)	22 (20 %)	36 (33 %)

Values expressed as number (percentage)

MV mechanical ventilation, VAD vasoactive drugs, RRT renal replacement therapy, SD sedatives drug, RASS Richmond agitation-sedation scale, PTS+ physical therapy session carried out, PTS- no physical therapy session carried out, EM early mobilization

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Supplemental Digital Content3: Multivariate analyses for risk factors associated with mortality.

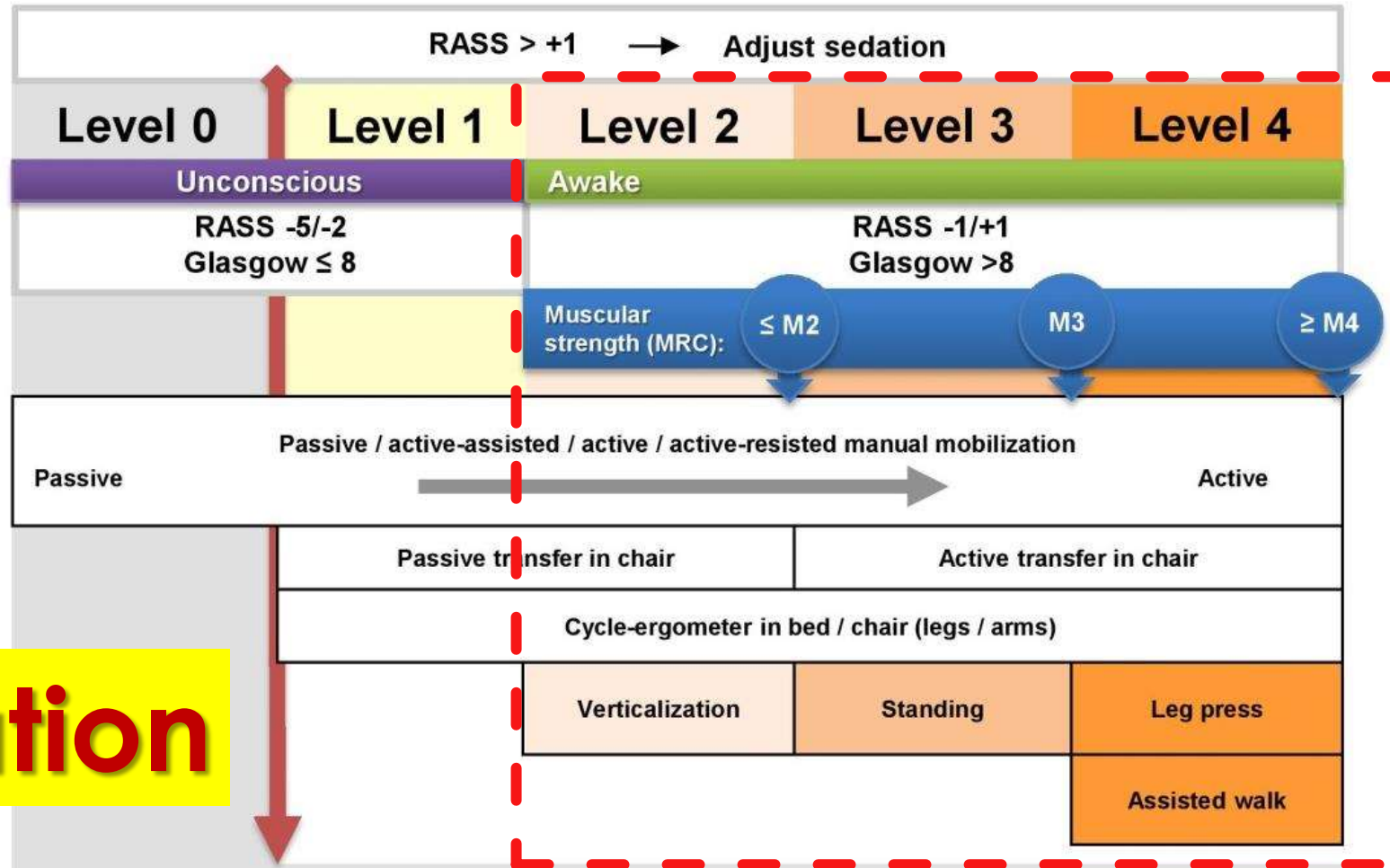
ICU mortality

	AOR (95% CI) <i>Adjusted on 15 covariables</i>	<i>p</i> -value	AOR (95% CI) <i>Adjusted on 4 covariables</i>	<i>p</i> -value
Early Mobilization	0.06 (0.01-0.42)	0.004*	0.06 (0.01-0.29)	0.001*
ICU length of stay	1.10 (1.04-1.17)	0.001*	1.08 (1.03-1.12)	0.001*
Male	1.78 (0.27-11.63)	0.55		
Age (years)	1.09 (1.01-1.17)	0.04*	1.07 (1.02-1.13)	0.01*
Tracheotomy	0.67 (0.05-8.47)	0.76		
Berlin classification	1.95 (0.78-4.90)	0.15	2.26 (1.01-5.03)	0.04*
Surgery [#]	1.54 (0.50-4.69)	0.45		
Cirrhosis	2.81 (0.35-22.77)	0.33		
BPCO	0.24 (0.01-5.07)	0.36		
Cancer	1.32 (0.21-8.18)	0.77		
Neurologic	1.24 (0.06-26.49)	0.89		
APACHE II score	1.06 (0.91-1.23)	0.49		
SOFA score	1.24 (0.92-1.69)	0.16	1.38 (1.14-1.67)	0.001*
Sedatives drug use	1.04 (0.07-15.33)	0.98		
Vasoactive drug use	1.99 (0.15-26.70)	0.60		
Renal replacement therapy	0.24 (0.04-1.40)	0.11		

AOR: Adjusted Odd-Ratio; [#]surgery: elective or urgent surgery; *denotes *p*-value < 0.05

Early mobilization protocol

M. Patri, CE. Hickmann, E. Bialais, J. Dugernier, P-F Laterre, J. Roeseler
Intensive care unit, Saint Luc university hospital, Brussels.



↓ Sedation

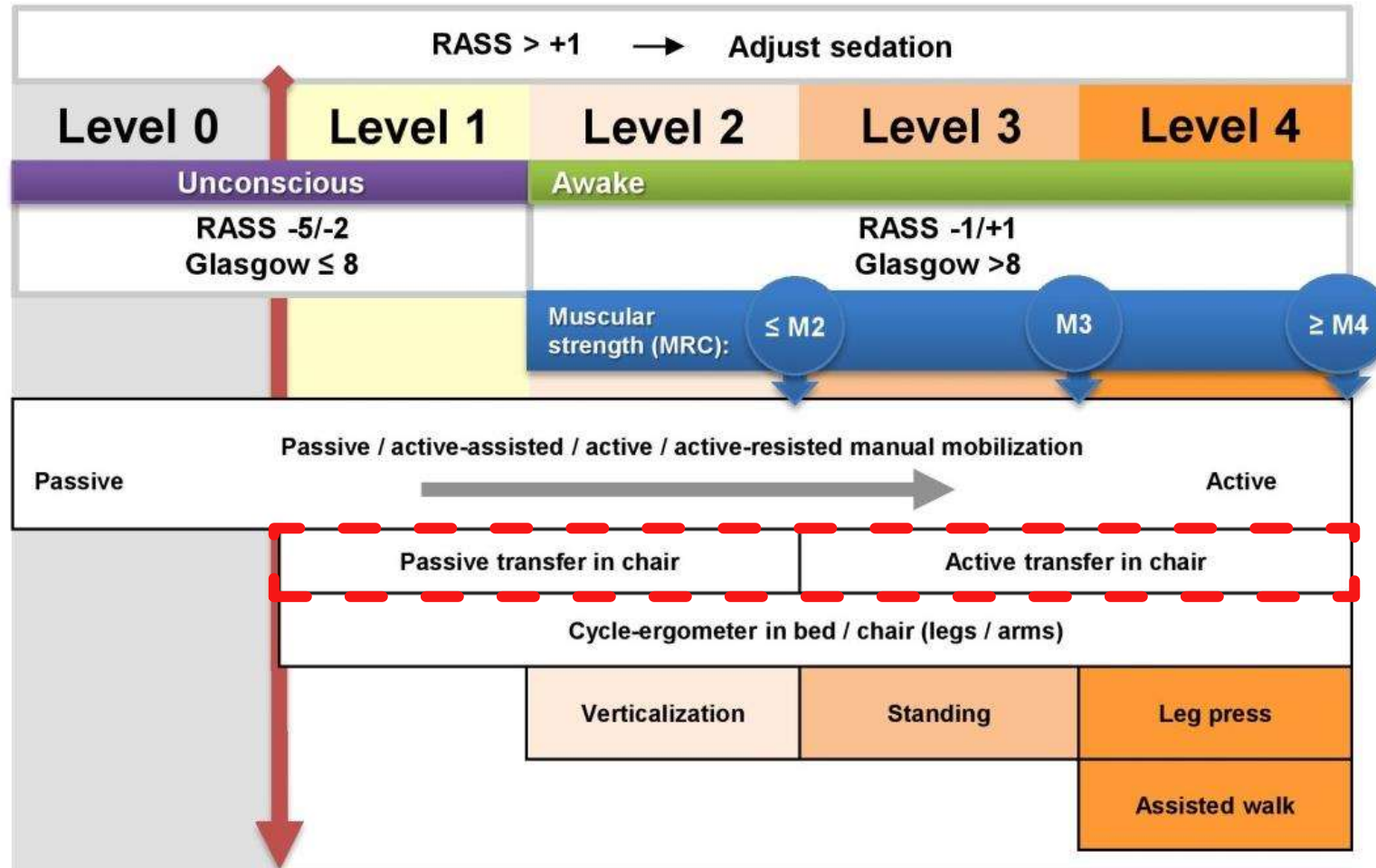
Contraindications of early mobilization (level 1 to 4)

- Acute myocardial infarction (confirmed by ECG)
- Active bleeding
- Increased intracranial pressure with major instability
- Spine or pelvis instable fracture
- Therapy withdrawal



Early mobilization protocol

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1 x day – ICU team

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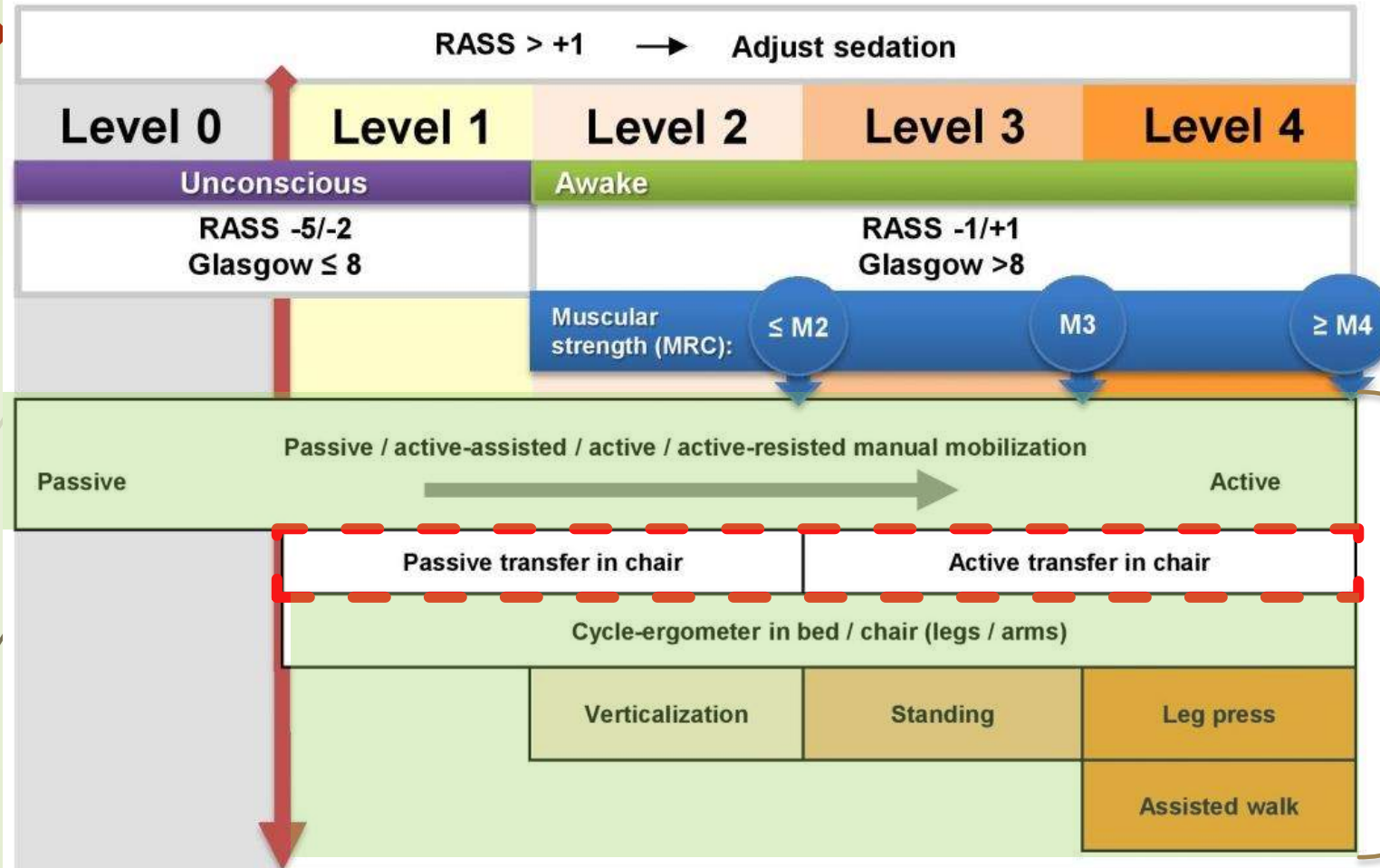






Early mobilization protocol

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Intensive care unit, Saint Luc university hospital, Brussels.



1 x day – ICU team

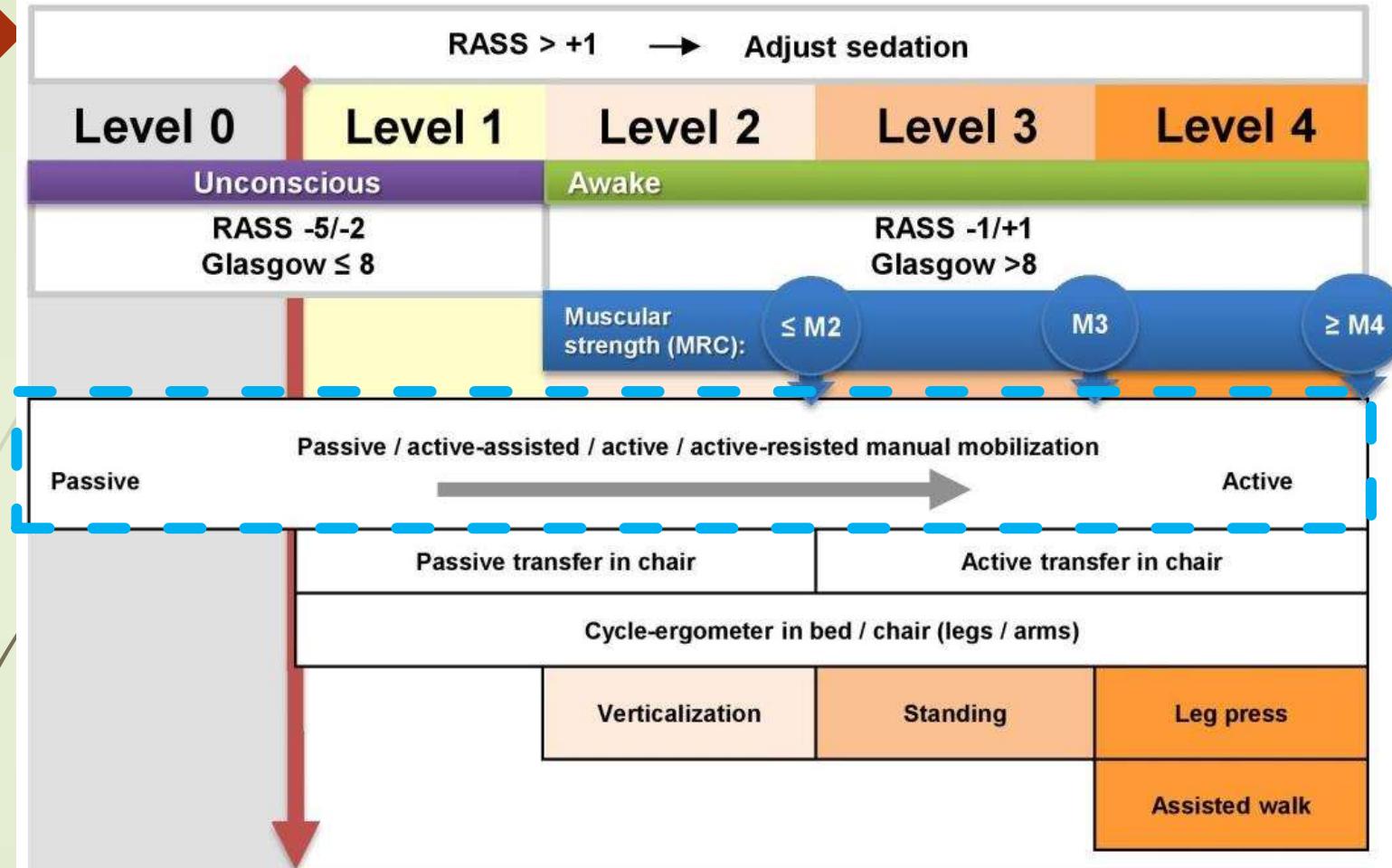
2 x day – PT team

Contraindications of early mobilization (level 1 to 4)

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- Active bleeding
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- Spine or pelvis instable fracture
- Therapy withdrawal

Early mobilization protocol

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Intensive care unit, Saint Luc university hospital, Brussels.



Contraindications of early mobilization (level 1 to 4)

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Passive / active-assisted / active / active-resisted manual mobilization

Passive

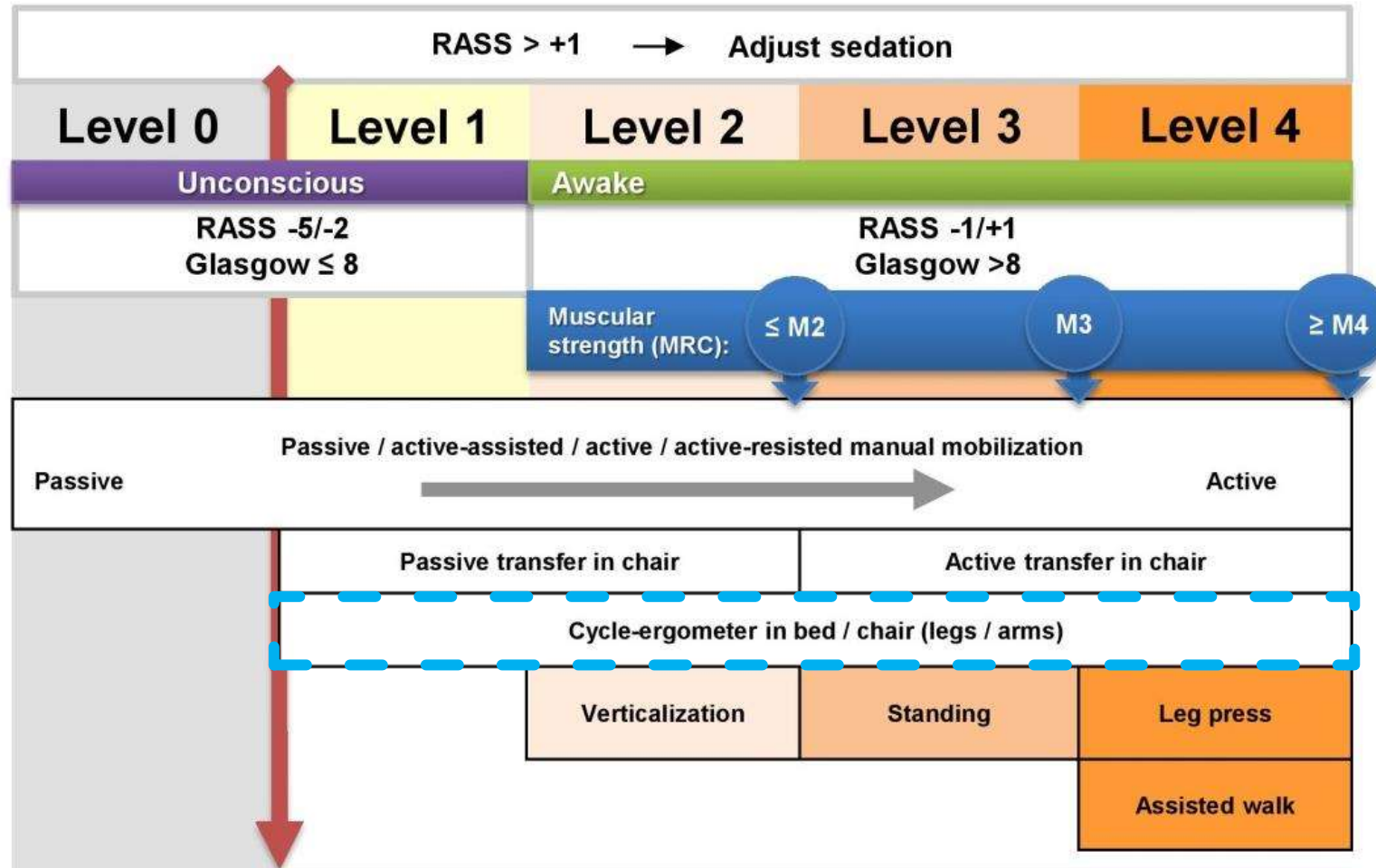


Active



Early mobilization protocol

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Intensive care unit, Saint Luc university hospital, Brussels.



Contraindications of early mobilization (level 1 to 4)

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- Therapy withdrawal

Cycle-ergometer in bed / chair (legs / arms)



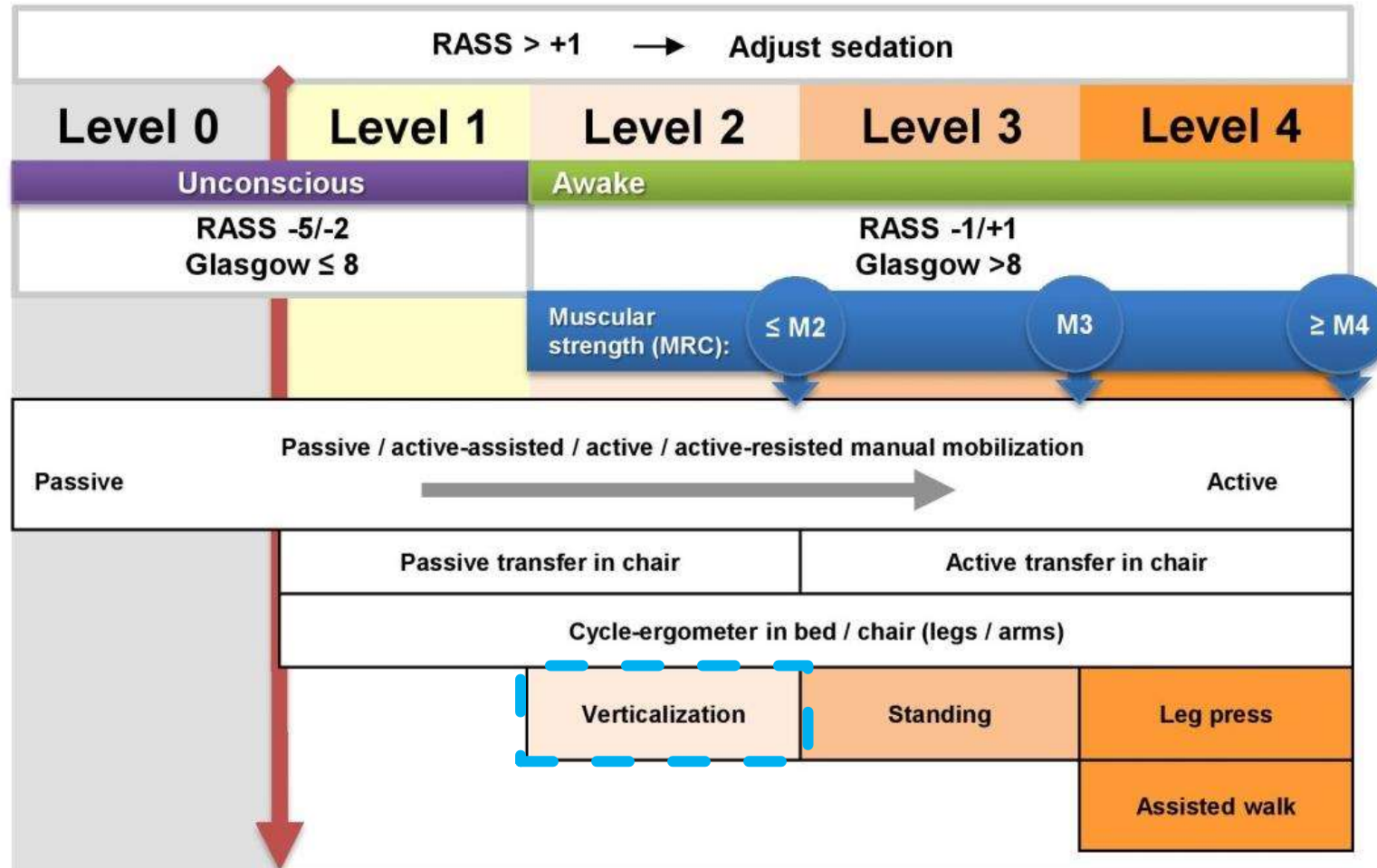


Cycle-ergometer in bed / chair (legs / arms)



Early mobilization protocol

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Intensive care unit, Saint Luc university hospital, Brussels.



Contraindications of early mobilization (level 1 to 4)

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Verticalization

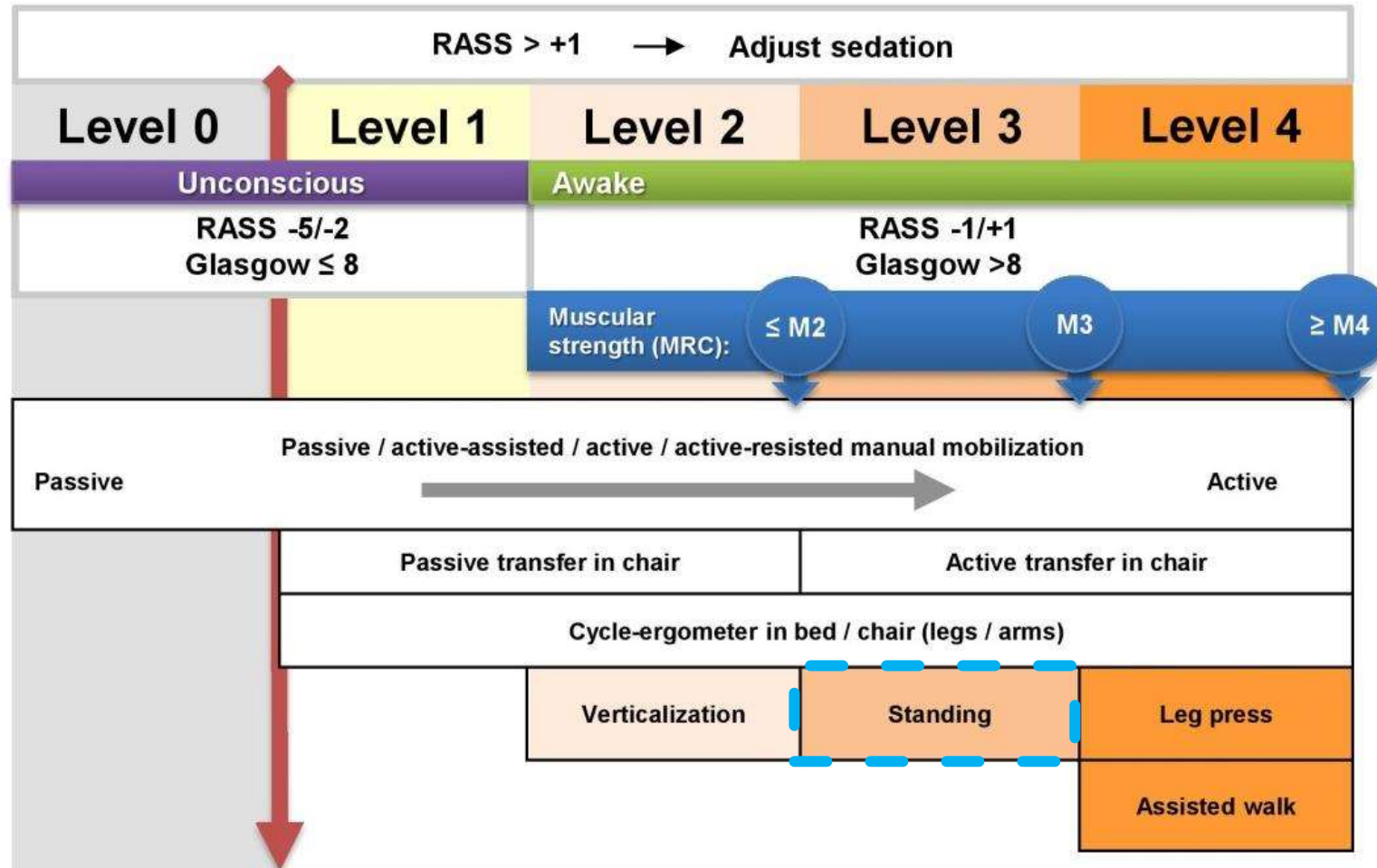


Verticalization



Early mobilization protocol

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Intensive care unit, Saint Luc university hospital, Brussels.



Contraindications of early mobilization (level 1 to 4)

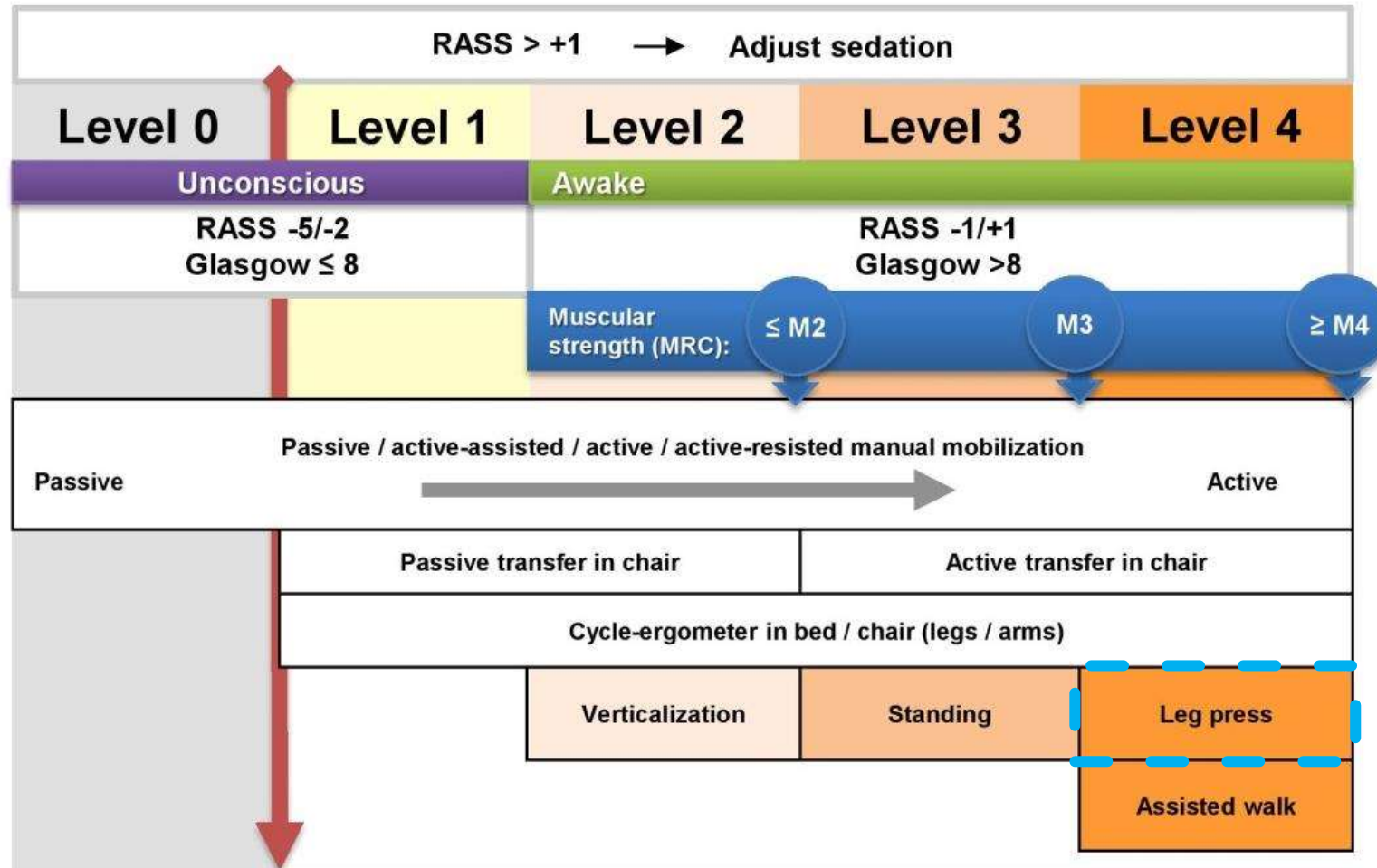
- Acute myocardial infarction (confirmed by ECG)
- Active bleeding
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- Therapy withdrawal



Standing

Early mobilization protocol

M. Patri, CE. Hickmann, E. Bialais, J. Dugernier, P-F Laterre, J. Roeseler
Intensive care unit, Saint Luc university hospital, Brussels.



Contraindications of early mobilization (level 1 to 4)

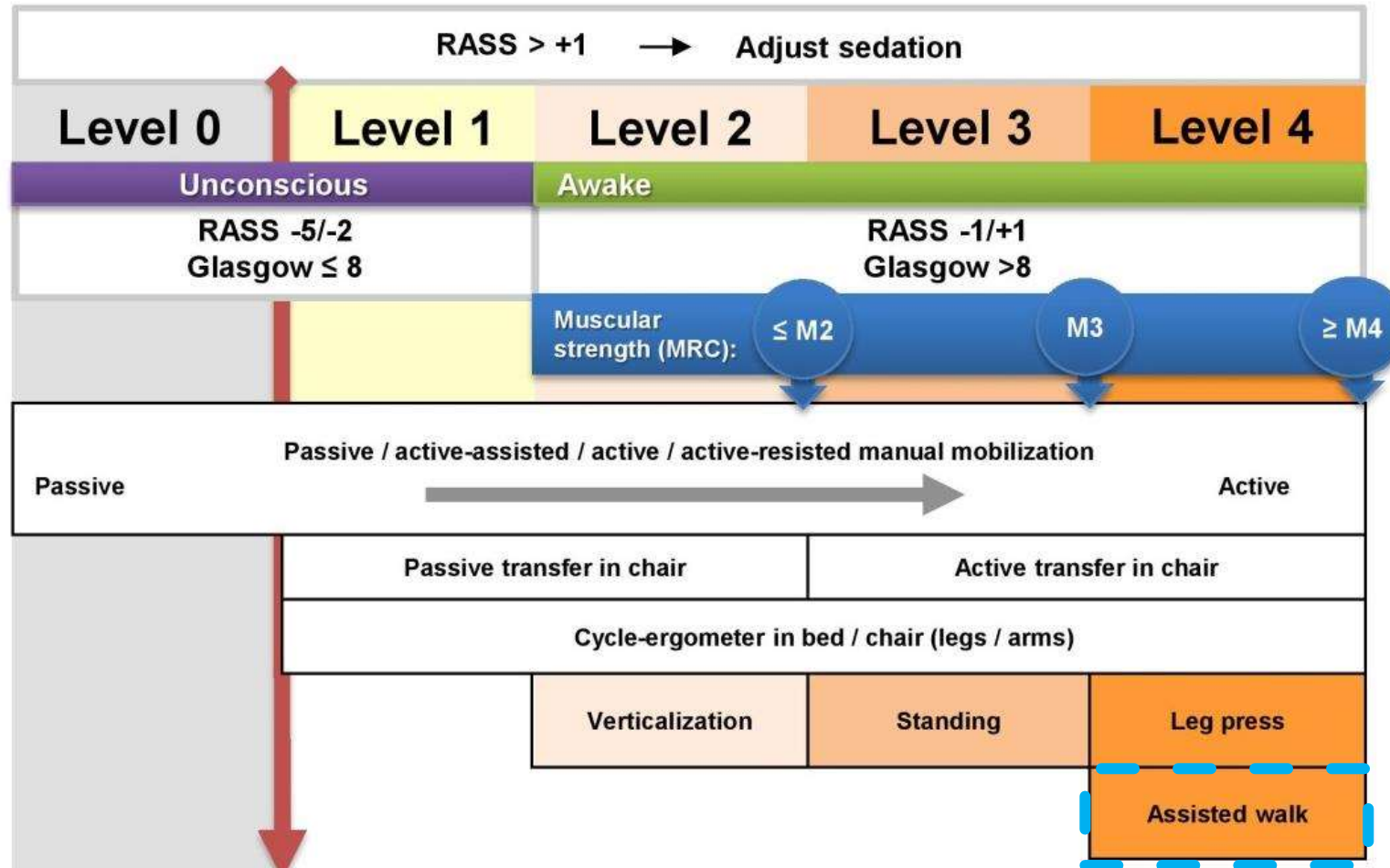
- Acute myocardial infarction (confirmed by ECG)
- Active bleeding
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- Spine or pelvis instable fracture
- Therapy withdrawal

Leg press



Early mobilization protocol

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Intensive care unit, Saint Luc university hospital, Brussels.



Contraindications of early mobilization (level 1 to 4)

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Assisted walk





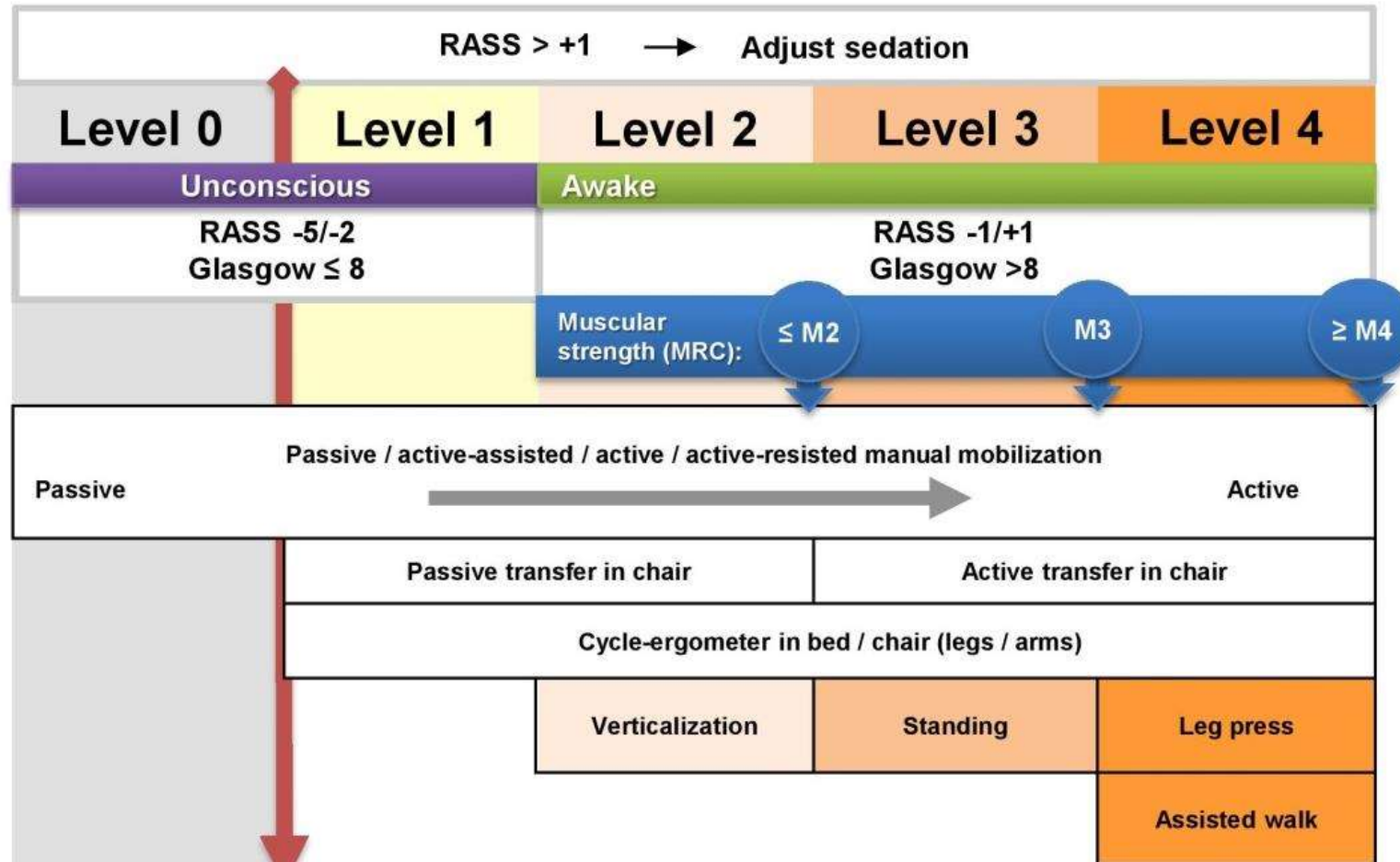
Assisted walk





Early mobilization protocol

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Contraindications of early mobilization (level 1 to 4)

- Acute myocardial infarction (confirmed by ECG)
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- Spine or pelvis instable fracture
- Therapy withdrawal

RESEARCH

Open Access

Expert consensus and recommendations on safety criteria for active mobilization of mechanically ventilated critically ill adults

Carol L Hodgson^{1,2*}, Kathy Stiller³, Dale M Needham⁴, Claire J Tipping², Megan Harrold⁵, Claire E Baldwin^{6,7}, Scott Bradley², Sue Berney⁸, Lawrence R Caruana⁹, Doug Elliott¹⁰, Margot Green¹¹, Kimberley Haines^{8,12}, Alisa M Higgins¹, Kirsi-Maija Kaukonen^{1,13}, Isabel Anne Leditschke^{14,15}, Marc R Nickels¹⁶, Jennifer Paratz^{17,18}, Shane Patman¹⁹, Elizabeth H Skinner^{20,21}, Paul J Young^{22,23}, Jennifer M Zanni²⁴, Linda Denehy²⁵ and Steven A Webb^{1,26}

	Low risk of an adverse event. Proceed as usual according to each ICU's protocols and procedures.
	Potential risk and consequences of an adverse event are higher than green, but may be outweighed by the potential benefits of mobilization. The precautions or contraindications should be clarified prior to any mobilization episode. If mobilized, consideration should be given to doing so gradually and cautiously.
	Significant potential risk or consequences of an adverse event. Active mobilization should not occur unless specifically authorized by the treating intensive care specialist in consultation with the senior physical therapist and senior nursing staff.

RESPIRATORY CONSIDERATIONS	IN-BED EXERCISES	OUT-OF-BED EXERCISES
Intubation		
Endotracheal tube ^a	●	●
Tracheostomy tube	●	●
Respiratory parameters		
Fraction of inspired oxygen		
≤ 0.6	●	●
> 0.6	▲	▲
Percutaneous oxygen saturation		
≥ 90%	●	●
< 90% ^b	▲	⬢
Respiratory rate		
≤ 30 bpm	●	●
> 30 bpm	▲	▲
Ventilation		
Mode HFOV	▲	⬢
PEEP		
≤ 10 cmH ₂ O	●	●
> 10 cmH ₂ O	▲	▲
Ventilator dysynchrony ^c	▲	▲
Rescue therapies		
Nitric oxide	▲	▲
Prostacyclin	▲	▲
Prone positioning ^d	⬢	⬢



a

CARDIOVASCULAR CONSIDERATIONS	IN-BED EXERCISES	OUT-OF-BED EXERCISES
Blood pressure		
Intravenous antihypertensive therapy for hypertensive emergency ^a		
MAP ^b :		
Below target range and causing symptoms		
Below target range despite support (vasoactive and/or mechanical)		
Greater than lower limit of target range while receiving no support or low level support		
Greater than lower limit of target range while receiving moderate level support		
Greater than lower limit of target range on high level support		
Known or suspected severe pulmonary hypertension		
Cardiac arrhythmias		
Bradycardia:		
Requiring pharmacological treatment (e.g., isoprenaline) or awaiting emergency pacemaker insertion		
Not requiring pharmacological treatment and not awaiting emergency pacemaker insertion		
Transvenous or epicardial pacemaker:		
Dependent rhythm		
Stable underlying rhythm		

b

Any stable tachyarrhythmia:		
Ventricular rate >150 bpm		
Ventricular rate 120 to 150 bpm		
Any tachyarrhythmia with ventricular rate < 120 bpm		
Devices		
Femoral IABP ^c		
ECMO:		
Femoral ^c or subclavian (not single bicaval dual lumen cannulae)		
Single bicaval dual lumen cannulae inserted into a central vein		
Ventricular assist device		
Pulmonary artery catheter or other continuous cardiac output monitoring device		
Other cardiovascular considerations		
Shock of any cause with lactate >4mmol/L		
Known or suspected acute DVT/PE		
Known or suspected severe aortic stenosis		
Cardiac ischemia (defined as ongoing chest pain and/or dynamic EKG changes)		

IABP = intra-aortic balloon pump; ECMO = extracorporeal membrane oxygenation; bpm = beats per minute; MAP = mean arterial pressure; DVT = deep vein thrombosis; PE = pulmonary embolus.

^a This may be a yellow (pause) for in-bed activities if the blood pressure is within target range as documented by the medical team.

^b Experienced ICU practitioners were considered to have good judgment about the impact of cardiovascular instability and low, medium or high levels of hemodynamic support, on the ability to exercise. However, in the case of uncertainty or lack of experience, it is recommended that the decision to mobilize a patient is discussed with appropriate experienced ICU staff. The target mean arterial pressure is determined by the treating ICU team.

^c Cycling and hip flexion may be contraindicated in the leg where the IABP/ECMO is inserted. If so, in-bed exercises may need to be modified to limit hip flexion.





Optiflow
High FiO₂

Going outside...





Traitement kiné

Vélo



Mise au fauteuil précoce



(Peu d'effet sur VO_2). Impact S/ moral du Patient, Famille, Personnel soignant

Table de verticalisation

- Peu « d'effet musculaire » (VO_2)
- Intérêt pour « resocialisation »
- Stimulant +++ système digestif
- Lutte contre équinisme +++ (N heures)



Exercices Membres **supérieurs**



Exercices Membres **supérieurs**



Exercices Membres **supérieurs**



Exercices Membres **inférieurs**



Exercices Membres inférieurs



Exercices Membres **inférieurs**

- Exercice de poussée des M.I. à l'aide d'un Ballon + tensiomètre



Exercices originaux (Ballon de baudruche)





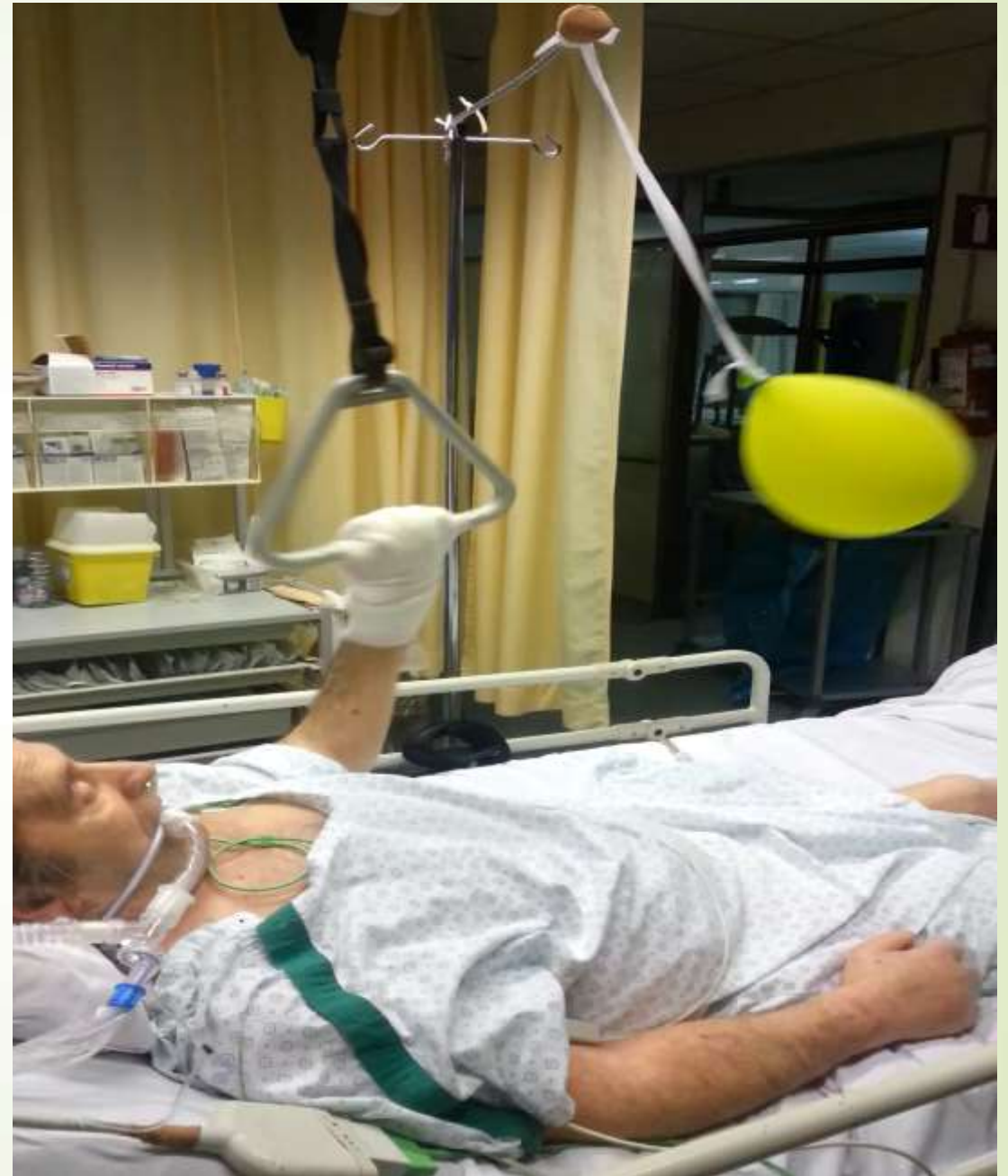




Exercice d'adresse



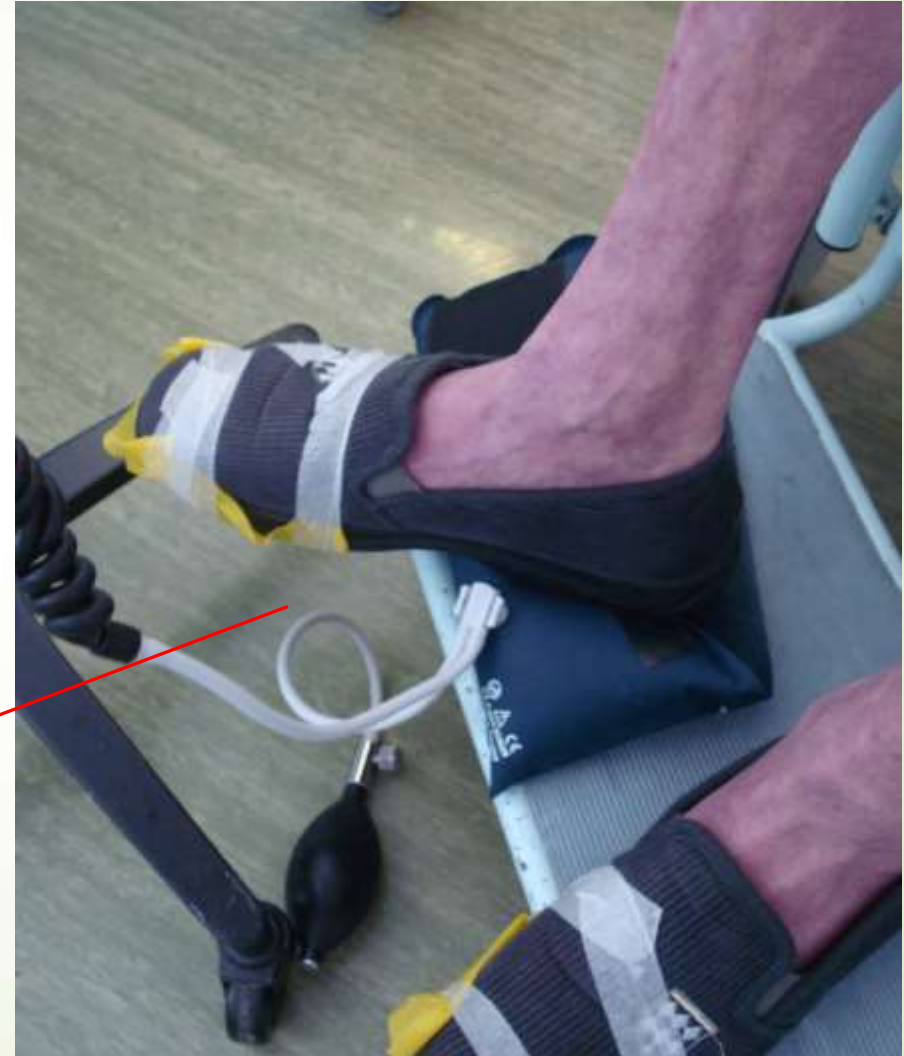
Mobilisation MS



Mobilisation MS



Exercices originaux (Tensiomètre mécanique)



Exercices originaux



Exercices originaux (plan incliné + ballon)







Exercices originaux (Elastoband)





Leg press au lit



Exercices avec ballon anti éclatement

Mur de la chambre



Exercices avec ballon anti éclatement (Flipper géant)



Rééducation à la marche



Rééducation à la marche



Rééducation à la marche



Marche



Porte perfusions

Oxygène

Poignée + porte redons

Roulette anti-basculement



Rééducation à la marche



Rééducation à la marche



Wii ?



Feed back des mouvements réalisés/24 heures



+/- 20 €



+/- 100 €



+/- 2500 €

Nécessité d'exercices:

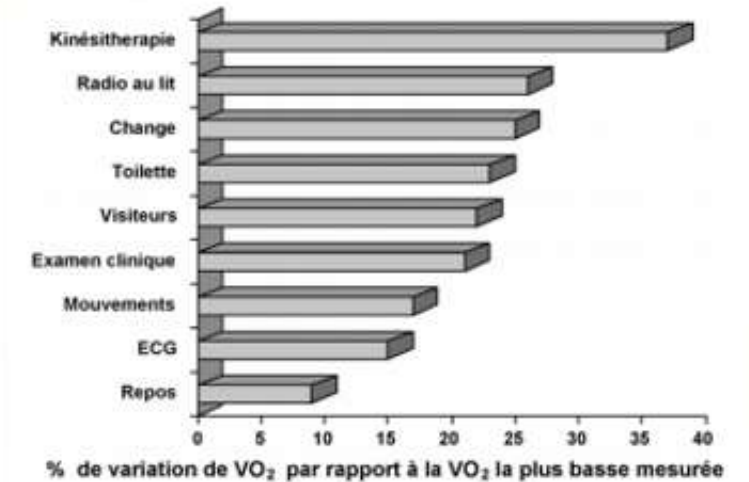
- LUDIQUES
- Diversifiés
- Répétés (rôle de l'équipe infirmières ?)
- Nécessité ambiance dynamique (musique ?)

Réanimation (2009) 18, 477–485

Dépense énergétique en réanimation

Energy expenditure in intensive care

C. Faisy^{a,*}, S.J. Taylor^b





Avenir ?:

Changer le métier de **masseur-KINESITHERAPEUTE**

en métier de **Ré-Animateur**

à l'USI





Merci pour votre attention

