# WEANING Framework — Reference Sheet by Domain

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## W — Work of Breathing / Respiratory Mechanics

*(Hard stop: extubation eligibility)*

**Key themes:** inspiratory effort, RSBI, respiratory mechanics, diaphragm dysfunction


1. Yang KL, Tobin MJ. A prospective study of indexes predicting the outcome of trials of weaning from mechanical ventilation. *N Engl J Med.* 1991;324:1445–1450.

2. Frutos-Vivar F, Ferguson ND, Esteban A, et al. Risk factors for extubation failure following a successful spontaneous breathing trial. *Chest.* 2006;130:1664–1671.

3. Torrini F, Gendreau S, Morel J, et al. Prediction of extubation outcome in critically ill patients: a systematic review and meta-analysis. *Crit Care.* 2021;25:391.

4. Dres M, Demoule A. Diaphragm dysfunction during weaning from mechanical ventilation. *Ann Intensive Care.* 2018;8:73.

5. Murgolo F, Spadaro S, Grieco DL, et al. Assessment of respiratory mechanics and inspiratory effort during spontaneous breathing trials to predict extubation failure in high-risk patients. *Am J Respir Crit Care Med.* 2025.


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## E — Electrolytes / End-Organ Reserve / Systemic Status

*(Modifier: fatigue and delayed failure risk)*

**Key themes:** metabolic reserve, cardiac reserve, electrolyte-driven muscle dysfunction


1. Baptistella AR, Mantelli LM, Matte L, et al. Development and validation of the Extubation Predictive Score (ExPreS). *PLoS One.* 2021;16:e0248868.

2. Torrini F, Gendreau S, Morel J, et al. Prediction of extubation outcome in critically ill patients. *Crit Care.* 2021;25:391.

3. Lemaire F, Teboul JL, Cinotti L, et al. Acute left ventricular dysfunction during unsuccessful weaning from mechanical ventilation. *Ann Intern Med.* 1988;108:548–555.

4. Liu J, Shen F, Teboul JL, et al. Cardiac dysfunction induced by weaning from mechanical ventilation. *Crit Care.* 2016;20:369.

5. Aubier M, Murciano D, Lecocguic Y, et al. Effect of hypophosphatemia on diaphragmatic contractility. *N Engl J Med.* 1985;313:420–424.

6. Shor R, Halabe A, Rishver S, et al. Severe hypophosphatemia in sepsis as a mortality predictor. *Crit Care Med.* 2006;34:1991–1996.

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# A — Awake / Analgesia / Sedation

*(Modifier: cognitive and drive-related risk)*

**Key themes:** mental status, delirium, sedative choice

1. Girard TD, Kress JP, Fuchs BD, et al. Awakening and breathing controlled trial. *Lancet.* 2008;371:126–134.

2. Jakob SM, Ruokonen E, Grounds RM, et al. Dexmedetomidine vs midazolam or propofol for prolonged ventilation. *JAMA.* 2012;307:1151–1160.

3. Reade MC, Eastwood GM, Bellomo R, et al. Dexmedetomidine for agitated delirium during weaning. *JAMA.* 2016;315:1460–1468.

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# N — Nutrition / Secretions / Aspiration Risk

*(Modifier: late extubation failure)*

**Key themes:** secretion burden, cough strength, dysphagia

1. Salam A, Tilluckdharry L, Amoateng-Adjepong Y, Manthous CA. Neurologic status, cough, secretions and extubation outcomes. *Intensive Care Med.* 2004;30:1334–1339.

2. Kifle N, Zewdu D, Abebe B, et al. Incidence and predictors of extubation failure. *PLoS One.* 2022;17:e0277915.

3. Skoretz SA, Flowers HL, Martino R. Dysphagia following endotracheal intubation: a systematic review. *Chest.* 2010;137:665–673.

4. Macht M, Wimbish T, Clark BJ, et al. Post-extubation dysphagia and outcomes. *Crit Care.* 2011;15:R231.

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# I — Infection / Inflammation / Hemodynamic Stability

*(Contextual risk: trajectory matters)*

**Key themes:** illness severity, pressors, systemic stress

1. Esteban A, Alía I, Gordo F, et al. Extubation outcome after spontaneous breathing trials. *Am J Respir Crit Care Med.* 1997;156:459–465.

2. Thille AW, Boissier F, Ben Ghezala H, et al. Risk factors for extubation failure. *Am J Respir Crit Care Med.* 2015;191:1039–1047.

3. Torrini F, Gendreau S, Morel J, et al. Prediction of extubation outcome. *Crit Care.* 2021;25:391.

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# N — Neurologic Function & Airway Protection

*(Hard stop: extubation eligibility)*

**Key themes:** airway reflexes, neurologic readiness, cough

1. Salam A, Tilluckdharry L, Amoateng-Adjepong Y, Manthous CA. Neurologic status and extubation outcomes. *Intensive Care Med.* 2004;30:1334–1339.

2. Asehnoune K, Seguin P, Lasocki S, et al. Extubation success prediction in severe brain injury. *Anesthesiology.* 2017;127:338–346.

3. Godet T, Chabanne R, Marin J, et al. Extubation failure in brain-injured patients. *Anesthesiology.* 2017;126:104–114.

4. Xu S, Tian Y, Gao R, et al. Prediction score for extubation readiness in neurosurgical patients. *Anesthesiology.* 2023;139:614–627.

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# G — Gas Exchange / Spontaneous Breathing Trial

*(Supportive, adjudicative domain — not routine ABG)*

**Key themes:** ABG not required routinely; selective adjudication

1. Pérez-Padilla R, Kacmarek RM. Importance of clinical assessment during spontaneous breathing trials. *Respir Care.* 2002;47:607–610.

2. Salam A, Smina M, Gada P, et al. Routine arterial blood gas testing after spontaneous breathing trials: is it necessary? *Respir Care.* 2003;48:552–557.

3. Epstein SK. Decision to extubate. *Intensive Care Med.* 2002;28:535–546.

4. Thille AW, Richard JCM, Brochard L. The decision to extubate in the ICU. *Am J Respir Crit Care Med.* 2013;187:1294–1302.

5. Frutos-Vivar F, Ferguson ND, Esteban A, et al. Risk factors for extubation failure. *Chest.* 2006;130:1664–1671.

6. Varón-Vega F, Giraldo-Cadavid LF, Uribe A, et al. COBRE-US trial. *Crit Care.* 2023;27:356.