Rehabilitation for patients in ICU: how to set up the protocol?

中山醫學大學醫學系臨床教授

教育部部定教授

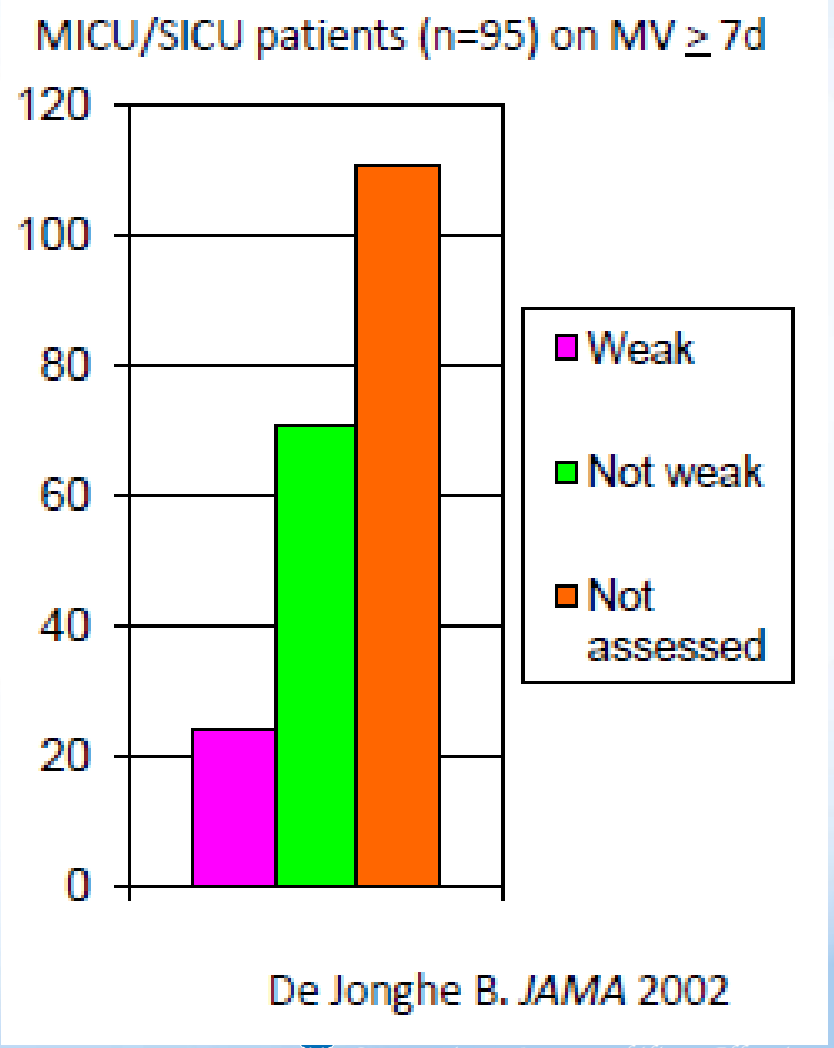
奇美醫療財團法人奇美醫院

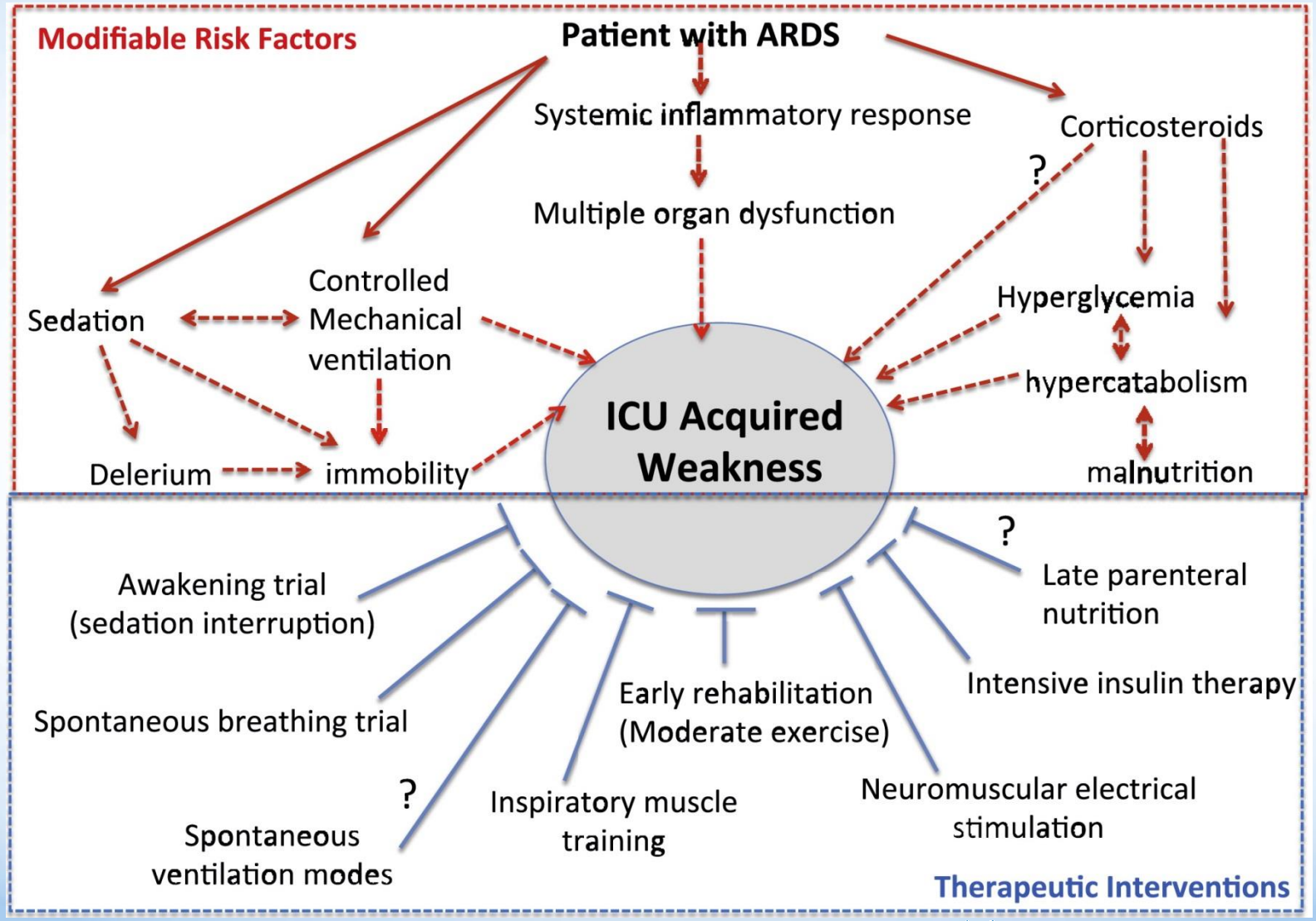
品質管理中心醫療副主任

加護醫學部 陳欽明醫師

How common is ICU-acquired weakness?

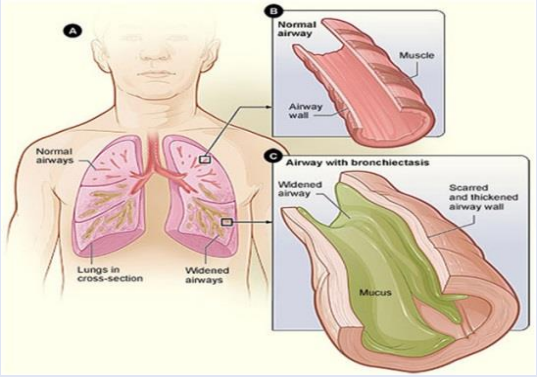
- At least 25% of ICU patients develop weakness
- BUT
  - Many ICU patients cannot be assessed by clinical examination




Modifiable Risk Factors
Patient with ARDS
Systemic inflammatory response
Multiple organ dysfunction
Corticosteroids
?
Sedation
Controlled Mechanical ventilation
Delerium
immobility
ICU Acquired Weakness
Hyperglycemia
hypercatabolism
malnutrition
?
Awakening trial (sedation interruption)
Spontaneous breathing trial
?
Spontaneous ventilation modes
Inspiratory muscle training
Early rehabilitation (Moderate exercise)
Neuromuscular electrical stimulation
Late parenteral nutrition
Intensive insulin therapy
Therapeutic Interventions

Effects of Immobility/ ICUAW (ICU-acquired weakness)

↓ motion and secretions



Strength ↓ 4-5% every week of bed rest

Orthostatic intolerance VTE

1st risk factor of decubitus ulcer

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 FEBRUARY 20, 2003 VOL. 348 NO. 8

One-Year Outcomes in Survivors of the Acute Respiratory Distress Syndrome

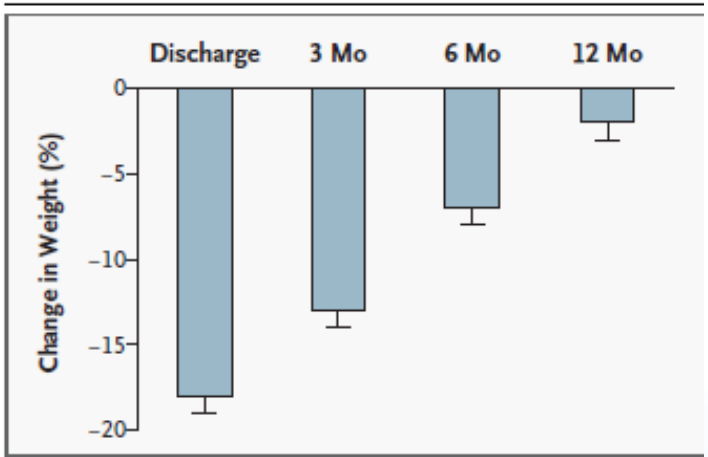


Figure 2. Mean (+SE) Change in Weight from Base Line among Patients with the Acute Respiratory Distress Syndrome at the Time of Discharge from the ICU and at 3, 6, and 12 Months.

Table 3. Ability to Exercise and Return to Work and Health-Related Quality of Life among Patients with the Acute Respiratory Distress Syndrome during the First 12 Months after Discharge from the ICU.

Outcome	3 Months	6 Months	12 Months
Distance walked in 6 min			
No. evaluated	80*	78†	81‡
Median — m	281	396	422
Interquartile range — m	55–454	244–500	277–510
Percentage of predicted value§	49	64	66
Returned to work — no./total no. (%)¶	13/83 (16)	26/82 (32)	40/82 (49)

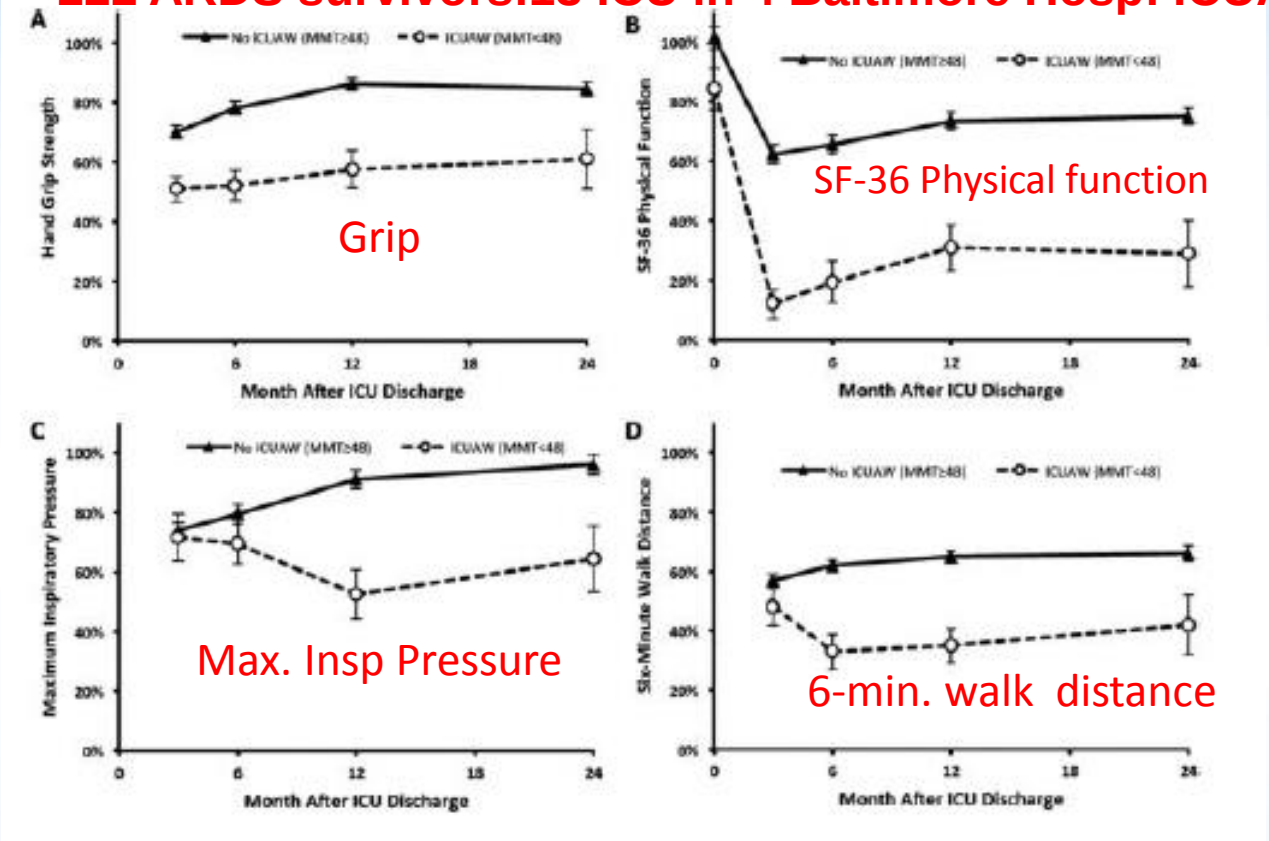
Lost 18% of body weight in ICU

6MWD improved over 1 year, but still abN as:
- **muscle wasting & weakness, foot drop, joint immobility**

Physical Complications in Acute Lung Injury Survivors: A 2-Year Longitudinal Prospective Study

Crit Care Med. 2014 April ; 42(4): 849–859.

222 ARDS survivors:13 ICU in 4 Baltimore Hosp: ICUAW



Multi-variable Predictors of Decrease in Strength

Variable (after adjusting for all variables below)	Time Since Discharge				
	D/C	3 Mo.	6 Mo.	12 Mo.	24 Mo.
Age (per 10 yr)	17% (3,34)	4% (-12,23)	19% (1,41)	15% (-5,39)	28% (2,60)
Duration of ICU bed rest (per day)	3% (0,7)	4% (0,8)	3% (0,7)	7% (3,12)	11% (4,19)

Mobility Is Medicine

Endothelium function

Neuromuscular integrity

CV function

Sugar homeostasis

Chronic inflammation

Depression

Early intensive care unit mobility therapy in the treatment of acute respiratory failure*

Crit Care Med 2008; 36:2238–2243

Peter E. Morris, MD; Amanda Goad, RN; Clifton Thompson, RN; Karen Taylor, MPT; Bethany Harry, MPT; Leah Passmore, MS; Amelia Ross, RN, MSN; Laura Anderson; Shirley Baker; Mary Sanchez; Lauretta Penley; April Howard, RN; Luz Dixon, RN; Susan Leach, RN; Ronald Small, MBA; R. Duncan Hite, MD; Edward Haponik, MD

Outcomes (survivors)	Usual care (n=135)	Protocol (n=145)	P-value
% received PT	47%	80%	<0.001
Days to first out of bed	11.3	5.0	<0.001*
Ventilator days	10.2	8.8	0.163*
ICU length of stay	6.9	5.5	0.025*
Hospital LOS	14.5	11.2	0.006*

*Adjusted for body mass index, APACHE II, and vasopressor use in ICU (yes/no)

Early, goal-directed mobilisation in the surgical intensive care unit: a randomised controlled trial

The Lancet 2016

*Stefan J Schaller, Matthew Anstey, Manfred Blobner, Thomas Edrich, Stephanie D Grabitz, Ilse Gradwohl-Matis, Markus Heim, Timothy Houle, Tobias Kurth, Nicola Latronico, Jarone Lee, Matthew J Meyer, Thomas Peponis, Daniel Talmor, George C Velmahos, Karen Waak, J Matthias Walz, Ross Zafonte, Matthias Eikermann, for the International Early SOMS-guided Mobilization Research Initiative**

	Mobility (n=104)	Control (n=96)	P value
Total PT minutes in ICU	60 (0-110)	48 (20-128)	
Sedation Score (RASS)	-0.7 (0.1)	-0.8 (0.1)	
Mean SOMS in ICU	2.2 (1.0)	1.5 (0.8)	<0.001
Walking at ICU D/C	52%	25%	
ICU / Hospital LOS	7 (5-12) / 15 (11-27)	10 (6-15) / 22 (15-30)	0.005 / 0.01
Func Indepen / DC home	51% / 51%	28% / 27%	0.003 /<0.001
ICU delirium-free days	25 (16-27)	22 (15-25)	0.016

- **Adverse events:**
  - No serious adverse events, no imp't difference between groups
  - In-hospital/3-mo. death: 16% v. 8% (p=0.09) / 22% v. 17% (p=0.35)

Chronic Respiratory Disease

Chronic Respiratory Disease
Volume 16: 1–8

DOI: 10.1177/1479973118820310
journals.sagepub.com/home/crd
SAGE

Effectiveness of early rehabilitation on patients with chronic obstructive lung disease and acute respiratory failure in intensive care units: A case–control study

(*SCI, IF*: 2.275, *correspondence author, 39/60)

Early rehabilitation for COPD pts in the ICU with ARF is associated with↓ **MV duration**

Willy Chou[1,2,*], Chih-Cheng Lai[3,*], Kuo-Chen Cheng[4,5], Kuo-Shu Yuan[6,7], Chin-Ming Chen[2,8] and Ai-Chin Cheng[9,10]

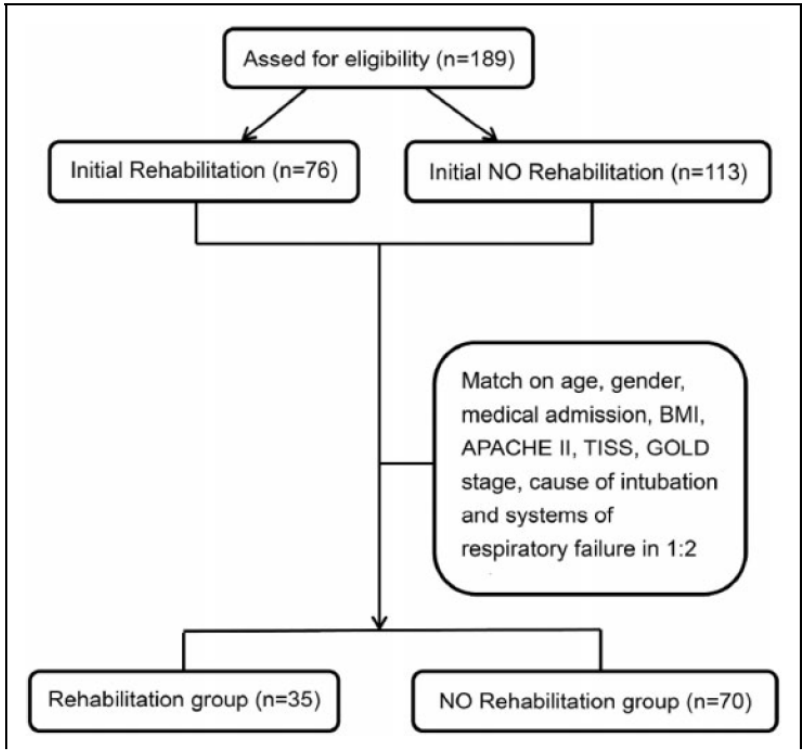


Table 3. Clinical outcomes of the groups.[a]

Groups: Variables	Total (n = 105)	Rehabilitation (n = 35)	No rehabilitation (n = 70)	p
28-Day survival	97 (92.4)	33 (94.3)	64 (91.4)	0.716
Survival at discharge	90 (85.7)	31 (88.6)	59 (84.3)	0.554
Successful extubation	93 (88.6)	33 (94.3)	60 (85.7)	0.329
MV duration (hours)	152.5 ± 129.3	137.3 ± 136.9	160.1 ± 125.7	0.396
ICU stays (days)	8.1 ± 7.8	5.8 ± 6.1	9.2 ± 8.3	0.033
Hospital stays (days)	22.9 ± 21.5	17.9 ± 14.6	25.4 ± 24.0	0.095
Medical costs (×NT$10,000)	20.3 ± 19.7	15.2 ± 13.6	22.9 ± 21.7	0.058

Table 4. Multiple regression model: the predictors of MV, ICU stays, hospital stays, and medical costs after planned extubation in COPD patients with respiratory failure.

Variables	Mechanical ventilation (hours)					ICU stays (days)					Hospital stays (days)					Medical costs (×NT$10,000)				
	β	SE	t	p	95.0% CI	β	SE	t	p	95.0% CI	β	SE	t	p	95.0% CI	β	SE	t	p	95.0% CI
Rehabilitation therapy	−.188	24.327	2.115	**0.037**	−99.754	−3.137	−0.001	1.361	−0.008	0.994	−2.713	2.693	−0.058	4.622	−0.568	0.572	−11.802	6.554	−0.041	3.962	−0.429	0.669	−9.568	6.169
Age	−0.027	1.066	−0.308	0.759	−2.446	1.789	0.090	0.060	1.110	0.270	−0.052	0.185	−.039	0.203	−.388	0.699	−.481	0.324	0.079	0.174	0.840	0.403	−.199	0.491
Gender	−0.088	25.401	−1.064	0.290	−77.465	23.417	−0.033	1.421	−0.422	0.674	−3.422	2.222	0.038	4.826	0.397	0.692	−7.668	11.498	0.052	4.137	0.582	0.562	−5.808	10.623
APACHE II Score	−0.117	2.360	−1.035	0.304	−7.129	2.245	0.128	0.132	1.222	0.225	−0.101	0.424	0.110	0.448	0.854	0.395	−.507	1.273	0.132	0.384	1.092	0.277	−.343	1.183
TISS	0.062	1.868	0.668	0.506	−2.461	4.959	−0.005	0.105	−0.058	0.954	−0.214	0.202	0.103	0.355	0.967	0.336	−0.362	1.048	0.137	0.304	1.372	0.174	−.187	1.022
Hemoglobin	−0.300	5.706	−3.188	**0.002**	−29.522	−6.859	−0.156	0.319	−1.781	0.078	−1.203	0.065	−.140	1.084	−1.307	0.194	−3.570	0.736	−.146	0.929	−1.454	0.149	−3.197	0.494
Albumin	−0.089	26.254	−1.047	0.298	−79.629	24.640	−0.033	1.469	−0.411	0.682	−3.521	2.313	−0.026	4.988	−0.266	0.791	−11.232	8.578	−.028	4.276	−.310	0.757	−9.818	7.165
Comorbidity	−.198	14.089	−2.294	**0.024**	−60.307	−4.349	−0.076	0.788	−.951	0.344	−2.315	0.816	0.074	2.677	0.750	0.455	−3.309	7.323	−.016	2.295	−.175	0.861	−4.959	4.155
Pulmonary cause of respiratory failure	0.277	25.561	3.319	**0.001**	34.081	135.598	0.110	1.430	1.413	0.161	−0.819	4.861	0.220	4.856	2.308	**0.023**	1.566	20.853	0.113	4.163	1.262	0.210	−3.015	13.520

Observational Study

Medicine (2019) 98:11(e14877

Medicine®

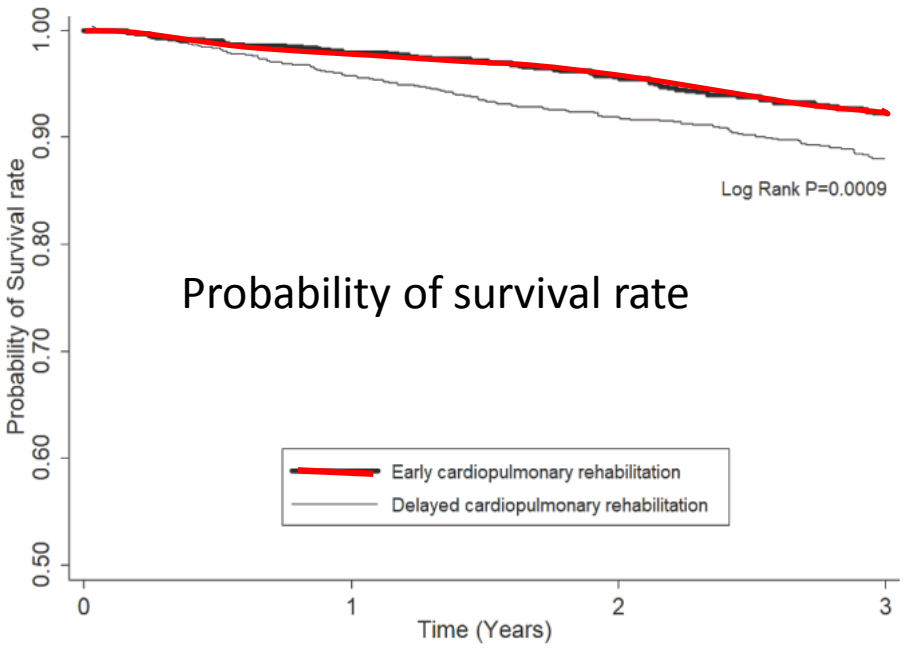
OPEN

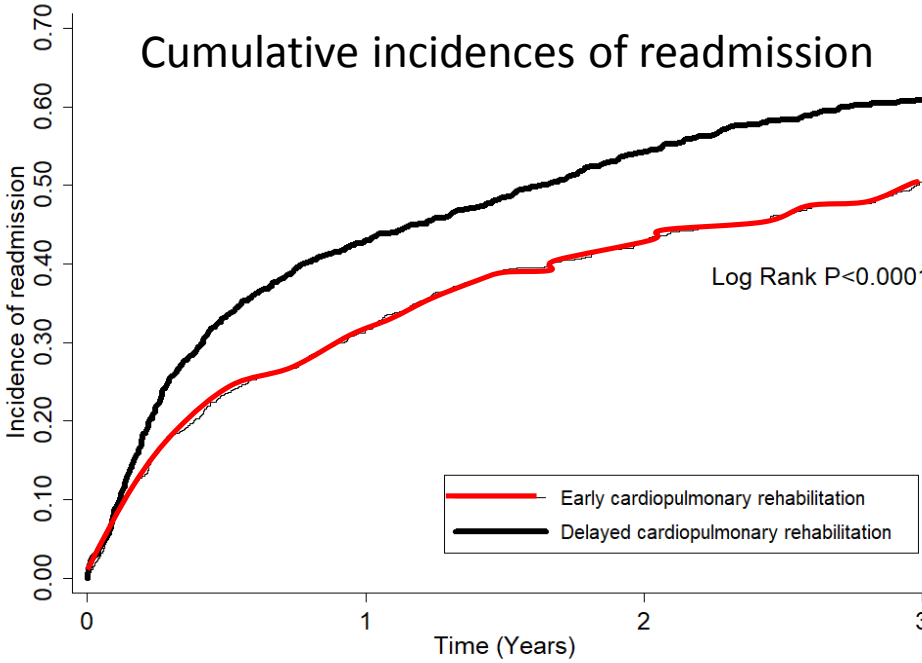
(SCI, IF:2.028,*correspondence author, 56/154)

The effect of early cardiopulmonary rehabilitation on the outcomes of intensive care unit survivors

Chih-Cheng Lai, MD[a], Willy Chou, MD[b,c], Ai-Chin Cheng, RRT[d,e], Chien-Ming Chao, MD[a], Kuo-Chen Cheng, MD[f,g], Chung-Han Ho, PhD[h], Chin-Ming Chen, MD[i,*]

Early post-discharge **rehabilitation** among ICU survivors has the long-term **survival** benefit and significantly ↓ **readmission** rate





2018
台灣成人重症
PADIS治療中文共識

Pain
Agitation/Sedation
Delirium
Immobility
Sleep Disruption

中華民國重症醫學會
Taiwan Society of Critical Care Medcine

中華民國急救加護醫學會
Society of Emergency & Critical Care Medcine, Taiwan, R.O.C.

26. 復健和活動是否可改善成人加護病房病人的臨床結果？

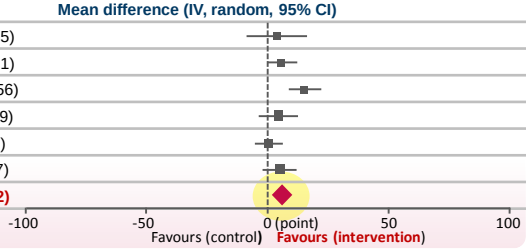
共識: 推薦成人加護病房病人應**盡早進行復健和活動**	編記: 1. ICU 的病人原先是約束，希望讓他可以儘早活動。 2. 運動也是活動的一種，「運動」這個詞的強度會比「活動」來得強，也因此國內專家決定用「活動」來取代「運動」一詞。
說明: 根據 CCM 2018 PADIS 指引。 進行復健和運動，可改善成人加護病房病人的肌力和縮短呼吸器使用時間。	參考資料 Devlin JW, *et al. Crit Care Med*. 2018 Sep;46(9):e848-e849.

Why Add Immobility to PAD?

- ICU-acquired weakness (**ICUAW**) presents in **25 - 50%** of critically ill patients

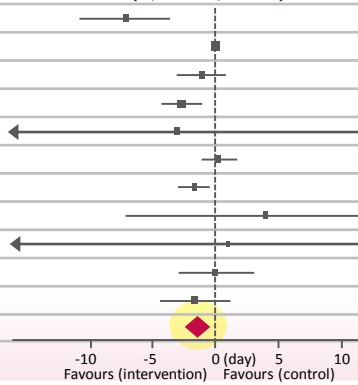
Muscle strength at ICU discharge (6 RCTs, 304 patients)

Study or subgroup	Mean difference (IV, random, 95% CI)
Schweickert 2009*	4.00 (-9.25, 17.25)
Routsi 2010**	6.00 (-0.01, 12.01)
Dantas 2012	15.60 (9.64, 21.56)
Kayambu 2015	4.60 (-2.69, 11.89)
Kho 2015	1.00 (-4.19, 6.19)
Hodgson 2016	5.20 (-1.07,11.47)
Total (95% CI)	**6.24 (1.67, 10.82)**



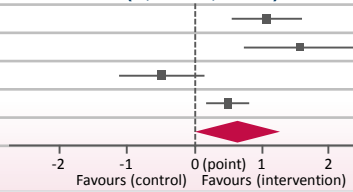
Duration of mechanical ventilation (11 RCTs, 1,128 patients)

Study or subgroup	Mean difference (IV, random, 95% CI)
Yosef-Braner	-7.22 (-10.74, -3.70)
Patman 2001	0.01 (-0.04, 0.07)
Morris 2008	-1.10 (-3.06, 0.86)
Schweickert 2009	-2.70 (-4.21, -1.19)
Routsi 2010	-3.00 (-23.34, 17.34)
Denehy 2013	0.30 (-1.10,1.70)
Ocng 2014	-1.70 (-2.95, -0.45)
Kho 2015	4.00 (-7.22, 15.22)
Kayambu 2015	1.00 (-17.98, 19.98)
Moss 2015	0.00 (-3.05, 3.05)
Hodgson 2016	-1.60 (-4.43,1.23)
Total (95% CI)	**-1.31 (-2.44, -0.19)**



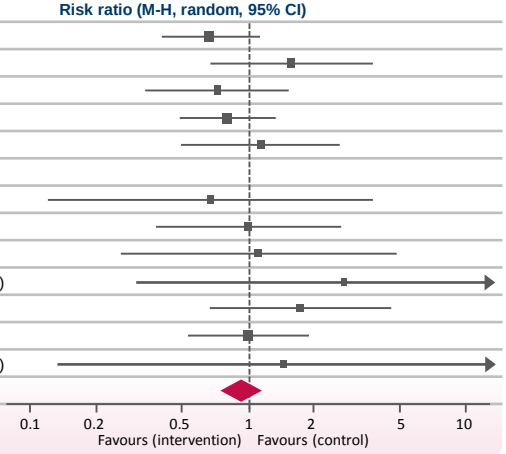
Quality of life (SF-36 physical function) within 2 months (4 RCTs, 303 patients)

Study or subgroup	Std. mean difference (IV, random, 95% CI)
Burtin 2009	1.08 (0.56, 1.59)
Ali 2014	1.58 (0.75, 2.41)
Moss 2015	-0.49 (-1.12, 0.14)
Morris 2016	0.51 (0.20, 0.82)
Total (95% CI)	**0.64 (-0.05, 1.34)**



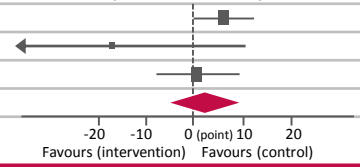
Hospital mortality (13 RCTs, 1,421 patients)

Study or subgroup	Risk ratio (M-H, random, 95% CI)
Morris 2008	0.67 (0.40, 1.12)
Burtin 2009	1.57 (0.67, 3.69)
Schweickert 2009	0.72 (0.34, 1.52)
Dantas 2012	0.80 (0.48, 1.33)
Denehy 2013	1.14 (0.49, 2.65)
Ali 2014	Not estimable
Dong 2014	0.67 (0.12, 3.71)
Brummel 2014	1.00 (0.38, 2.62)
Kho 2015	1.13 (0.26, 4.80)
Kayambu 2015*	2.77 (0.31, 24.85)
Moss 2015	1.72 (0.67, 4.44)
Morris 2016	1.00 (0.54, 1.85)
Hodgson 2016	1.45 (0.14, 14.94)
Total (95% CI)	**0.93 (0.74,1.18)**



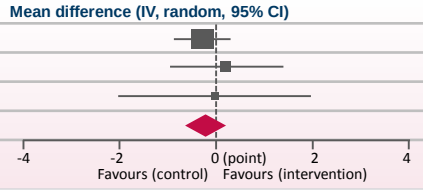
Times up and go (TUG) Test (3 RCTs, 172 patients)

Study or subgroup	Mean difference (IV, random, 95% CI)
Denehy 2013	5.90 (-0.58, 12.38)
Brummel 2014	-17.00 (-44.86, 10.86)
Moss 2015	0.40 (-7.99, 8.79)
Total (95% CI)	**2.22 (-4.99, 9.43)**



Physical function in ICU Test (PFIT) Test (3 RCTs, 209 patients)

Study or subgroup	Mean difference (IV, random, 95% CI)
Denehy 2013	-0.30 (-0.88, 0.28)
Kayambu 2015	0.20 (-0.97, 1.37)
Hodgson 2016	0.00 (-2.02, 2.02)
Total (95% CI)	**-0.19 (-0.69, 0.31)**



We suggest performing rehabilitation or mobilization in critically ill adults

Crit Care Med. 2018 Sep;46(9):e825-e873. (2018 PADIS Guidelines)

27. 成人加護病房病人進行復健和活動是否安全?

共識: 進行復健和活動時，並**不常發生**嚴重的**安全事件**或傷害。 應由加護病房團隊**共同合作**，避免低血氧、管路滑脫、高血壓或跌倒等風險。	編記: 1. 國內專家認為「應由加護病房團隊合作，避免低血氧、管路滑脫、高血壓或跌倒等風險」。 2. 加護病房團隊應包含職能治療、物理治療師、呼吸治療師、護理師及醫師。
說明: 根據 CCM 2018 PADIS 指引。 文獻顯示 12,200 個病例中，有 15 個病人發生嚴重的安全事件或傷害。	參考資料 Devlin JW, *et al. Crit Care Med*. 2018 Sep;46(9):e849.

Safety of Patient Mobilization and Rehabilitation in the ICU: Systematic Review with Meta-Analysis

Nydahl, P.; Sricharoenchai, T.; Chandra, S; Kundt, F.; Huang, M.; Fischill, M.; Needham, DM.

Annals of the American Thoracic Society; 2017

- **Adult studies of ICU mobility with safety data**
- **Exclusion: in-bed intervention** (cycle, NMES); **no report of # of sessions**
- **48 publications (n=7,546 pts; 22,351 sessions)**
  - 6 RCT, 2 non-rdm trial, 5 before-after, 22 prosp. cohort, 11 retro cohort, 2 pt prev
- **583 (2.6%) potential safety events**
  - Most common: De-sat, hemodynamic changes, catheter removal
    - Only 2 ETT removals (1 without replacement; 1 with in-bed mobility)
  - Events w/ consequence, incl. stop rehab (subset of studies): **78 (0.6%)**
    - 1 fall, 11 tube removal, 34 hemodynamic change, 18 desaturation, 14 other
  - **Pooled incidence per 1,000 sessions** (in studies reporting data):

Hemodynamic Changes	3.8 episodes	Oxygen desaturation	1.9 episodes
High heart rate	1.9 episodes		
Low blood pressure	4.3 episodes	High blood pressure	3.9 episodes
Low systolic blood pressure	1.8 episodes	High systolic blood pressure	0.3 episodes

Safety Screening --- MOVE

- **M**yocardial stability
  - (1)超過24小時無心肌缺血
  - (2)24小時內無增加抗心律不整藥物
- **O**xygenation adequate
  - (1)FiO_2<0.6
  - (2)PEEP<10cmH_2O
- **V**asopressor minimal
- **E**ngaged to voice

Perceived Barriers

Patient/Family

Hemodynamics?

Dislodgement of tube?

Team work?

safety concerns

Patient comfort?

Specialist Attitudes

Gas exchange↓?

Over-sedation?

Trained staff

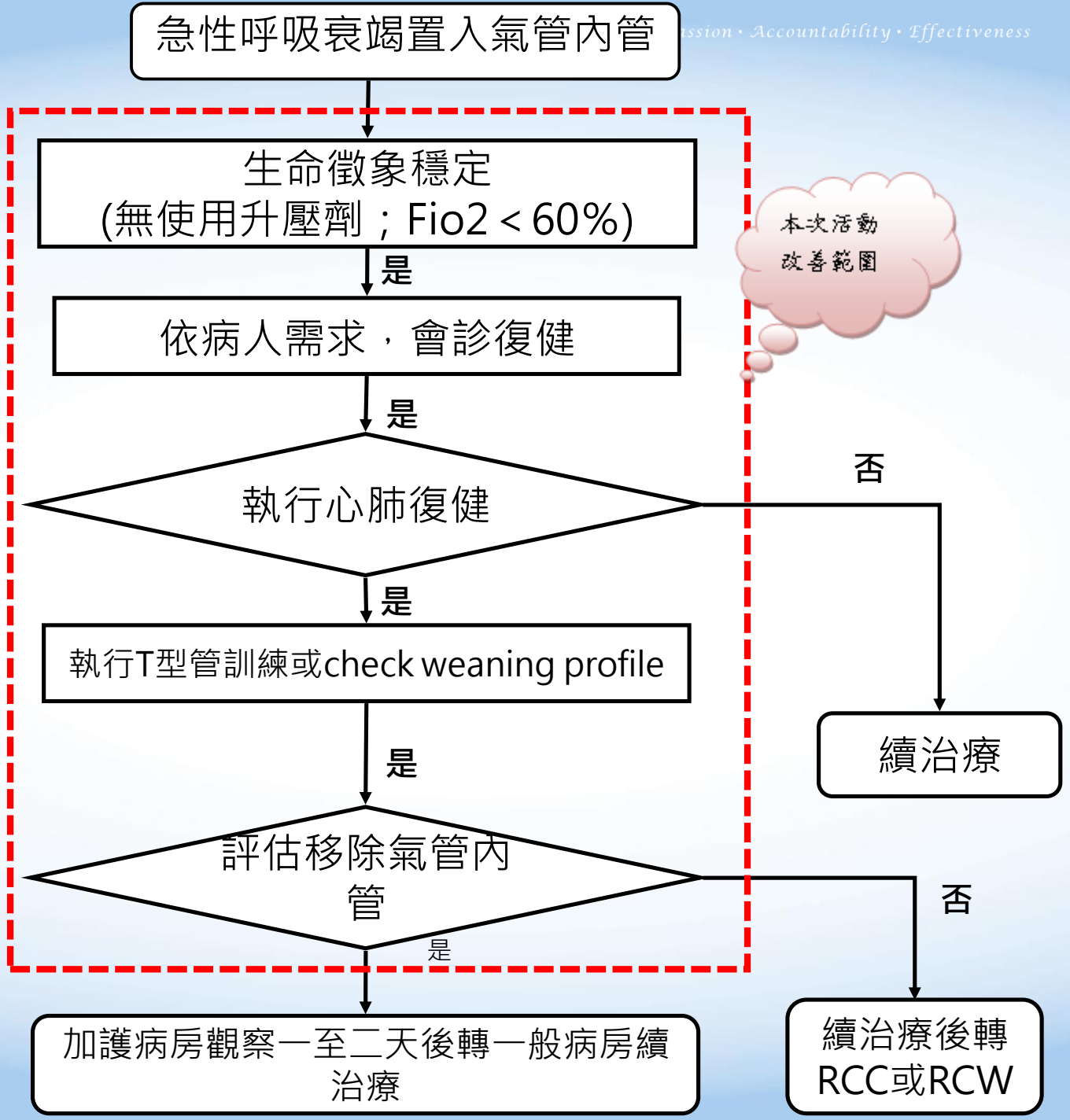
Interdisciplinary Team

奇美醫療財團法人 奇美醫院 Chi Mei Medical Center

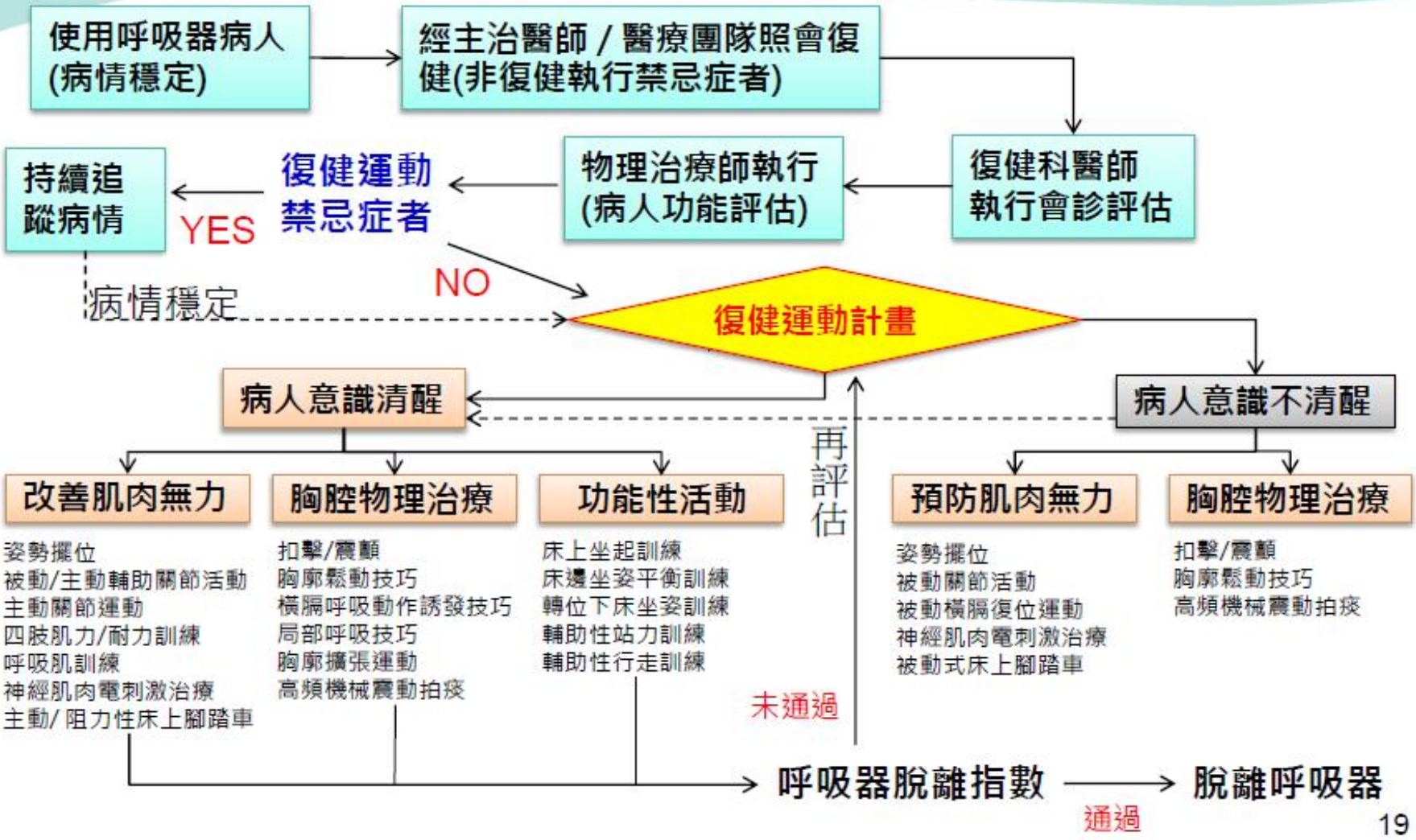
ICU病人早期下床復健(72小時內)

- 要活就要動
- 沒活動多病痛

Bailey(2007), Peter等(2008), Schweickert (2009)


急性呼吸衰竭置入氣管內管
生命徵象穩定
(無使用升壓劑；Fio2 < 60%)
是
依病人需求，會診復健
是
執行心肺復健
否
是
執行T型管訓練或check weaning profile
是
評估移除氣管內管
否
是
加護病房觀察一至二天後轉一般病房續治療
續治療
續治療後轉RCC或RCW
本次活動改善範圍

Phase I rehabilitation protocol - Facilitate weaning



Hodgson *et al. Critical Care* (2014) 18:658
DOI 10.1186/s13054-014-0658-y

CRITICAL CARE

A systematic literature review by a meeting of 23 multidisciplinary ICU experts

RESEARCH Open Access

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

4 categories: Chest, CV, neuro & other.

好處>>壞處

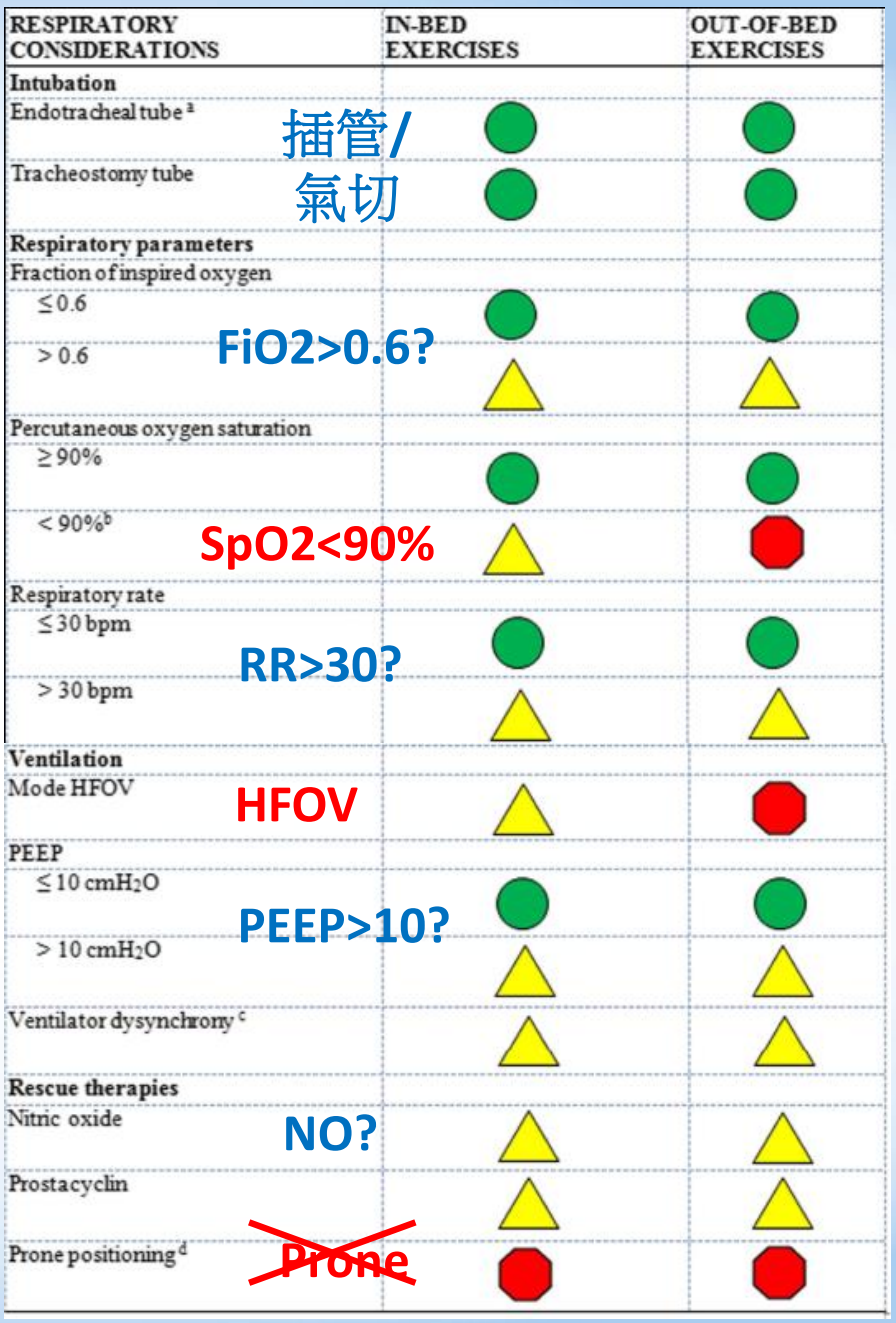
好處≥壞處

好處<<壞處

	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.

Safety: Mobilization

Respiratory condition



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

Safety: Mobilization

Cardiovascular condition

Cardiovascular Considerations	In-bed exercises	Out-of-bed exercises
Blood pressure		
Intravenous antihypertensive therapy for hypertensive emergency [a]	IV anti-H/T	
MAP [b]:		
Below target range and causing symptoms	↓ MAP & sx	
Below target range despite support (vasoactive and/or mechanical)	vasopressor	
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	High support	
Known or suspected severe pulmonary hypertension		
Cardiac arrhythmias		
Bradycardia:	Bradycardia with drugs /pacemaker	
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:	TVP (dependent)	
Dependent rhythm		
Stable underlying rhythm		
Any stable tachyarrhythmia:	Tachycardia >150	
Ventricular rate >150 bpm		
Ventricular rate 120 to 150 bpm		
Any tachyarrhythmia with ventricular rate < 120 bpm	Tachycardia <120	
Devices		
Femoral IABP [c]	Femoral IABP	
ECMO:		
Femoral [c] or subclavian (not single bicaval dual lumen cannulae)	Femoral ECMO	
Single bicaval dual lumen cannulae inserted into a central vein		
Ventricular assist device	VAD	
Pulmonary artery catheter or other continuous cardiac output monitoring device	PCWP/PiCCO	
Other cardiovascular considerations		
Shock of any cause with lactate >4mmol/L	Lactate>4	
Known or suspected acute DVT/PE	DVT	
Known or suspected severe aortic stenosis	AS	
Cardiac ischemia (defined as ongoing chest pain and/or dynamic EKG changes)	IHD	

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

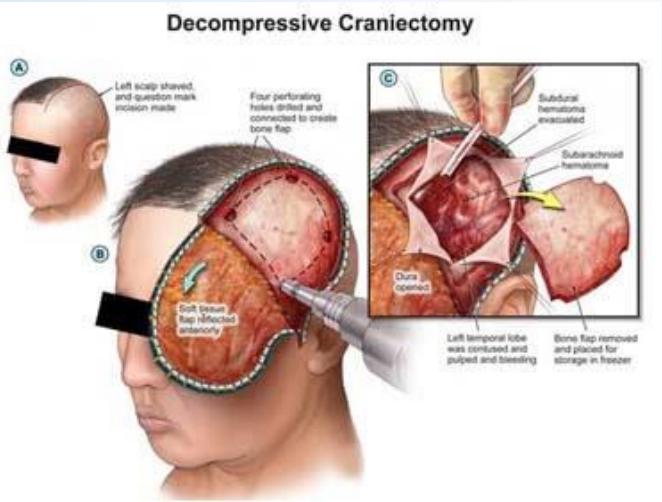
Safety: Mobilization

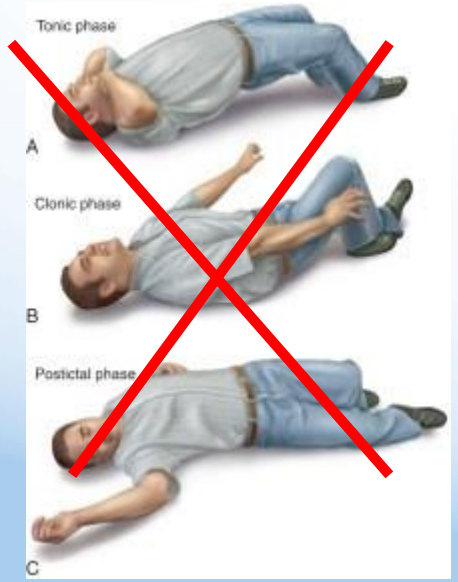
Neurologic condition

NEUROLOGICAL CONSIDERATIONS	IN-BED EXERCISES	OUT-OF-BED EXERCISES
Level of consciousness		
Patient drowsy, calm or restless (e.g., RASS -1 to +1)	●	●
Patient lightly sedated or agitated (e.g., RASS -2 or +2)	▲	▲
Patient unrousable or deeply sedated (e.g., RASS <-2)	▲	■
Deep sedation		
Patient very agitated or combative (e.g., RASS >+2)	■	■
Agitation		
Delirium		
Delirium tool (e.g., CAM-ICU) –ve **Delirium-**	●	●
Delirium tool +ve and able to follow simple commands	●	▲
Delirium+		
Delirium tool +ve and not able to follow commands	▲	▲
Intracranial pressure		
Active management of intracranial hypertension, with ICP not in desired range **IICP**	■	■
Intracranial pressure monitoring without active management of intracranial hypertension **Normal ICP**	●	▲

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

Safety: Mobilization





Neurologic condition

Other neurological considerations		
Craniectomy		
Open lumbar drain (not clamped)		
Subgaleal drain		
Spinal precautions (pre-clearance or fixation)		
Acute spinal cord injury		
Subarachnoid haemorrhage with unclipped aneurysm		
Vasospasm post-aneurysmal clipping		
Uncontrolled seizures		

RASS = Richmond Agitation Assessment Scale; CAM-ICU = confusion assessment method for the ICU.

Craniectomy

Open Lumbar drain

Spinal precautions

SCI

SAH

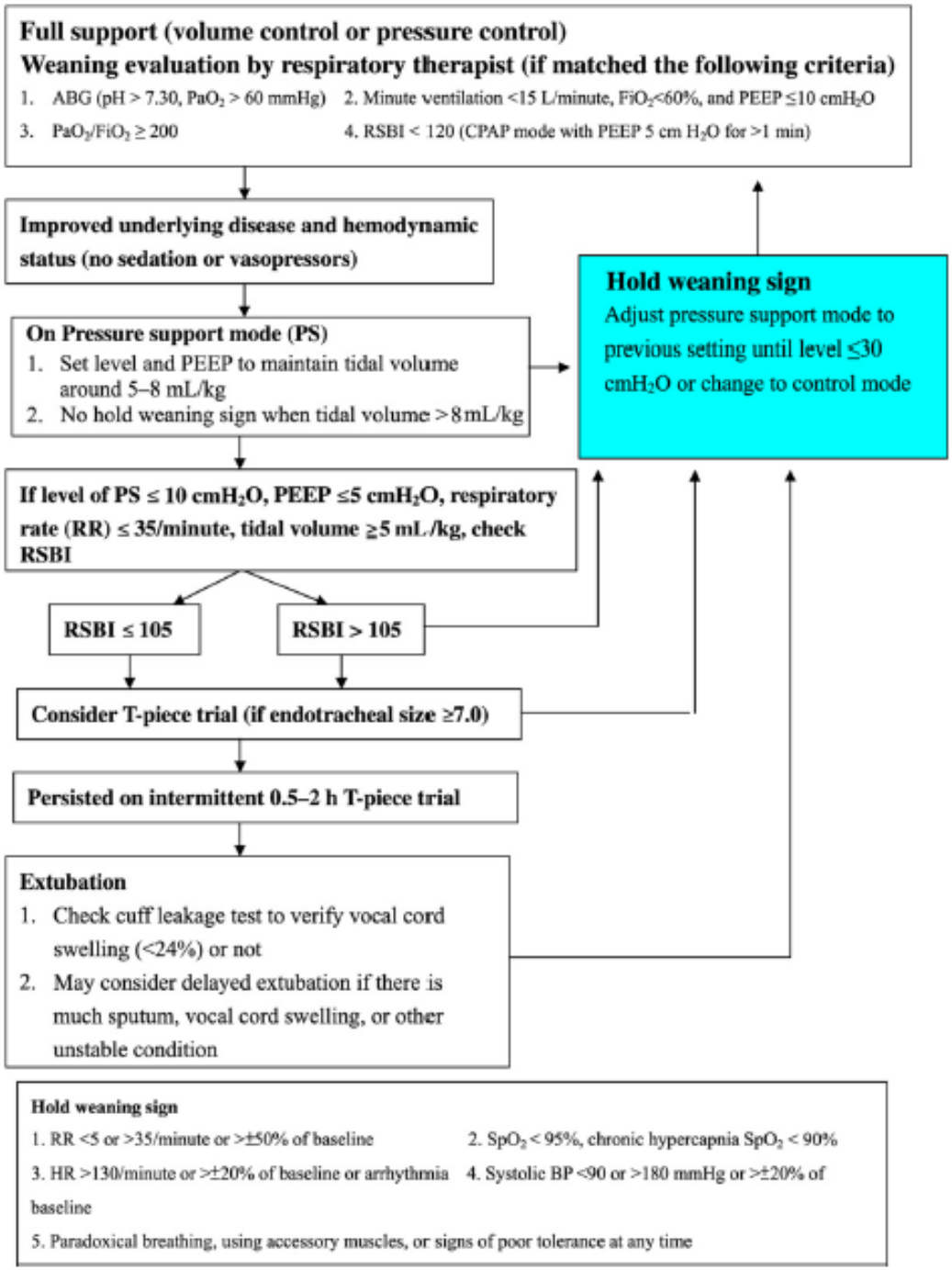
Uncontrolled seizure

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

Safety: Mobilization

Surgical		
Unstable/unstabilized major fracture Pelvic Spinal Lower limb long bone **Unstable Fx**	▲	●
Large open surgical wound Chest/sternum[a] Abdomen[a] **Large open W'd**	●	●
Medical		
Known uncontrolled active bleeding **Uncontrolled bleeding**	●	●
Suspicion of active bleeding or increased bleeding risk[b]	●	▲
Patient is febrile with a temperature exceeding acceptable maximum despite active physical or pharmacological cooling management	▲	▲
Active hypothermia management **Active hypothermia**	▲	▲
Other considerations		
ICU-acquired weakness **ICUAW**	●	●
Continuous renal replacement therapy (including femoral dialysis catheters) **CVVH**	●	●
Venous and arterial femoral catheters **Femoral line**	●	●
Femoral sheaths **Femoral sheath**	▲	●
All other drains and attachments, e.g., Nasogastric tube Central venous catheter Pleural drain Wound drain Intercostal catheter Urinary catheter	●	●

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



奇美醫院
Weaning protocol

W: weaning parameter
E: electrolyte
A: ABG
N: nutrtion
S: Secretion
N: Neuromuscular
O: airway obstruction
W: wait underlying

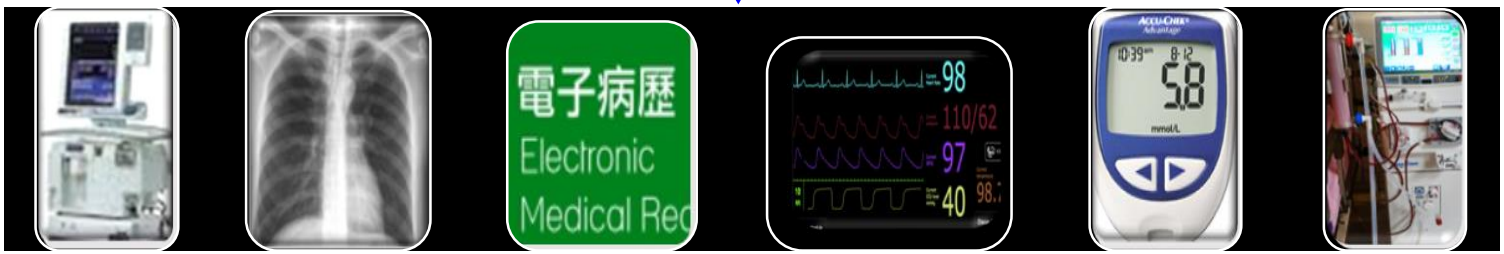
數據收集

創新研發

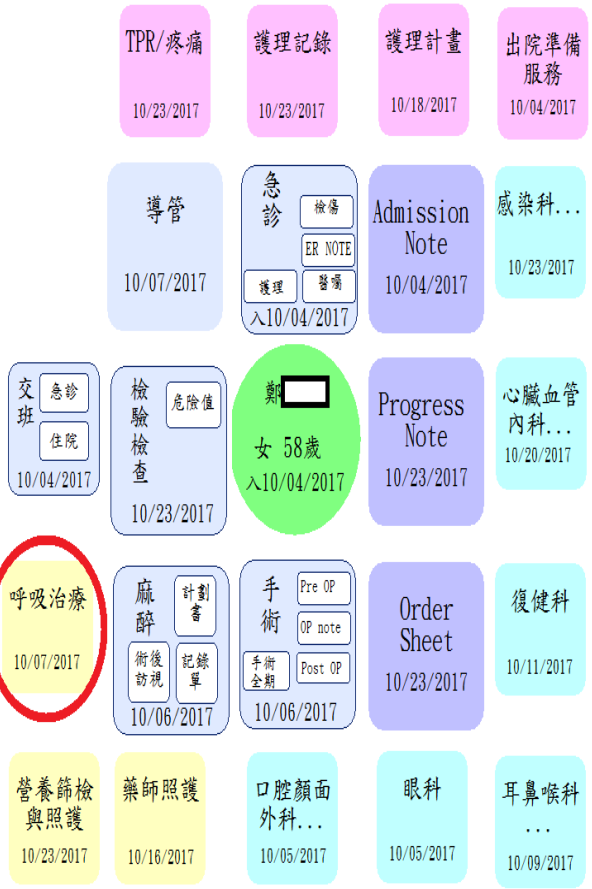
奇美雲

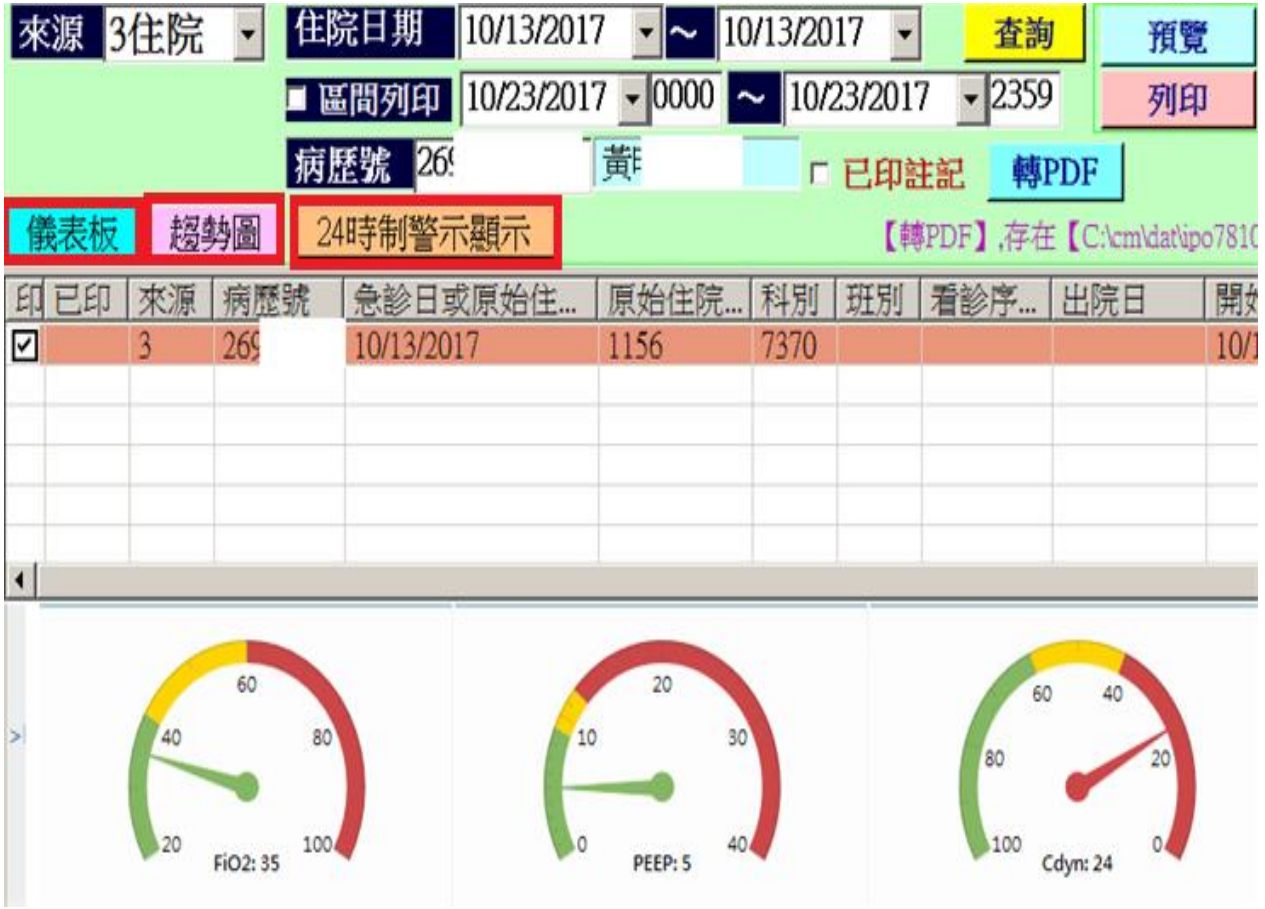
統計分析

整合運用

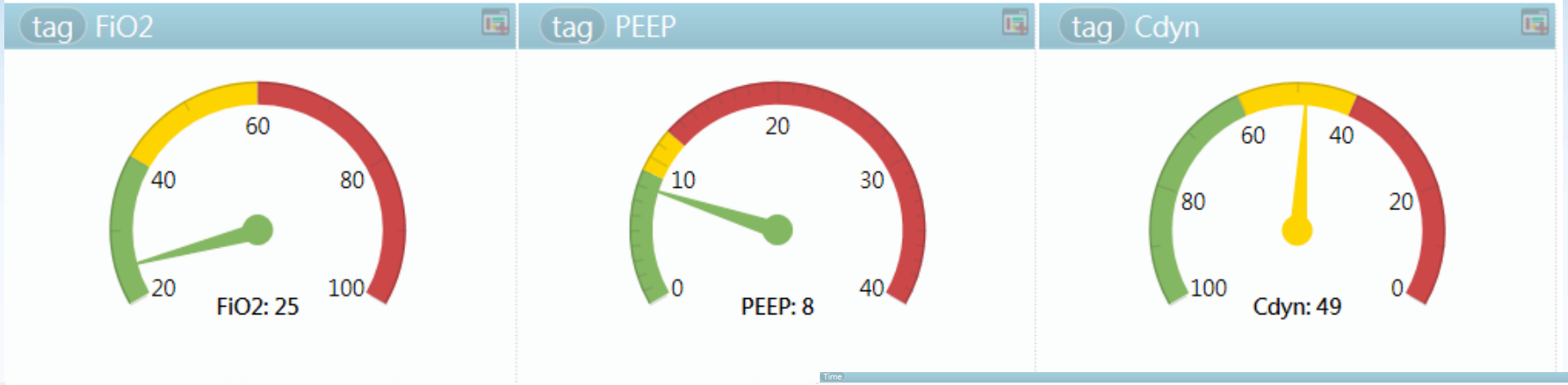


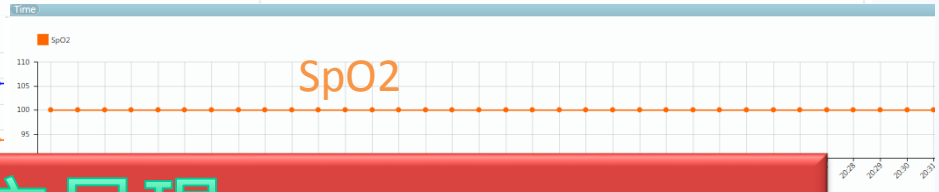
提供照護團隊即時資訊


TPR/疼痛
10/23/2017
護理記錄
10/23/2017
護理計畫
10/18/2017
出院準備服務
10/04/2017
導管
10/07/2017
急診
檢傷
ER NOTE
護理
醫囑
入10/04/2017
Admission Note
10/04/2017
感染科...
10/23/2017
交班
急診
住院
10/04/2017
檢驗檢查
危險值
10/23/2017
鄭
女 58歲
入10/04/2017
Progress Note
10/23/2017
心臟血管內科...
10/20/2017
呼吸治療
10/07/2017
麻醉
計劃書
術後訪視
記錄單
10/06/2017
手術
Pre OP
OP note
手術全期
Post OP
10/06/2017
Order Sheet
10/23/2017
復健科
10/11/2017
營養篩檢與照護
10/23/2017
藥師照護
10/16/2017
口腔顏面外科...
10/05/2017
眼科
10/05/2017
耳鼻喉科...
10/09/2017

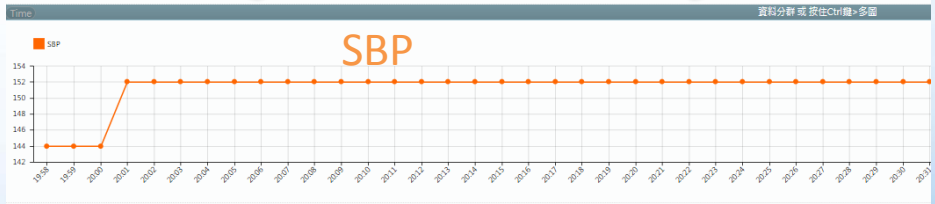

來源 3住院
住院日期 10/13/2017 ~ 10/13/2017
查詢
預覽
區間列印 10/23/2017 0000 ~ 10/23/2017 2359
列印
病歷號 269 黃
已印註記
轉PDF
儀表板
趨勢圖
24時制警示顯示
【轉PDF】,存在【C:\cm\dat\po7810
印 已印 來源 病歷號 急診日或原始住... 原始住院... 科別 班別 看診序... 出院日 開
3 269 10/13/2017 1156 7370
FiO2: 35
PEEP: 5
Cdyn: 24

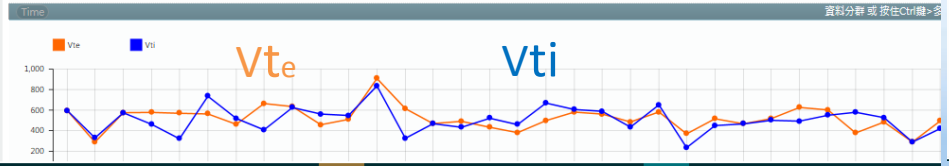
奇美醫院呼吸器智慧拋轉

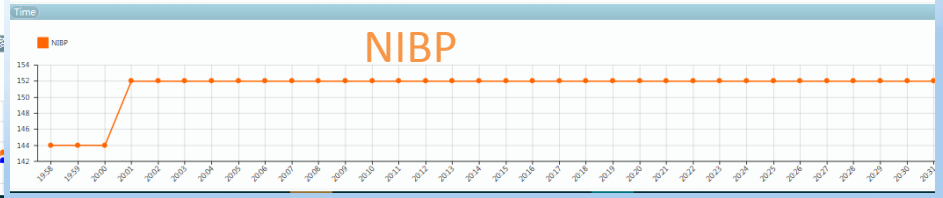




- 呼吸系統嚴重度之呈現
- 每隔60秒數值自動更新(可彈性設定)

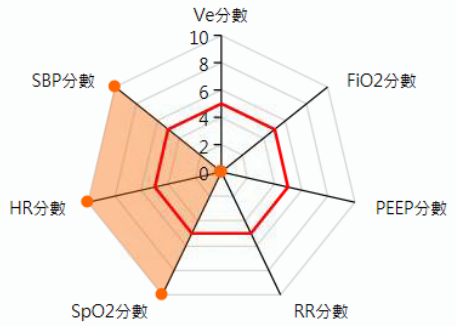






呼吸器智慧拋轉-準備脫離?

期間



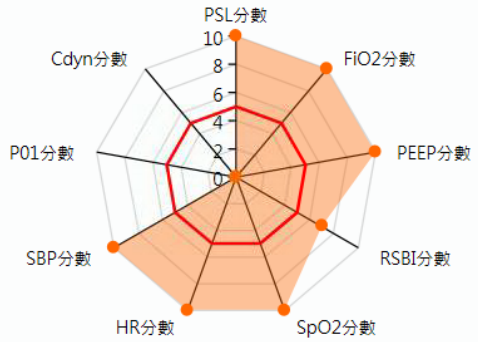
Full support mode (A/C, CPPV, PCV, PCP, PRVC,CPPV+AF)篩選,近篩選時間持續4小時

- 1. MV使用 > 1天
- 1. VE < 15 L/min(< 3.0 L/min排除)
  2. FiO2≦50%
  3. PEEP≦8 cmH2O
  4. RR < 35 bpm
- 1. 90 < SBP < 180 mmHg
  2. HR < 120
  3. SpO2≧9 5 %

評估脫離呼吸器

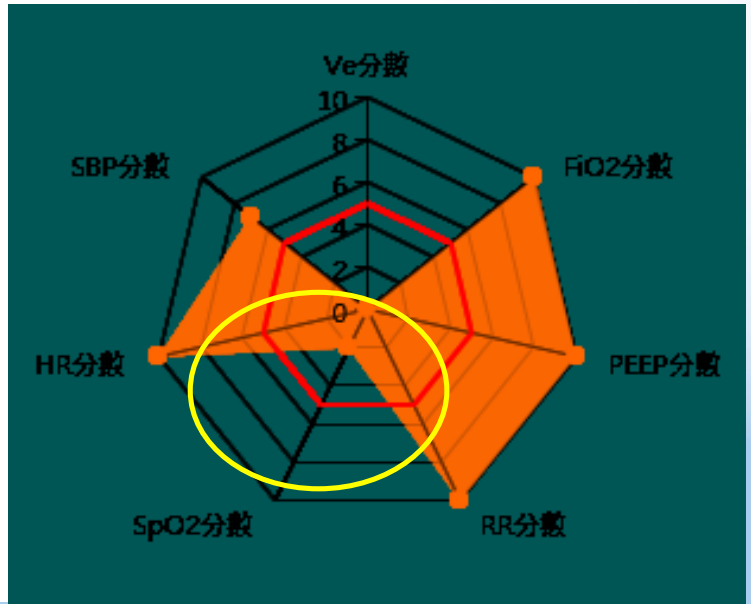
	期間	Ve分數	FiO2分數	PEEP分數	RR分數	SpO2分數	HR分數	SBP分數	下探
1	10704					10	10	10	
*	小計	0	0	0	0	10	10	10	

期間



Remove E-T tube (PSV, PSP,CPAP),近篩選時間持續 2 小時

- 1. PSL≦10cmH2O
  2. FiO2≦35%
  3. PEEP≦8 cmH2O
  4. RSBI < 60
  5. P0.1 < 2
  6. Cdyn > 30
- 1. 90 < SBP < 180 mmHg
  2. HR < 120
  3. SpO2≧90%



評估移除氣管內管

	期間	PSL分數	FiO2分數	PEEP分數	RSBI分數	SpO2分數	HR分數	SBP分數	P01分數	Cdyn分數	下探
1	10704	10	10	10	7	10	10	10			
*	小計	10	10	10	7	10	10	10	0	0	

奇美醫院經驗

早齊下床

創新與特色

「早期下床活動」
縮短加護病房病人呼吸器使用天數

2014 Early Mobilization

2016 ABCDE Bundle

2018 AI Application

救生圈

- ✓成立於2010年3月25 日
- ✓：長圈黃惠美
- ✓：員 導 輔陳欽明
- ✓跨部門組成:

  加護醫學部、護理部

  呼吸治療科、復健部

課題達成型品管手法
+ HFMEA

Mobilization is Medicine

EARLY GOAL-DIRECTED MOBILIZATION

早齊下床

瞻妄發生率
ICU天數
呼吸器天數
住院費用

拔管成功率
醫院榮耀

自拔壓力
自拔風險

減少成本

文獻查證(依據Peter E. Morris 2008年介入計畫,分為四個階段)

	段階 I	段階 II	段階 III	段階 IV
入介	• 天每3次 • 被動運節關動	• 天每3次 • 動主/主式助協動運動 • 上床在坐30鐘分	• 天每3次 • 邊床在坐30鐘分	• 位移邊床由動主至床旁伴陪椅30分鐘
下入進段階一準標的	的況情識意步進	以可力肌肢上當動活力重抗-二肱力肌肌頭3/5上以	以可力肌肢下當動活力重抗-四股力肌肌頭3/5上以	
識意況情	識意無	成達能3上 以個指令 開：(關)、睛眼嘴開打、我著看巴　點、頭舌出伸抬時五到數、頭毛眉高	段階和 II 同相	段階和 II 同相

第一階段-北冥神功

第二階段-降龍18掌

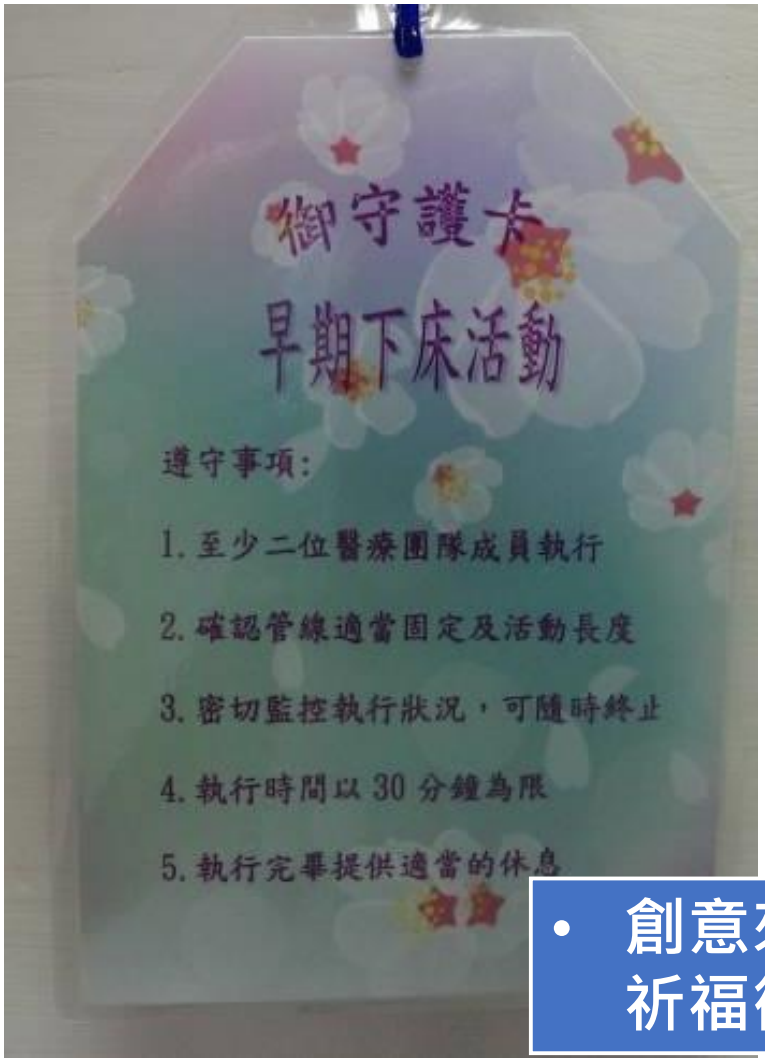
第三階段-移形換位

第四階段-乾坤大挪移

D 對策實施: 2.購置安全防護輔具x2

D

對策實施: 3.製作23個御守小卡



- 創意來源: 日本祈福御守

對策實施與檢討：「早期下床」活動用運HFMEA行進安全性失疏之防護

管路滑脫

病人跌倒

0%

ACRM
AMERICAN CONGRESS OF REHABILITATION MEDICINE

Archives of Physical Medicine and Rehabilitation

journal homepage: www.archives-pmr.org

Archives of Physical Medicine and Rehabilitation 2017;98:931-9

ORIGINAL RESEARCH

SCI, IF:3.289, 5/65

Early Mobilization Reduces Duration of Mechanical Ventilation and Intensive Care Unit Stay in Patients With Acute Respiratory Failure

Chih-Cheng Lai, MD,[a,*] Willy Chou, MD,[b,*] Khee-Siang Chan, PhD,[c] Kuo-Chen Cheng, MD,[d,e] Kuo-Shu Yuan, PhD,[f,g] Chien-Ming Chao, MD,[a] Chin-Ming Chen, MD[b,c]

Correspondence author

Journal Metrics

2016 Impact Factor: **3.289**

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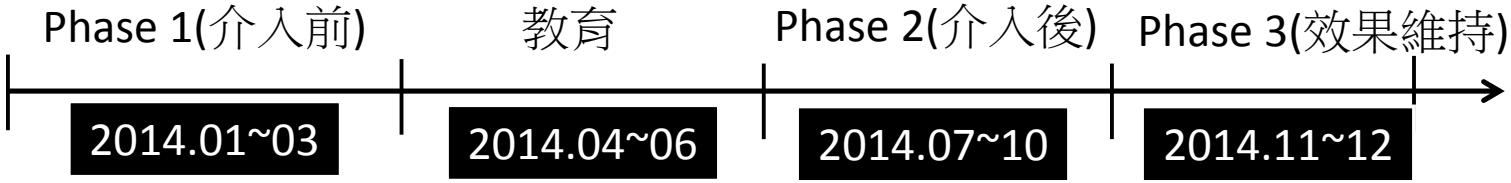
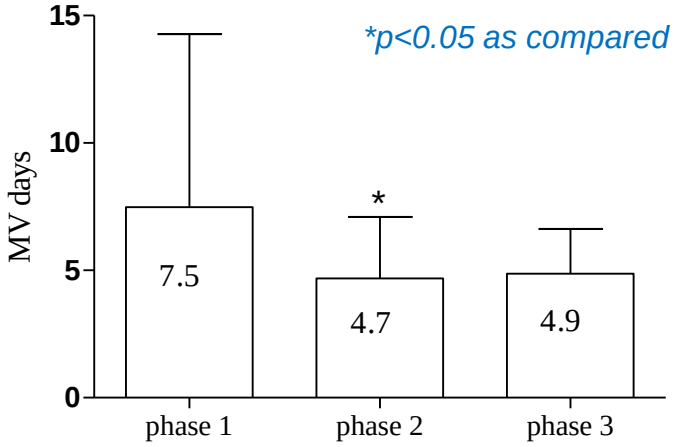
Clinical outcomes of different groups

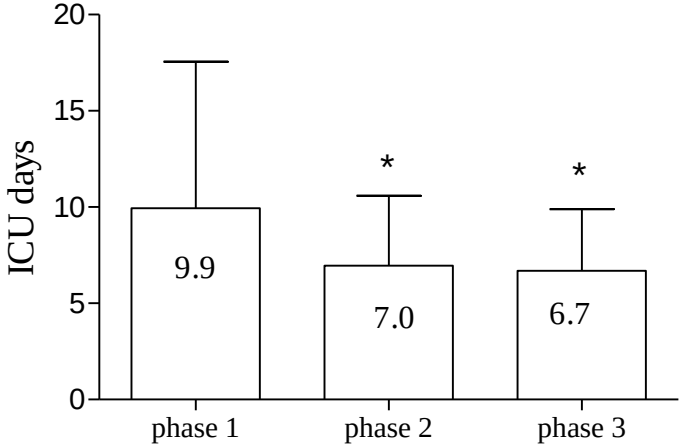


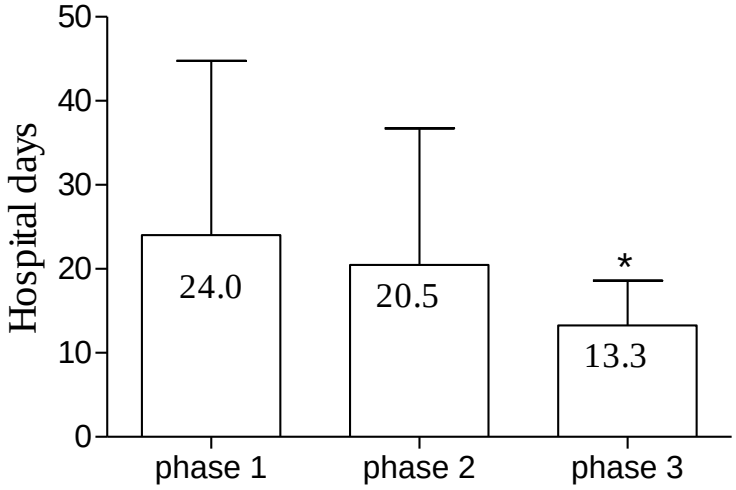
介入前(63 pts)

介入前(90 pts)

*p<0.05 as compared with phase 1







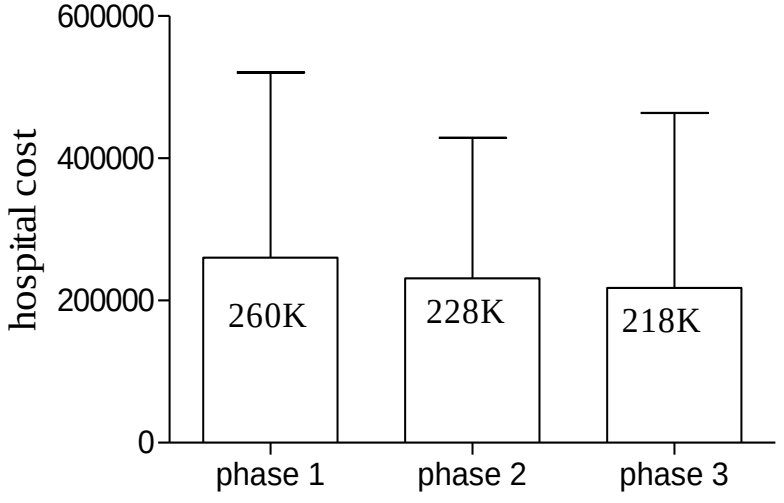


Table 4. Hierarchical regression model for associated factors and mechanical ventilation duration

Variables	β	S.E.	t	P	95% CI
Age	−0.038	0.033	−0.365	0.715	−0.079 to 0.054
Sex	−0.032	0.965	−0.358	0.721	−2.256 to 1.564
Body mass index	0.100	0.096	1.082	0.281	−0.086 to 0.295
APACHE II	0.259	0.112	2.016	0.046*	0.004 to 0.449
TISS Scale	0.052	0.106	0.529	0.598	−0.153 to 0.265
Glasgow coma scale	−0.055	0.191	−0.516	0.607	−0.477 to 0.280
Number of comorbidities	−0.080	0.536	−0.920	0.360	−1.554 to 0.568
BUN	0.308	0.027	2.820	0.006**	0.023 to 0.132
Sodium	−0.019	0.117	−0.220	0.826	−0.256 to 0.205
Potassium	0.022	0.886	0.243	0.808	−1.539 to 1.970
Calcium	0.101	0.614	1.148	0.253	−0.511 to 1.921
Phosphate	−0.015	0.348	−0.157	0.875	−0.744 to 0.634
Albumin	−0.010	1.108	−0.096	0.924	−2.301 to 2.089
Hemoglobin	−0.225	0.331	−1.908	0.059	−1.288 to 0.024
Hematocrit	0.008	0.090	0.072	0.943	−0.172 to 0.185
FiO_2	0.009	0.191	0.094	0.925	−0.360 to 0.396
PaO_2	−0.002	0.018	−0.015	0.988	−0.036 to 0.035
$PaCO_2$	0.115	0.093	1.312	0.192	−0.062 to 0.306
PaO_2/FiO_2	−0.068	0.007	−0.586	0.559	−0.017 to 0.009
Respiratory rate	−0.028	0.097	−0.320	0.749	−0.223 to 0.161
Heart rate	0.102	0.028	1.188	0.237	−0.022 to 0.088
Mean arterial pressure	−0.096	0.031	−1.136	0.258	−0.096 to 0.026
Tidal volume	0.007	0.006	0.048	0.962	−0.011 to 0.012
Minute ventilation	0.039	0.306	0.374	0.709	−0.491 to 0.720
MIP	−0.004	0.033	−0.044	0.965	−0.067 to 0.064
MEP	0.035	0.020	0.353	0.725	−0.032 to 0.046
RSBI	0.019	0.033	0.142	0.888	−0.060 to 0.070
Early mobilization	−0.269	0.933	−3.129	0.002**	−4.767 to −1.072

Table 5. Logistic regression for the predictors of mechanical ventilation for ≥ 7 days

Variable	β	S.E.	P	OR	95% CI
Age	0.041	0.022	0.061	1.042	0.998 to 1.087
Sex	0.474	0.673	0.481	1.606	0.430 to 6.003
Body mass index	−0.077	0.064	0.232	0.926	0.816 to 1.050
APACHE II	0.002	0.073	0.975	1.002	0.869 to 1.155
TISS score	0.073	0.065	0.260	1.075	0.947 to 1.221
Glasgow coma scale	−0.240	0.119	0.044*	0.787	0.623 to 0.993
No. of comorbidities	−0.017	0.315	0.958	0.983	0.530 to 1.825
Blood urea nitrogen	0.013	0.015	0.402	1.013	0.983 to 1.043
Sodium	−0.081	0.070	0.247	0.922	0.804 to 1.058
Potassium	−0.699	0.613	0.254	0.497	0.150 to 1.653
Calcium	0.462	0.376	0.219	1.587	0.760 to 3.315
Phosphate	0.097	0.255	0.704	1.102	0.668 to 1.817
Albumin	−1.081	0.708	0.127	0.339	0.085 to 1.358
Hemoglobin	−0.386	0.216	0.073	0.680	0.445 to 1.037
Hematocrit	0.023	0.060	0.700	1.023	0.910 to 1.150
FiO_2	0.123	0.123	0.317	1.131	0.889 to 1.440
PaO_2	−0.032	0.023	0.165	0.969	0.927 to 1.013
$PaCO_2$	0.291	0.083	0.000***	1.338	1.137 to 1.574
PaO_2/FiO_2	0.009	0.006	0.107	1.009	0.998 to 1.021
Respiratory rate	0.051	0.057	0.378	1.052	0.940 to 1.177
Heart rate	−0.009	0.019	0.650	0.991	0.954 to 1.030
Mean arterial pressure	−0.042	0.022	0.058	0.958	0.917 to 1.002
Tidal volume	0.000	0.003	0.895	1.000	0.993 to 1.006
Minute ventilation	0.298	0.217	0.171	1.347	0.879 to 2.063
MIP	0.018	0.028	0.523	1.018	0.964 to 1.075
MEP	0.003	0.013	0.798	1.003	0.979 to 1.029
RSBI	0.000	0.020	0.992	1.000	0.962 to 1.039
Early mobilization	−2.507	0.684	0.000***	0.082	0.021 to 0.311

奇美醫療財團法人 奇美醫院
Chi Mei Medical Center

運用ABCDE bundle提升加護病房呼吸器病人臨床照護成效

課題達成型品管手法

2014 Early Mobilization

2016 ABCDE Bundle

2018 AI Application

主題選定：四、文獻查證

Effectiveness and Safety of the Awakening and Breathing Coordination, Delirium Monitoring/ Management, and Early Exercise/Mobility Bundle

Michele C. Balas, PhD, RN, APRN-NP, CCRN[1]; Eduard E. Vasilevskis, MD, MPH[2,3,4]; Keith M. Olsen, PharmD, FCCP, FCCM[5,6]; Kendra K. Schmid, PhD[7]; Valerie Shostrom, MS[7]; Marlene Z. Cohen, PhD, RN, FAAN[8]; Gregory Peitz, PharmD, BCPS[5,6]; David E. Gannon, MD, FACP, FCCP[9]; Joseph Sisson, MD[9]; James Sullivan, MD[10]; Joseph C. Stothert, MD, PhD, FCCM, FACS[11]; Julie Lazure, BSN, RN[12]; Suzanne L. Nuss, PhD, RN[13]; Randeep S. Jawa, MD, FACS, FCCM[11]; Frank Freihaut, RRT[14]; E. Wesley Ely, MD, MPH, FCCM[3,4,15]; William J. Burke, MD[16]

Balas M CCM Crit Care Med. 2014 May ; 42(5): 1024–1036

Balas於人等2014行推年ABCDE bundle→

- **數天用使器吸呼↓3天**
- 間時妄瞻 ↓ 17%
- 率亡死 ↓ (19.9%→11.3%)

持續改善

A B C

每**醒清**人病讓天(**A**wakening)

練訓**吸呼**主自受接(**B**reathing)

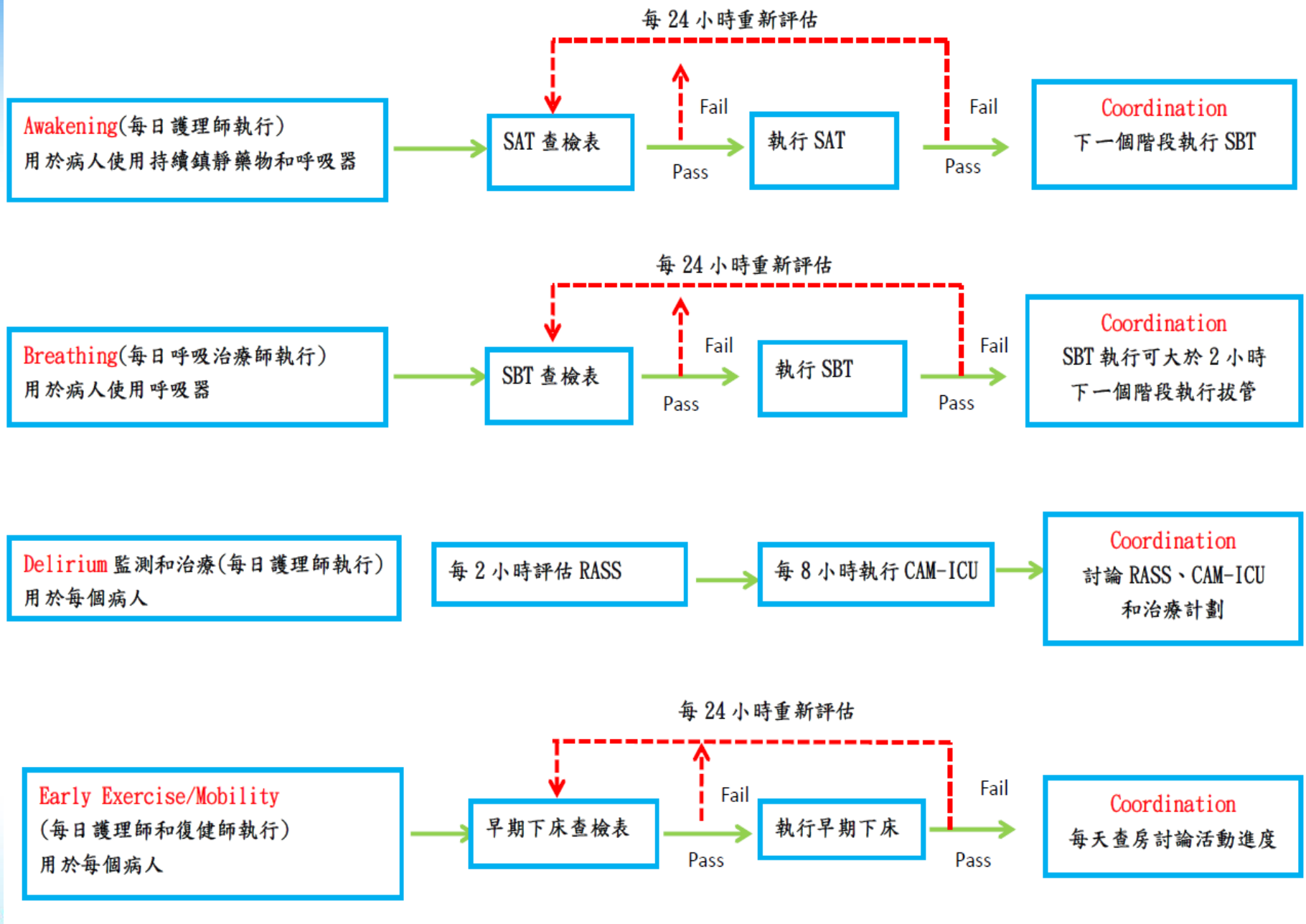
整調物藥(**C**oordination)

D

形情**妄瞻**理管和測監 (**D**elirium survey & management)

E

動活**床下期早**(**E**arly Exercise and Mobility)


每 24 小時重新評估
Awakening(每日護理師執行)
用於病人使用持續鎮靜藥物和呼吸器
SAT 查檢表
Fail
Pass
執行 SAT
Fail
Pass
Coordination
下一個階段執行 SBT
每 24 小時重新評估
Breathing(每日呼吸治療師執行)
用於病人使用呼吸器
SBT 查檢表
Fail
Pass
執行 SBT
Fail
Pass
Coordination
SBT 執行可大於 2 小時
下一個階段執行拔管
Delirium 監測和治療(每日護理師執行)
用於每個病人
每 2 小時評估 RASS
每 8 小時執行 CAM-ICU
Coordination
討論 RASS、CAM-ICU
和治療計劃
每 24 小時重新評估
Early Exercise/Mobility
(每日護理師和復健師執行)
用於每個病人
早期下床查檢表
Fail
Pass
執行早期下床
Fail
Pass
Coordination
每天查房討論活動進度

D

對策實施2: CAM-ICU評估監測機制

附件三：　　鎮靜與譫妄評估-CAM-ICU 中文版

第一步：鎮靜評估（RASS）

如果RASS 是 -4 或 -5，則停止並之後再重新評估病人。如果RASS 在-4 以上（-3到+4），則進入第二步。

第二步：譫妄評估（CAM-ICU）

特徵1: 精神狀態改變的急性發作或變動的進程

1. 有沒有任何從精神狀態基本線的急性改變?

2. 在過去 24 小時中病患變動的精神狀態是否有鎮靜指數（例如 RASS）、昏迷指數(GCS)、或之前的譫妄評估為變動的依據?

若任一問題回答是 則特徵 1 為陽性的。

特徵 2: 注意力不集中

用注意力篩檢測驗(ASE)評估注意力---數字（聽力）或圖片（視覺）

1. 注意力篩檢測驗數字: 隨機數字 " 1" 測試

指引: 對病患說，" 我要對你讀一個十個數字的序列。無論何時你聽到數字 " 1" ，就握住我的手" 。用正常的音調從以下的數字序列中讀出數字。

8 1 7 5 1 4 1 1 3 6

分數: 當病患沒有在 "1" 時握住手且當病患在不是 "1" 握住手時，都算是錯誤。

2. 圖片測試(圖片要印在"6×10 英寸"的淺黃色无反光喷砂面紙上。

若注意力篩檢測驗分數小於八分則特徵 2 為陽性的。

特徵 3: 沒有組織的思考

是/否問題 可用 A 或B 組，若需要連續天數時可交替使用(分數: 病患的每個正確答案皆可由4 分中獲得1 分)

A 組

1. 石頭會浮在水面上嗎?　　2. 海裡會有魚嗎?　　3. 一公斤是否比兩公斤重?

4. 你可以用鐵鎚釘釘子嗎?

B 組

1. 葉子會浮在水面上嗎?　　2. 海裡會有大象嗎?　　3. 兩公斤是否比一公斤重?

4. 你可以用鐵鎚砍木頭嗎?

命令

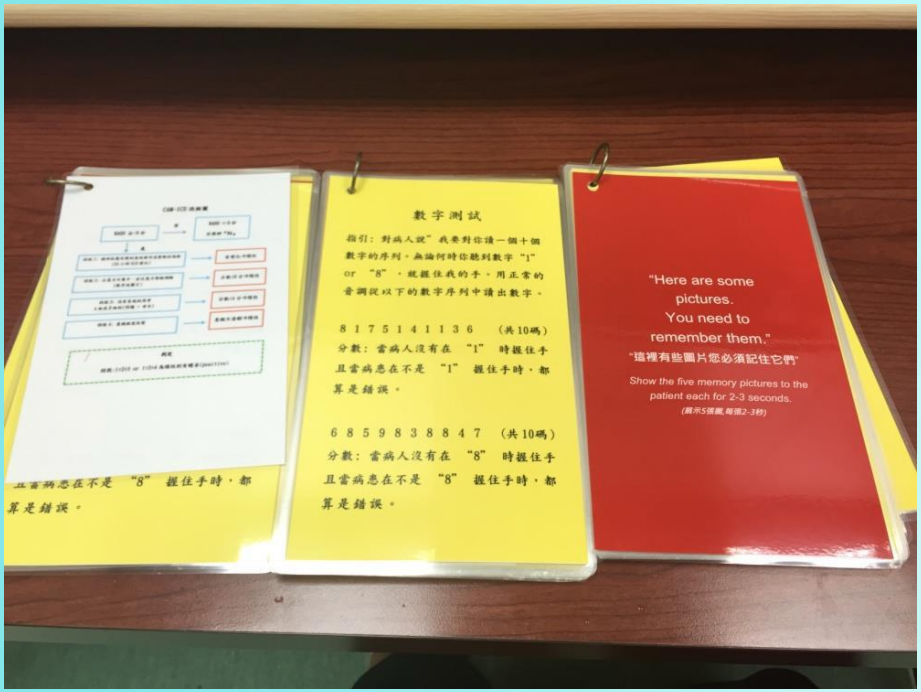
對病患說: "舉出這麼多隻手指" (檢查者在病患面前舉出兩隻手指) "現在用另一隻手做一樣的事" (不要重覆手指的數目)。

分數: 若病患可成功完成整個命令可獲得1 分。

如果綜合 (問題 + 命令)分數少於4 分則特徵 3 是陽性的

特徵 4: 意識程度改變

若病患目前的意識程度是在清醒以外，則特徵 4 是陽性的 (例如，評估時的RASS 不 " 0")



D

對策實施: 1.家屬片相供提營造熟悉感及家的感覺或加油塗鴉

D

對策實施: 3.每天報時播放(每次1分鐘)
4. 每天中午13:00-14:00輪流播放喜愛之音樂

07:00 /12:00/17:00/21:00，每次1分鐘(播放人員:白班:品管圈人員;夜班:小組長)

每天13:00-14:00輪流喜放播樂音之愛(如古典樂，經典老歌，爵士樂，輕音樂)

D

對策實施: 5.每天07:00開燈/21:00星空影像

6.單位提供眼罩/耳塞,減少噪音以利晚上睡眠

開燈和像影空星，營造天白

晚夜及的區別

D

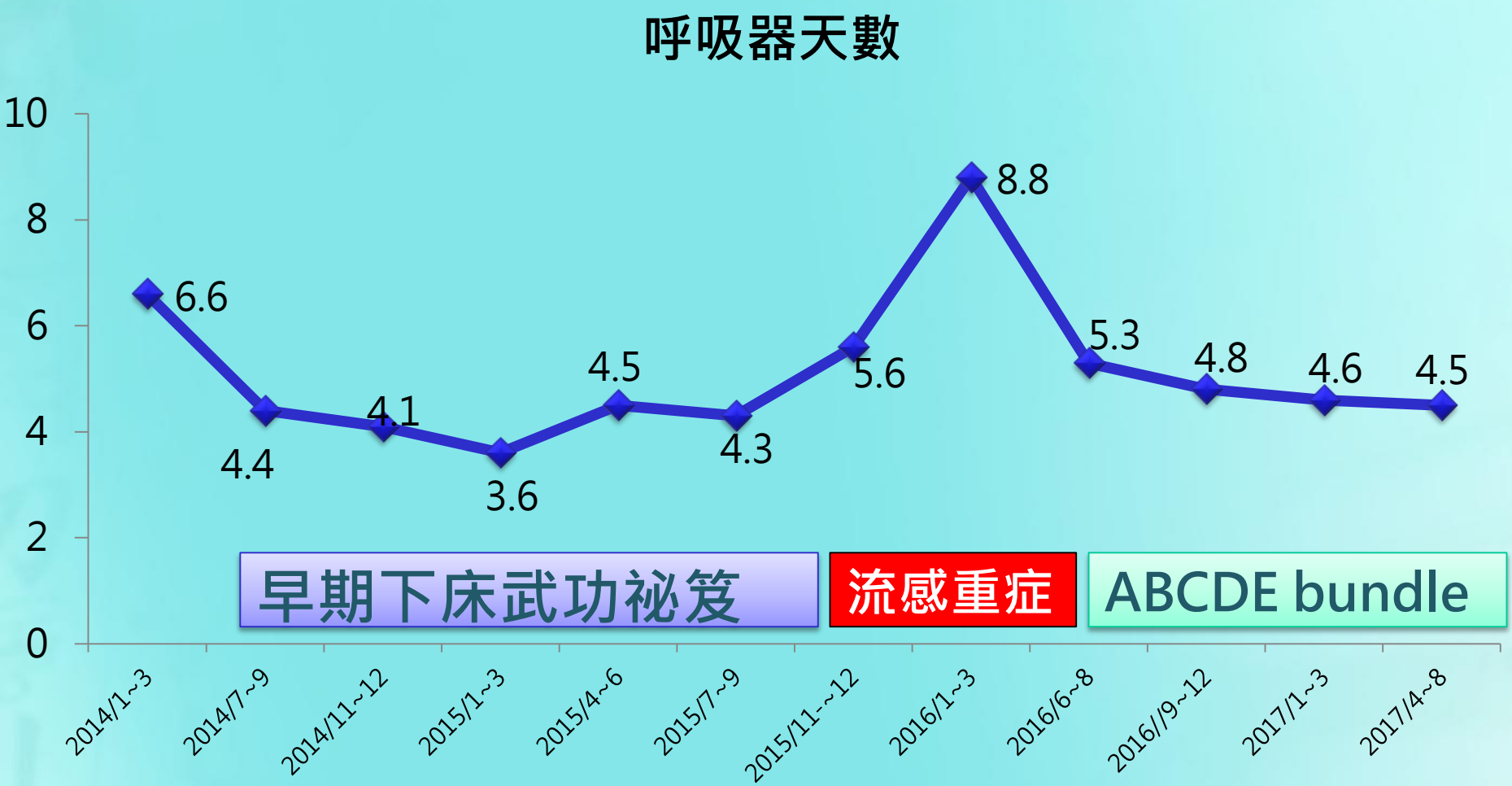
對策實施: 7.提供電子化溝通圖卡
8.由複健師、護理師和家屬共同協助早期下床活動及手搖機使用

置於面桌車動行理護，方便人員取用，增加與病人之間溝通

每天會客由複健師、護理師和家屬共同用使機搖手及動活床下期早助協

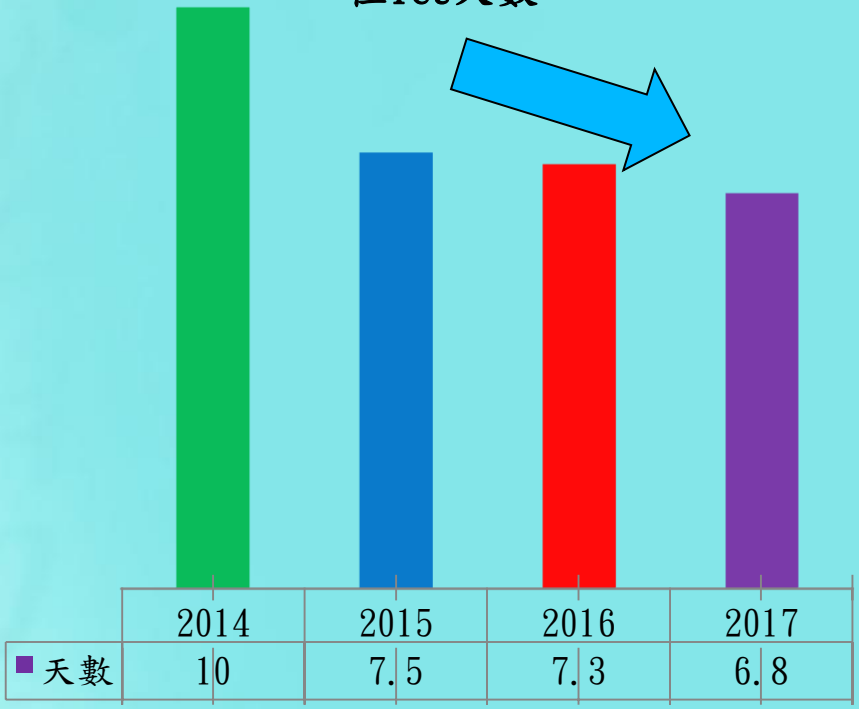
第四階段-乾坤大挪移

從武功祕笈到ABCDE bundle來改善呼吸器病人預後



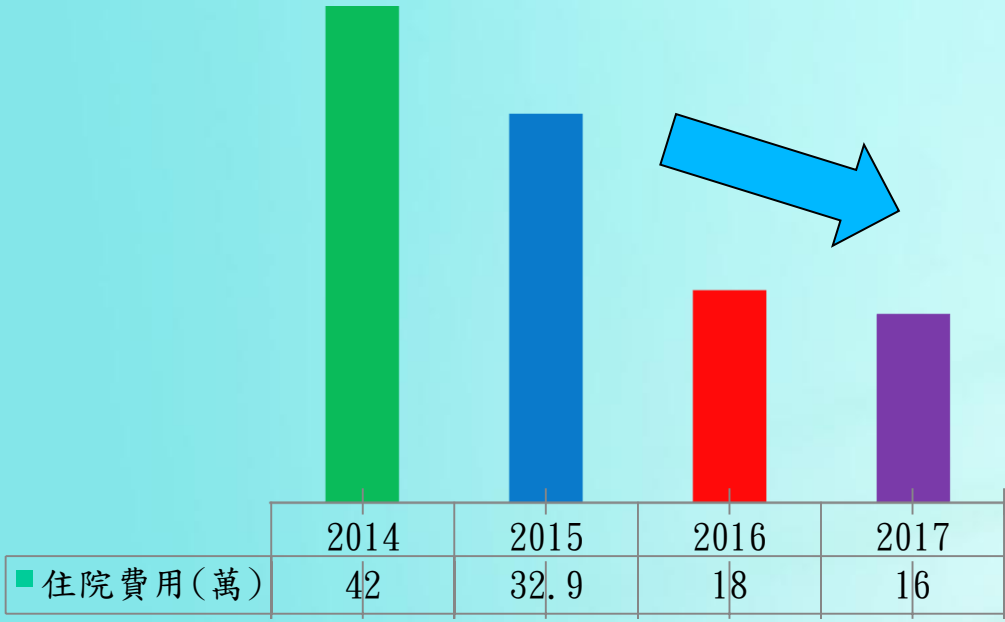
從武功祕笈到ABCDE bundle來改善呼吸器病人預後

住ICU天數



	2014	2015	2016	2017
天數	10	7.5	7.3	6.8

平均住院費用(每人)



	2014	2015	2016	2017
住院費用(萬)	42	32.9	18	16

Compassion

Hierarchical regression model for associated factors and ICU days (N=173)

Variable	鯵b	SE	t	p	95% CI
Age	-0.077	0.046	-1.026	0.306	-0.137~0.043
Sex	-0.137	1.391	-1.849	0.066	-5.317~0.174
Body mass index	-0.166	0.108	-2.227	0.027	-0.453~-0.027
APACHE II score	-0.087	0.081	-1.137	0.257	-0.252~0.068
TISS score	-0.025	0.113	-0.336	0.745	-0.261~0.187
GCS score	0.098	0.205	1.311	0.192	-0.136~0.673
No. of comorbidities	-0.062	0.035	-0.838	0.403	-0.097~0.039
Blood urea nitrogen	0.269	0.021	3.344	0.001	0.029~0.114
Creatinine level	0.063	0.307	0.807	0.421	-0.358~0.853
Sodium level	0.041	0.138	0.547	0.585	-0.197~0.348
Potassium level	-0.028	1.101	-0.371	0.711	-2.582~1.766
Calcium level	0.113	0.621	1.437	0.153	-0.335~2.120
Phosphate level	-0.058	0.423	-0.699	0.485	-1.132~0.540
Albumin level	-0.094	1.252	-1.213	0.227	-3.991~0.953
Hemoglobin level	-0.232	0.317	-3.172	0.002	-1.631~-0.380
FiO_2	-0.051	0.325	-0.601	0.549	-0.839~0.448
PaO_2					-0.037~0.039
$PaCO_2$					-0.017~0.214
PaO_2/FiO_2					-0.032~0.009
Respiratory rate					-0.013~0.539
Heart rate					-0.049~0.174
Mean arterial pressure					-0.151~0.019
Tidal volume	-0.185	0.009	1.650	0.103	-0.032~0.003
Minute ventilation	-0.145	0.466	-1.278	0.206	-1.523~0.333
MIP	-0.063	0.107	-0.550	0.584	-0.272~0.154
MEP	-0.210	0.040	-1.881	0.064	-0.156~0.005
RSIB	0.109	0.037	0.962	0.339	-0.038~0.108
Phase 2 (ABCDE bundle)	-0.214	1.379	-2.864	0.005	-6.673~-1.228
F	8.202				
R^2	0.046				
$\triangle R^2$	0.005				

ABCDE bundle is associated with Lower ICU stays

奇美醫療財團法人 奇美醫院
Chi Mei Medical Center

2014 Early Mobilization

2016 ABCDE Bundle

2018 AI Application

跨單位合作：
加護醫學部、護理部(6BICU)、
復健部、呼吸治療科、藥劑部、感染管制中心、資訊室

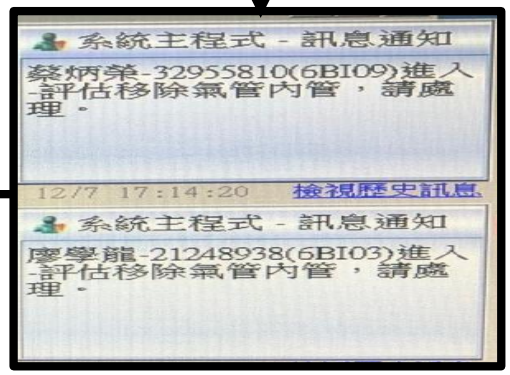
選擇改善工具－精實管理

導入智慧化組合照護模式
降低呼吸器相關事件發生率

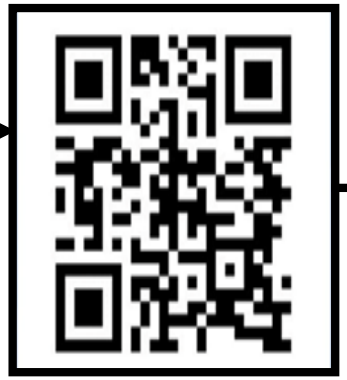
智慧化呼吸雲及AI於呼吸器脫離之運用

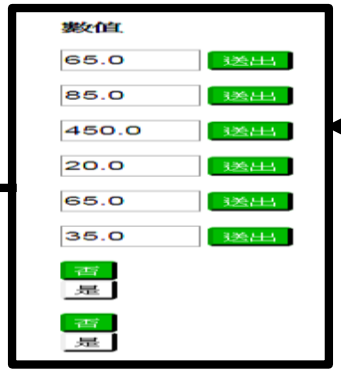
全台首創
AI人工智慧
『Palifer』

行動醫療車訊息提示相關**拔管訊息**



創新運用ChiMei extubation **Scores 8**『Palifer』APP**預測拔管機率**





輸入病人**8**個指標
年齡,**心跳**,氧合...
預測成功率
87.71%

智慧化呼吸雲及AI於呼吸器脫離之運用

Journal of *Clinical Medicine*

(SCI, IF: 5.688)

MDPI

Article

An Artificial Neural Network Model for Predicting Successful Extubation in Intensive Care Units

Meng-Hsuen Hsieh [1,†], Meng-Ju Hsieh [2,†], Chin-Ming Chen [3,4,*], Chia-Chang Hsieh [5], Chien-Ming Chao [6] and Chih-Cheng Lai [6,*]

鑑古知今:
以本院**過去資料**發表文章找出**預測拔管影響因子**

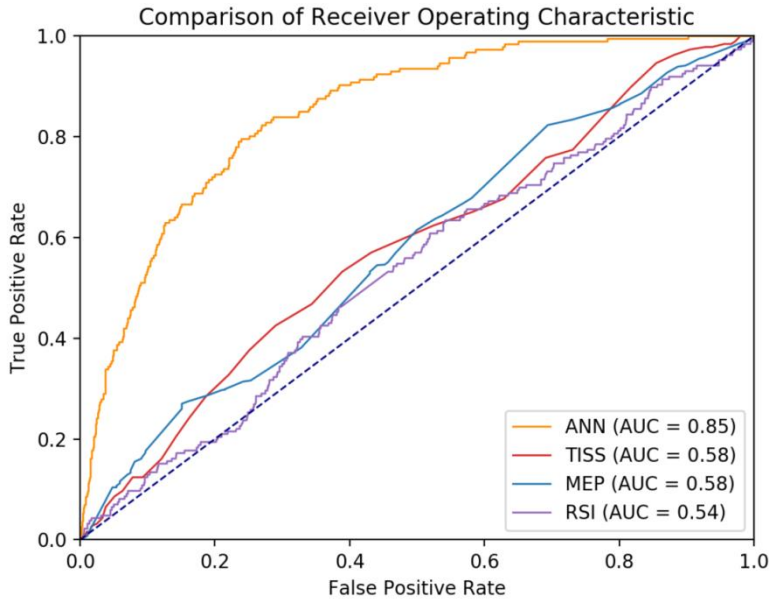


Table 2. Significant predictors of the failed extubation of all planned extubation patients.

Variable	OR	95% CI	*P**	OR	95% CI	*P***
Age (years)	1.107	1.007–1.027	0.001			
APACHE II	1.046	1.027–1.066	<0.001			
TISS Scale	1.036	1.017–1.055	<0.001	1.814 #	1.283–2.563	0.001
Glasgow coma scale	0.930	0.894–0.967	<0.001			
Comorbidities						
Chronic hemodialysis	12.970	9.483–17.740	<0.001	12.264	8.556–17.580	<0.001
Diabetes	1.507	1.110–2.045	0.008			
Active cancer	0.629	0.417–0.948	0.027			
Ventilator use duration (*h*)	1.002	1.001–1.003	<0.001			
Weaning parameter						
RSI	1.008	1.004–1.012	<0.001	2.003 %	1.378–2.910	<0.001
MIP	0.983	0.970–0.995	0.008			
MEP	0.989	0.983–0.995	<0.001	0.610 @	0.413–0.899	0.013
Pre-extubation data						
Pulse rate	1.014	1.005–1.023	0.003	1.705 *	1.173–2.480	0.005
PaO_2/FiO_2	0.997	0.995–0.998	<0.001	0.529 %	0.373–0.750	<0.001
Hemoglobin	0.832	0.765–0.904	<0.001			
Hematocrit (%)	0.961	0.939–0.984	0.001			
BUN	1.012	1.007–1.017	<0.001			

#: TISS ≥ 28.5, AUC ≈ 0.6, $p < 0.001$; %: RSI ≥ 49.95, AUC ≈ 0.6, $p < 0.001$; @: MEP < 39 cm H_2O, AUC ≈ 0.6, $p < 0.001$; Pulse rate ≥ 102.5 /min, AUC ≈ 0.6, $p = 0.026$; %: $PaO_2/FiO_2 \leq 323.25$, AUC ≈ 0.6, $p < 0.001$; * Value for univariate analysis; ** Value for multivariate analysis;

翻轉疾病復原計畫講座，連結科技新知識(D)

儀器拋轉資料持續監測生命現象
24小時制警示圖形化及異常數據自動化監測

靈活運用約束工具，優化護理工作(D)

改良式約束加油棒共4組
手部副木套版共2副

爭取志工協助
約束衛教短片QR code

創新點子
志工加入
重症醫療團隊

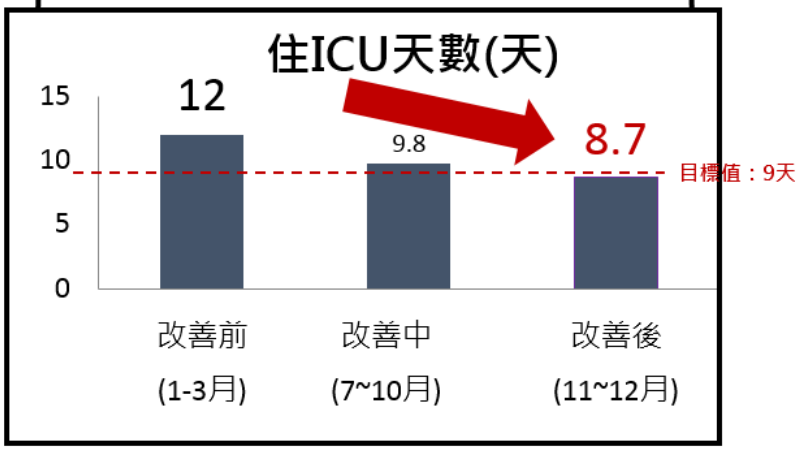
呼吸肌訓練

- 吸氣肌訓練：MIP<60cmH2O
  可加速呼吸器脫離，改善呼吸困難，改善運動耐受力

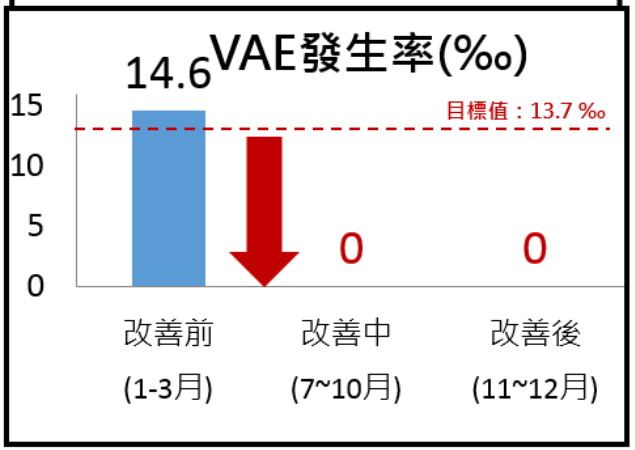
- 吐氣肌訓練：MEP<70cmH2O
  可改善呼吸功能，改善吞嚥與咳嗽功能，促進語言音量與清晰度

效果確認

住加護病房天數
持續降低
目標達成率**110%**
進步率**27.5%**



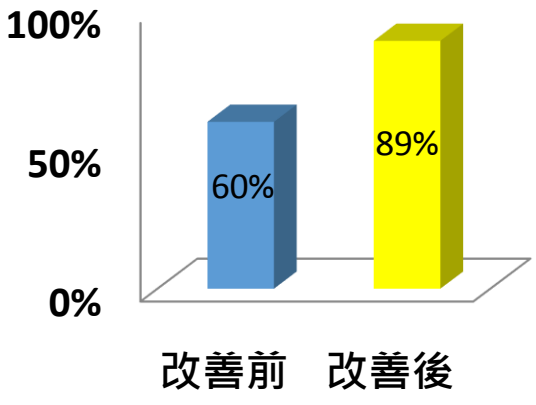
呼吸器相關事件(VAE)
發生率**大幅下降**
目標達成率**162%**
進步率**100%**



延伸效益

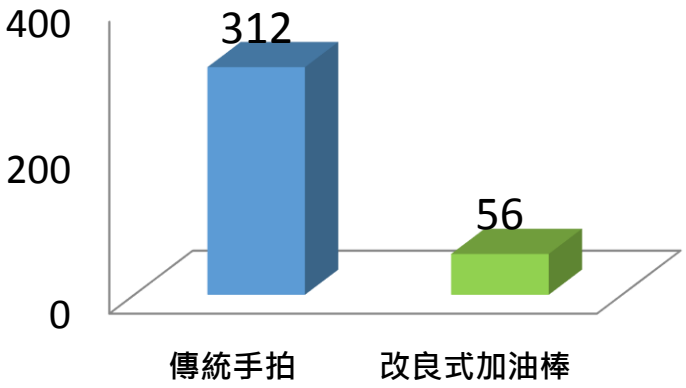
約束滿意**大幅提升**

約束工具滿意度



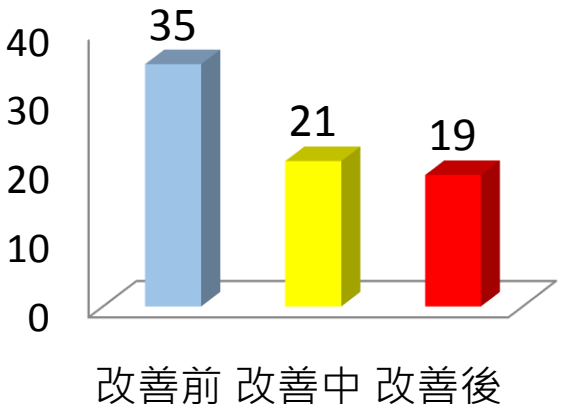
護理時數**大幅減少**

減少護理時數(使用240人次)



住院費用**持續改善**

住院費用(萬)



Mobilization is Medicine

EARLY GOAL-DIRECTED MOBILIZATION

早齊下床

瞻妄發生率
ICU天數
呼吸器天數
住院費用

拔管成功率
醫院榮耀

自拔壓力
自拔風險

減少成本

- 要活就要動
- 沒活動多病痛

持續改善-ABCDE bundle

A

每天讓病人**清醒** (Awakening)

B

接受自主**呼吸**訓練(Breathing)

C

整調物藥(Coordination)

D

妄瞻理管和測監 (Delirium survey & management)

E

床下期早(Early Exercise and Mobility)

Family

Phase I rehabilitation protocol - Facilitate weaning