

# Weaning/HS (nurse)

*This article is intended for students of secondary and higher vocational schools of nursing.*

## Explanation of terms

- Weaning – weaning, weaning.
- Discontinuation – termination, disconnection.
  - **Successful disconnection** – disconnection from the ventilator and spontaneous ventilation for at least 48 hours without the need for ventilatory support.
  - Successful extubation/decannulation.
  - **Disconnection failure** – necessity to restart the patient's UPV after previous disconnection within 48-72 hours of spontaneous ventilation.
    - On average in about 20% of patients, in patients with CNS impairment up to 33%.
- **Simple disconnection** – the patient tolerates the first SBT and is successfully extubated – 70% of patients.
- **Difficulty** Weaning – First Spontaneous Breathing Trial (SBT) failed, 2-3 SBTs required for successful weaning or within 7 days of first SBT.
- **Prolonged disconnection** – Failed at least 3 SBTs or lasted more than 7 days since the first SBT.
- **Spontaneous Breathing Trial (SBT)** – Spontaneous breathing on low pressure support (5-7 cm H<sub>2</sub>O)/ATC or Ayer 'T' at FiO<sub>2</sub> 0.5.
  - Closer monitoring is needed for the first few minutes → most problems occur during this period.
  - The test lasts a minimum of 30 minutes, but no more than 120 minutes.
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## Method

1. 1. Income.
2. Treatment of respiratory failure.
3. Readiness for disconnection.
4. Unplugging.
5. SBT.
6. Extubation.
7. Release.

 **It is necessary to consider the termination of ventilation support from the moment of its initiation!**

- - Switch to a mode with elements of spontaneous ventilation as soon as possible.
  - Support of spontaneous breathing activity (outside the critical phase).
  - Test the ability to breathe spontaneously.
  - Elimination/reduction of sedation.
  - Guidelines – protocol of the department.
  - Type of patients, experience, ventilator types, nurse/patient ratio.

## Approaches

1. 1. *Clinical approach - physician-directed approach*.
  - The attending physician assesses the patient's condition and decides on the initiation of disconnection and the method of disconnection.
2. *Protocol (nurse) driven approach*.
  - The procedure established by the protocol.
  - Routine disconnection "readiness" screening:
    - Nurse, respiratory technician, resident;
    - part of the office of the responsible doctor.

## Ayer's T

- - Minimum resistance.
  - Excellent tolerance test - 30'-120'.
  - Absence of ventilator monitoring.
  - Absence of backup ventilation.
  - The need for supervision.
  - Very fast transition to spontaneous breathing.

## Weaning via ASB

- - The patient regulates f, Vi and VT himself.

- Fan synchronization, WOB reduction.
- PEEPint compensation in COPD (COPD).
- Optimal f 25-30/m.
- Unsuitable unstable respiratory drive.
- Tachypnea (autoPEEP).
  - Auto-trigger (leak).
  - Apnoeic pauses during excessive inspiratory pressure!!!

## Risks of extending UPV

- Infection (VAP).
- UPV lung damage.
- Need for sedation.
- Respiratory tract injury.
- Costs.

## Risks of premature termination of UPV

- Loss of control of airway patency.
- Cardiovascular stress - circulatory failure.
- Insufficient gas exchange.
- Excessive strain and fatigue of respiratory muscles.

## Reintubation

- Reintubation is an independent risk factor for the development of nosocomial pneumonia and higher mortality.
- Internal and neurological patients → longer hospitalization, more frequent tracheostomy, higher mortality.
- Positive fluid balance.
- Positive culture of tracheobronchial secretions in patients with COPD within 72h after extubation.
- Amount of sputum - suction > 2 x hour, sputum > 2.5 ml/h.
- Tidal volumes -  $V_t > 4-5$  ml/kg,  $f < 30$ /min.

## Cause of disconnection failure

- Respiratory tract: Aspiration (gastric nutrition, suction NG body position), secretion in the respiratory tract, swelling of the respiratory tract.
- Outside the respiratory tract: Respiratory insufficiency due to other causes, cardiac failure, impaired consciousness, uncooperative patient.

## Failure factors

- Decreased activity of the respiratory center: Lack of sleep, general fatigue, encephalopathy of various etiology, excessive sedation, metabolic alkalosis (compensation of chronic RAC).
- Increased work of breathing: Hyperventilation - CNS damage, increased dead space ventilation, withdrawal syndrome; difficult expiration - PEEPi, airway obstruction, COPD; inappropriate ventilation mode; increased production of CO<sub>2</sub> - increased intake of energy (sugars), hypermetabolism, hyperthermia; raised diaphragm - high intra-abdominal pressure.
- Central and peripheral nervous system - ventilatory failure.
- Respiratory system: Oxygenation failure - cause at the level of blood gas exchange through the alveolocapillary membrane (pneumonia, fibrosis,...); ventilation failure - malfunction of the ventilation pump.
- Cardiovascular system: Changes in intrathoracic pressure during disconnection; increased respiratory muscle demands; heart failure; imbalance between the supply and consumption of oxygen by the myocardium - myocardial ischemia.
- Psychological cause.
- Weakness and fatigue of respiratory muscles.
- Malnutrition, respiratory muscle catabolism.
- Muscular atrophy, neuromyopathy of critically ill patients.
- Mineral breakdown (hypophosphatemia, hypomagnesemia).
- Muscle ischemia during excessive exercise.
- Paresis of the phrenic nerve.
- Polyneuritis, myasthenia.
- muscle relaxation.

## Clinical monitoring

- Subjective shortness of breath.
- Involvement of auxiliary respiratory muscles.
- Perspiration.
- Tachycardia.
- Abdominal paradoxical breathing.
- Subjective discomfort.

## Disconnect criteria

1. Adequate oxygenation (more permissive).
  - $\text{PaO}_2 / \text{FiO}_2 > 150$  to 200 mm Hg; PEEP < 5–8 cm H<sub>2</sub>O;  $\text{FiO}_2 < 0.4$  to 0.5; pH > 7.25.
2. Hemodynamic stability.
  - Absence of acute myocardial ischemia.
  - Absence of significant hypotension (0/ or only low-dose dopamine / dobutamine <5µg/kg/min), heart rate <140/min.
3. Improvement of clinical condition.
  - Afebrile < 38 °C, no RAc and RaI, Hgb 80–100 g/l, GCS > 13, no continuous sedation, stable metabolic conditions (electrolytes).

## Prerequisites for successful extubation

- Airway patency.
- Reflexes of the cranial nerves (coughing, swallowing, expectoration).
- Absence of excessive secretion from the respiratory tract.
- Consciousness (minimizing sedation, responding to challenge).
- No risk of post-extubation stridor.
- Test for determining the risk of post-extubation airway obstruction (air leakage around the deflated cuff of the tracheal tube).

## SBT failure procedure

- Connection to a ventilator (adequate ventilation support),
- The need to identify the cause of the failure.
- Repetition of SBT is recommended no earlier than in 24 hours, performing several times a day is not demonstrably associated with shortening the duration of ventilatory support.
- In selected situations where SBT fails due to a quickly correctable cause, it is considered to repeat it earlier.
- Gradual reduction of ventilatory support.

## Disconnection tolerance criteria

- RR > 35/min,  $\text{SpO}_2 < 88\%$ ,  $\text{PaO}_2 < 60$  mmHg, VT below 4 ml/kg.
- Tachycardia.
  - Lower values can be tolerated for a maximum of minutes.
- **Signs of respiratory distress** (at least 2):
  - significant involvement of auxiliary respiratory muscles;
  - paradoxical abdominal breathing;
  - perspiration;
  - subjective feeling of dyspnea.

## Patients who are difficult to detach

- Failure after 14–21 days of repeated attempts.
  - Irreversible addiction (neurological dg. 1–5%).
  - High spinal cord lesion, ALS,...
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- Freight patients.
  - Higher morbidity & mortality (only 25% discharge).
  - Specialized rehab centers.
  - At least a 3-month limit to declare permanent dependence.

## Links

- Artificial pulmonary ventilation/SŠ (nurse)

## Source

- MUDR. VOJTÍŠEK, Petr. *Weaning* [lecture for subject Modul UPV, specialization Sestra pro intenzivní péči – postgraduální studium, Vyšší odborná škola zdravotnická škola Střední a vyšší zdravotnická škola Ústí nad Labem]. Ústí nad Labem. 16.12. 2012.
- DOSTÁL, Pavel, et al. *Základy umělé plicní ventilace*. 2., rozšířené edition. Praha : Maxdorf Jessenius, 2005. ISBN 80-7345-059-3.

