Pharmacotherapy in Weaning

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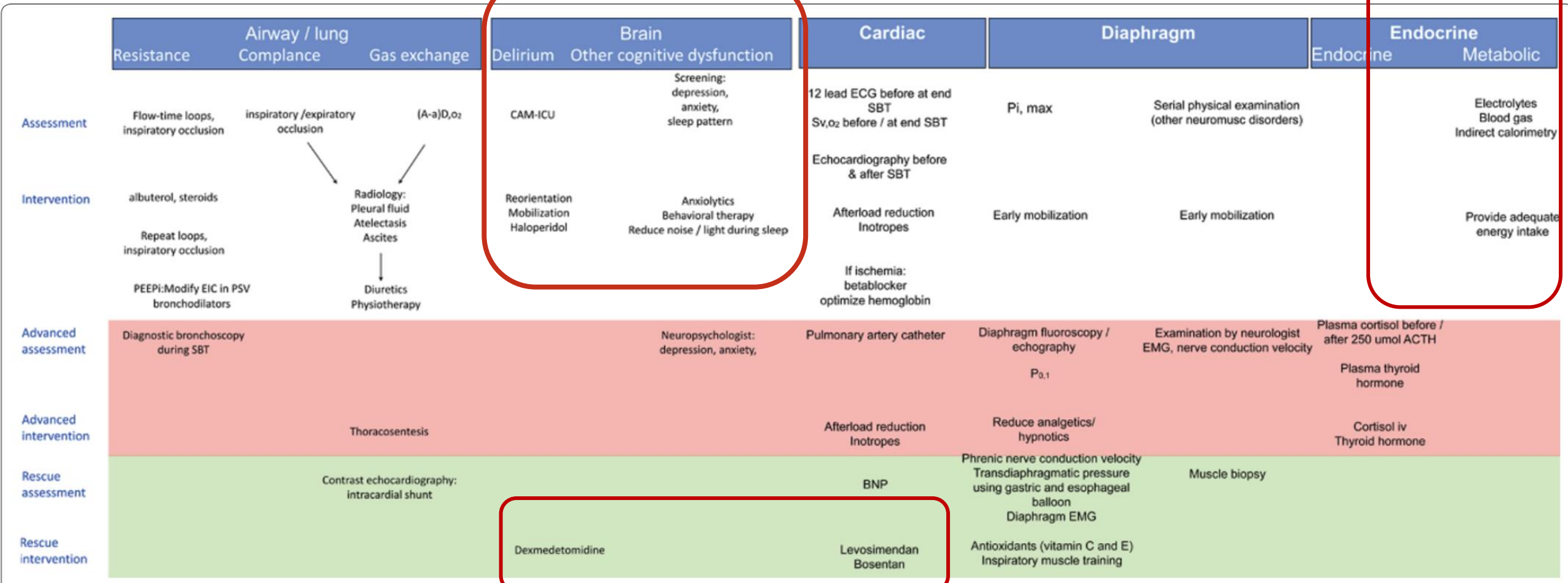
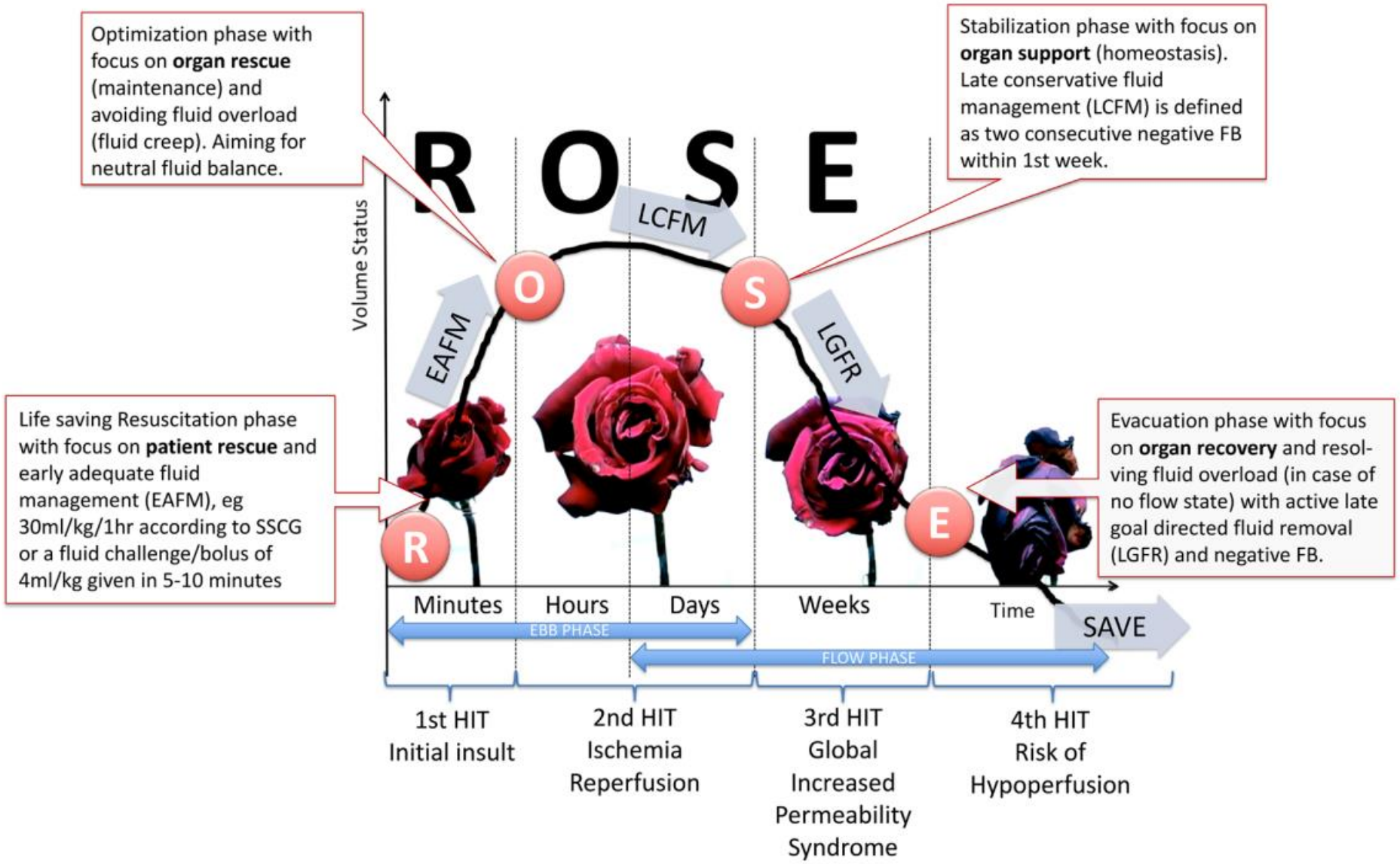


Heunks and van der Hoeven Critical Care 2010, 14:245

Panel A



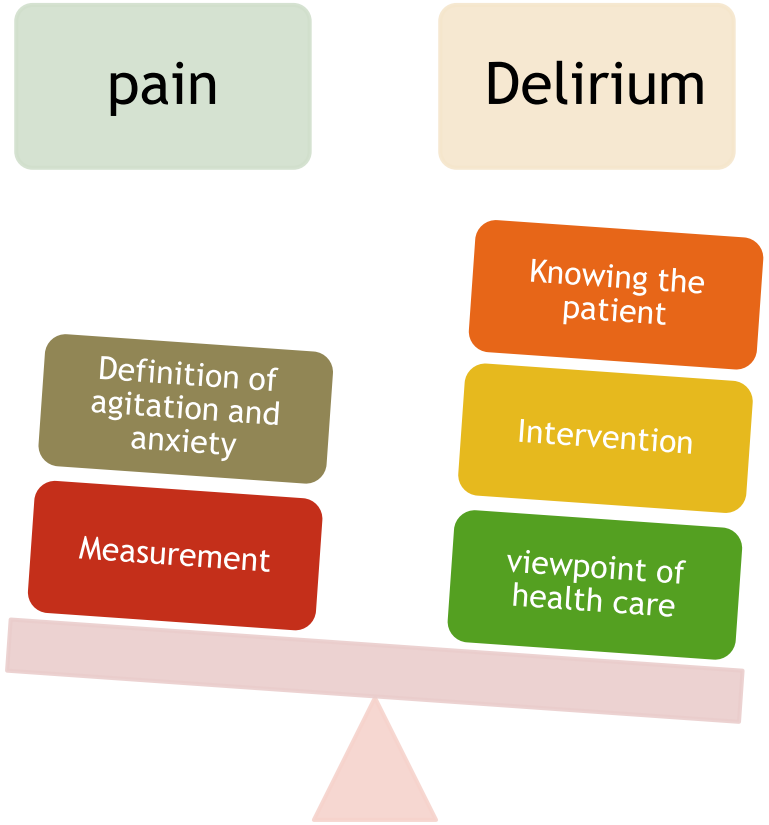
Malbrain et al. Ann. Intensive Care (2020) 10:64
https://doi.org/10.1186/s13613-020-00679-3

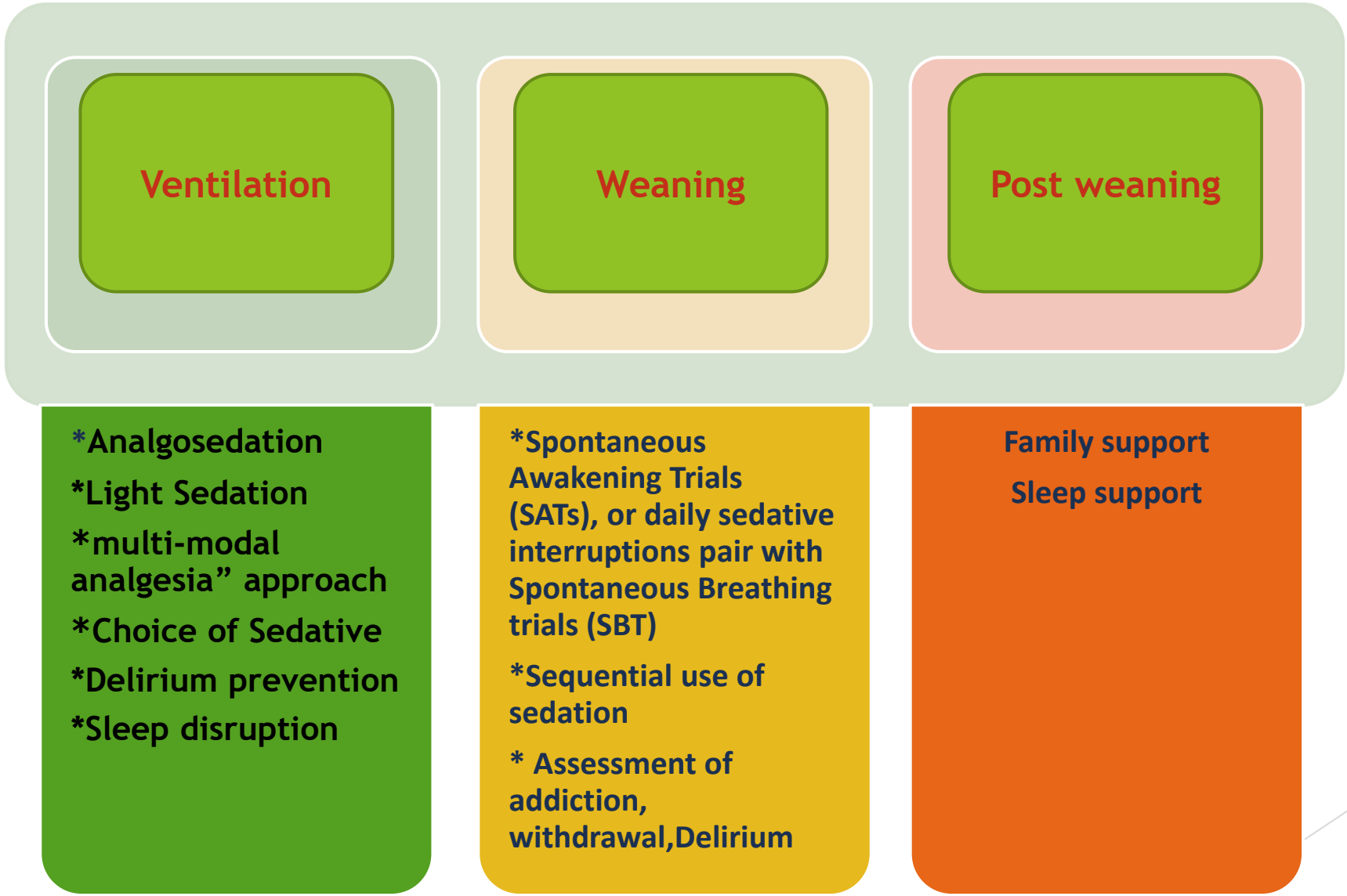
Influence of sedation on the success or failure of weaning in ICU patients

Disadvantage of Excessive or prolonged sedation:

- Prolong mechanical ventilation and hospitalization
- Predisposing the patient to ventilator associated pneumonia
- Lung injury
- Malnutrition
- Polyneuropathy
- Long term negative psychiatric outcomes, such as depression and posttraumatic stress disorder
- Diaphragm weakness

Oversedation vs undersedation




Ventilation
Weaning
Post weaning
*Analgosedation
*Light Sedation
*multi-modal analgesia" approach
*Choice of Sedative
*Delirium prevention
*Sleep disruption
*Spontaneous Awakening Trials (SATs), or daily sedative interruptions pair with Spontaneous Breathing trials (SBT)
*Sequential use of sedation
* Assessment of addiction, withdrawal,Delirium
Family support
Sleep support

Item	Description	Score
Facial expression	Relaxed	1
	Partially tightened (e.g., brow lowering)	2
	Fully tightened (e.g., eyelid closing)	3
	Grimacing	4
Upper limb movements	No movement	1
	Partially bent	2
	Fully bent with finger flexion	3
	Permanently retracted	4
Compliance with mechanical ventilation	Tolerating movement	1
	Coughing but tolerating ventilation for the most of time	2
	Fighting ventilator	3
	Unable to control ventilation	4

Behavioral Pain Scale in intubated (BPS)
Critical-Care Pain Observation Tool (CPOT)
demonstrate the greatest validity and reliability
for monitoring pain.

Indicator	Description	Score	
Facial expression	No muscular tension observed	Relaxed, neutral	0
	Presence of frowning, brow lowering, orbit tightening, and levator contraction	Tense	1
	All of the above facial movements plus eyelid tightly closed	Grimacing	2
Body movements	Does not move at all (does not necessarily mean absence of pain)	Absence of movements	0
	Slow, cautious movements, touching or rubbing the pain site, seeking attention through movements	Protection	1
	Pulling tube, attempting to sit up, moving limbs/thrashing, not following commands, striking at staff, trying to climb out of bed	Restlessness	2
Muscle tension	No resistance to passive movements	Relaxed	0
Evaluation by passive flexion and extension of upper extremities	Resistance to passive movements	Tense, rigid	1
	Strong resistance to passive movements, inability to complete them	Very tense or rigid	2
Compliance with the ventilator (intubated patients)	Alarms not activated, easy ventilation	Tolerating ventilator or movement	0
	Alarms stop spontaneously	Coughing but tolerating	1
	Asynchrony: blocking ventilation, alarms frequently activated	Fighting ventilator	2
OR			
Vocalization (extubated patients)	Talking in normal tone or no sound	Talking in normal tone or no sound	0
	Sighing, moaning	Sighing, moaning	1
	Crying out, sobbing	Crying out, sobbing	2
Total, range			**0-8**

Sedation/agitation monitoring ARDS patients

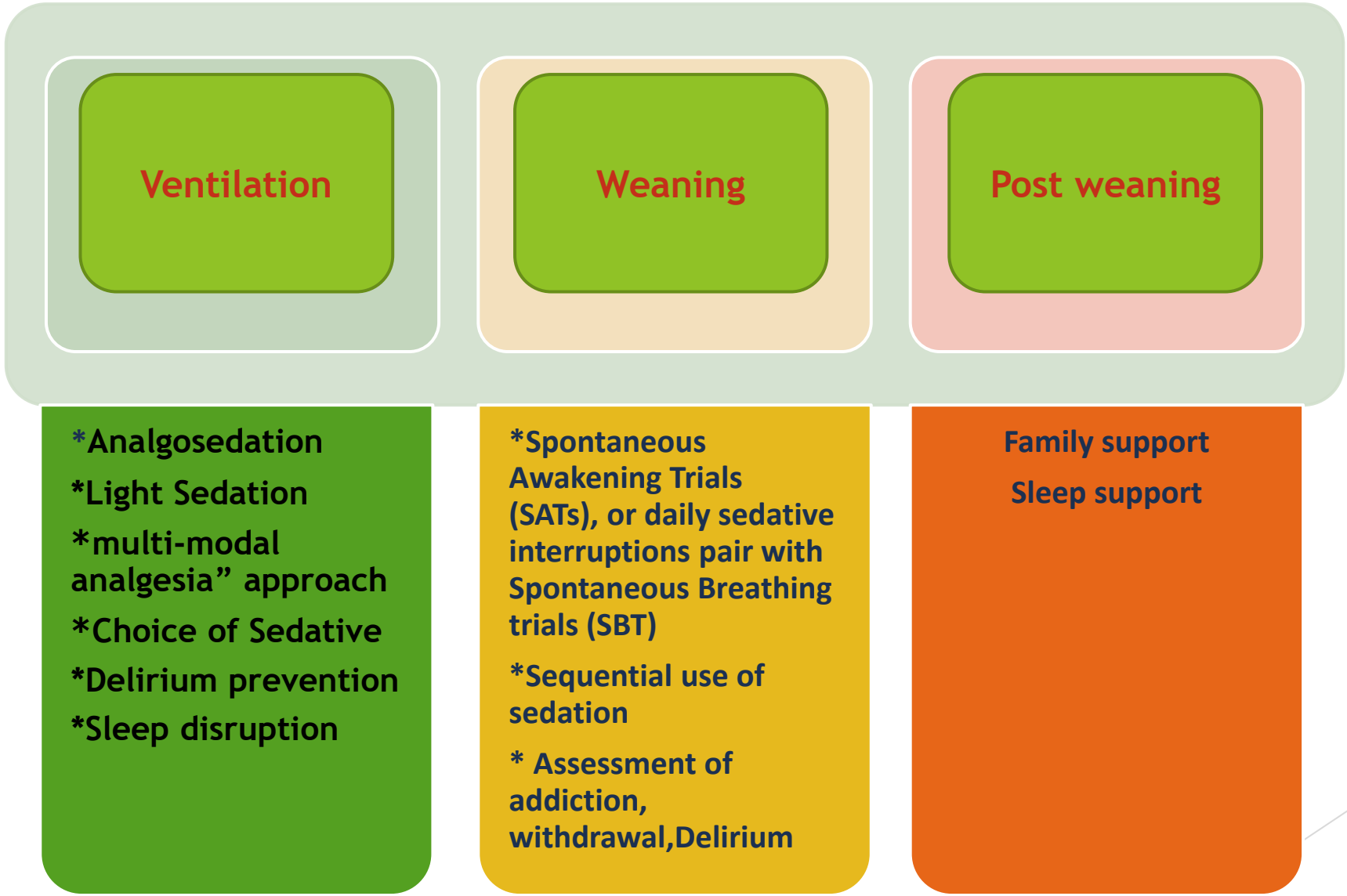
	Bispectral index BIS 1994	Richmond Agitation Sedation Scale RASS 2002	Ramsay Sedation Score RAMSAY 1974	Riker Sedation-Agitation Scale SAS 2001	
Combative	90–100	+4	1	7	Combative
Very agitated		+3		6	Very agitated
Agitated		+2		5	Agitated
Restless		+1			Restless
Alert and calm		0	2	4	Alert and calm
Drowsy		–1	3	3	Drowsy
Light sedation	80–90	–2			Light sedation
Moderate sedation		–3	4	2	Moderate sedation
Deep sedation	60–80	–4	5	1	Deep sedation
Unarousable	40–60	–5	6		Unarousable

Choice of Sedative

- Midazolam and propofol used to be the first-line agents for sedation in mechanically ventilated patients.
- Midazolam is a potent anxiolytic, hypnotic, and sedative with a drawback of unpredictable accumulation of its active metabolite, and midazolam can induce anterograde amnesia.
- It showed that midazolam used for long-term sedation in mechanically ventilated patients was associated with worse outcomes, including delayed recovery, prolonged mechanical ventilation, and possible development of delirium
- Propofol, a sedative-hypnotic agent, was associated with a dose-dependent effect and faster recovery without accumulation.
- However, high dose or prolonged use of propofol may cause hypertriglyceridemia, uncommon fatal propofol infusion syndrome, respiratory drive depression, and hypotension because of systemic vasodilation.
- dexmedetomidine—a highly selective central alpha-2 adrenergic agonist with both analgesic and sedative effects, notable for its ability to provide light sedation, analgesia, and physiologic-like sleep, as well as its minimal effect on respiratory drive— has been shown to result in a more awake and interactive patient, a lower incidence of delirium, fewer days on ventilator, and an earlier ICU discharge

Choice of Sedative

- Using propofol over a benzodiazepine for sedation in mechanically ventilated adults after **cardiac surgery** (conditional recommendation, low quality of evidence).
- Using either propofol or dexmedetomidine over benzodiazepines for sedation in critically ill, mechanically ventilated adults (conditional recommendation, low quality of evidence).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* Assessment of addiction, withdrawal,Delirium
Family support
Sleep support

Efficacy and safety of a paired sedation and ventilator weaning protocol for mechanically ventilated patients in intensive care (Awakening and Breathing Controlled trial): a randomised controlled trial

Timothy D Girard, John P Kress, Barry D Fuchs, Jason W W Thomason, William D Schweickert, Brenda T Pun, Darren B Taichman, Jan G Dunn, Anne S Pohlman, Paul A Kinniry, James C Jackson, Angelo E Canonico, Richard W Light, Ayumi K Shintani, Jennifer L Thompson, Sharon M Gordon, Jesse B Hall, Robert S Dittus, Gordon R Bernard, E Wesley Ely

Lancet 2008; 371: 126–34

See **Comment** page 95

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Summary

Background Approaches to removal of sedation and mechanical ventilation for critically ill patients vary widely. Our aim was to assess a protocol that paired spontaneous awakening trials (SATs)—ie, daily interruption of sedatives—with spontaneous breathing trials (SBTs).

Methods In four tertiary-care hospitals, we randomly assigned 336 mechanically ventilated patients in intensive care to management with a daily SAT followed by an SBT (intervention group; n=168) or with sedation per usual care plus a daily SBT (control group; n=168). The primary endpoint was time breathing without assistance. Data were analysed by intention to treat. This study is registered with ClinicalTrials.gov, number NCT00097630.

Findings One patient in the intervention group did not begin their assigned treatment protocol because of withdrawal of consent and thus was excluded from analyses and lost to follow-up. Seven patients in the control group discontinued their assigned protocol, and two of these patients were lost to follow-up. Patients in the intervention group spent more days breathing without assistance during the 28-day study period than did those in the control group (14·7 days *vs* 11·6 days; mean difference 3·1 days, 95% CI 0·7 to 5·6; p=0·02) and were discharged from intensive care (median time in intensive care 9·1 days *vs* 12·9 days; p=0·01) and the hospital earlier (median time in the hospital 14·9 days *vs* 19·2 days; p=0·04). More patients in the intervention group self-extubated than in the control group (16 patients *vs* six patients; 6·0% difference, 95% CI 0·6% to 11·8%; p=0·03), but the number of patients who required reintubation after self-extubation was similar (five patients *vs* three patients; 1·2% difference, 95% CI –5·2% to 2·5%; p=0·47), as were total reintubation rates (13·8% *vs* 12·5%; 1·3% difference, 95% CI –8·6% to 6·1%; p=0·73). At any instant during the year after enrolment, patients in the intervention group were less likely to die than were patients in the control group (HR 0·68, 95% CI 0·50 to 0·92; p=0·01). For every seven patients treated with the intervention, one life was saved (number needed to treat was 7·4, 95% CI 4·2 to 35·5).

Interpretation Our results suggest that a wake up and breathe protocol that pairs daily spontaneous awakening trials (ie, interruption of sedatives) with daily spontaneous breathing trials results in better outcomes for mechanically ventilated patients in intensive care than current standard approaches and should become routine practice.

Sequential use of sedation

Zhou *et al. Critical Care* (2022) 26:122
https://doi.org/10.1186/s13054-022-03967-5

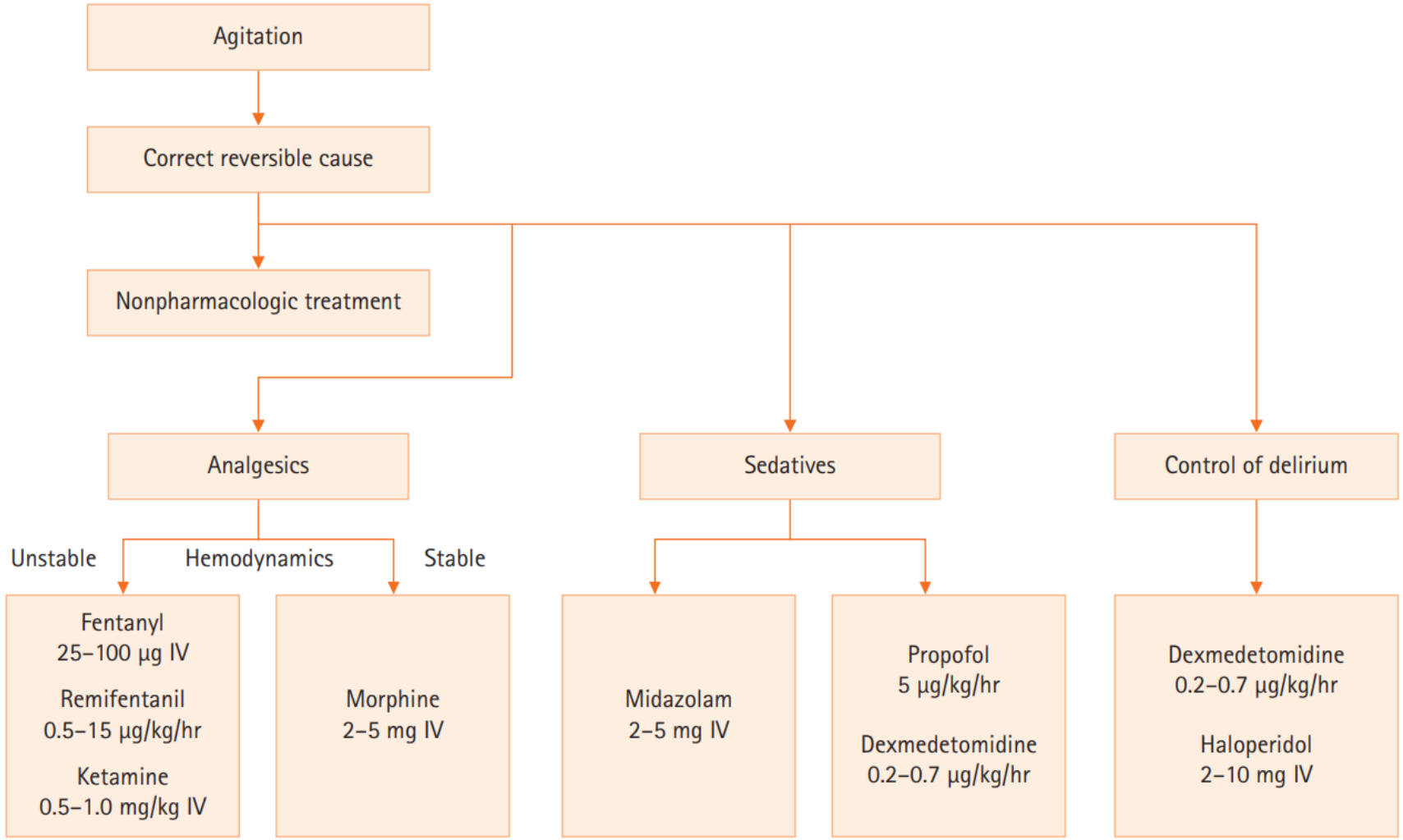
Critical Care

RESEARCH Open Access

Sequential use of midazolam and dexmedetomidine for long-term sedation may reduce weaning time in selected critically ill, mechanically ventilated patients: a randomized controlled study

Yongfang Zhou[1†], Jie Yang[1†], Bo Wang[1†], Peng Wang[1], Zhen Wang[2], Yunqin Yang[1], Guopeng Liang[1], Xiaorong jing[1], Xiaodong Jin[1], Zhongwei Zhang[1], Yiyun Deng[1], Chenggong Hu[1], Xuelian Liao[1], Wanhong Yin[1], Zhihong Tang[1], Yongming Tian[1], Liyuan Tao[3] and Yan Kang[1*]

Pharmacologic treatment flowchart for agitation in mechanically ventilated patient



Acute and Critical Care 2022 February 37(1):1-25

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Ketamine: Current applicatio
anesthesia, pain, and critical

Madhuri S. Kurdi, Kaushic A. Theerth, and Radhika

S. Deva

The Reemergence of Ketamine for Treatment in Critically Ill Adults

Authors: Hurth, Kimberly P.; Jaworski, Anthony; Thomas, Kristen B.; Kirsch, William B.; Rudoni, Michael A.; Wohlfarth,
Source: Critical Care Medicine, Volume 48, Number 6, 25 March 2020, pp. 899-911(13)

Key Component	Additional Considerations
1) From initiation of mechanical ventilation, minimize sedation to lowest effective dose	When possible, maintain light sedation with monitoring based on valid and reliable pain and sedation assessment tools. Nonbenzodiazepine strategies preferred over benzodiazepine strategies
2) To facilitate shorter weaning and discharge from ICU, select an enteral preparation and once off continuous infusions, taper doses in gradual, regular intervals.	Use standardized protocols with ability to tailor based on risk-stratification or other factors, choose dosing based on conversion tables or in consultation with critical care pharmacist
3) Use a standardized process for monitoring of withdrawal symptoms and adjust dosing accordingly	Research needed to develop validated scales for diagnosing IWS in adults, symptoms can be monitoring using non-validated tools that assess withdrawal symptoms
4) Where possible, standardize unit- or hospital-level protocols to promote local familiarity and expertise with a given strategy.	Although evidence does not clearly support one weaning strategy over another, a standardized team-based approach will facilitate efficiency and minimize errors
5) Hand off a well-documented "opioid exit plan" during transition to next care setting	Outcomes-based evaluations of implementation strategies such as pharmacist-, transition navigator-, or post-ICU clinic clinic-based models to facilitate uptake of such a plan are needed

ICU: Intensive care unit; IWS: Iatrogenic Withdrawal Syndrome.

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Thanks for Your Attention