Cardiovascular Surgery Weaning Pathway

Objective:
To efficiently wean cardiovascular surgical patients from mechanical ventilation.

Implementation Statement:
This is the CVICU pathway for weaning cardiac surgery patients following open-heart surgery. All patients will be weaned according to this pathway unless exclusion criteria are met or the attending physician has a sound medical reason for using a different approach. In those circumstances, a clear order must be given to the Respiratory Therapists and the Nursing Staff.

1.0 Exclusion from the CVS weaning pathway (adapted from Cheng and Tu)

Patients undergoing emergency surgery or single-valve replacement may be eligible for inclusion following a discussion with the physician.

Patients meeting the following criteria will be excluded. However, it may be appropriate for some excluded patients to be included in the pathway following a discussion with the MD.

Cardiac:

Pre-operative:
- IABP
- CHF within 24 hours prior to surgery
- Inotropic therapy within 24 hours before surgery

Post-operative:
- Inotropes: Dopamine or dobutamine > 5 mcg/kg/min
  or Neosynephrine > 0.5 mcg/kg/min
  or requiring increasing doses
- Uncontrolled dysrhythmia (A-fib with HR > 110, hemodynamically unstable when paced)
- Excessive bleeding (> 750 mL in 6 hours)

Non-cardiac:
- Acute renal insufficiency (creatinine > 150 mmol/L)
- Severe liver disease (ALT or AST > 150 IU/L)

2.0 Method of weaning and extubation

Conversion of A/C to PSV, when awake and triggering ventilator, tidal volume minimum of \( \geq 6 \text{ mL/kg} \).

If stable on PSV, proceed to assess for spontaneous breathing trial.
3.0 Criteria for Spontaneous Breathing Trial (SBT) (adapted from Cheng, Ely and Esteban)

(Usually performed 2 – 6 hours post-operatively)

Patient alert and cooperative
No need for further sedation, stable analgesic needs
Adequate pain control
Tympanic/ Core temperature >36.5 °C
Patient has not been shivering in the past 1 hr.

Pulmonary:
Following the CHR Oxygen Therapy protocol:
\[ P_aO_2 \geq 60 \text{ mmHg with a } F_1O_2 \leq 0.4 \text{ or } P_aO_2/ F_1O_2 \geq 150-200 \]
PEEP: \( \leq 5-8 \text{ cm } H_2O \)
pH \( \geq 7.30 \) (on previous ABG)
Screening parameters:
Respiratory Rate \( \leq 30 \text{ breaths/min} \)
Tobin ratio \( \leq 105 \text{ breaths/min/L} \)
Absence of paradoxical breathing
Clears secretions with cough
Endotracheal tube cuff leak

Cardiac:
Normal sinus rhythm, stable paced rhythm or controlled A-fib (HR < 110)
Cardiac index \( \geq 2.2 \text{ L/min/m}^2 \), \( S_vO_2 \geq 55\% \) (if previously done)
PCWP < 18 mmHg (If PA catheter in place)

Urine output \( \geq 0.5 \text{ mL/kg/hr.} \)
Chest tube drainage \( \leq 100 \text{ mL/hr in past 2 hr.} \)

*Proceed with SBT when ALL of the above criteria have been met.*

4.0 Spontaneous breathing trials (adapted from Esteban, Ely, Silbert and Reyes)

The RRT will place the patient on Pressure Support \( \leq 10 \text{ cmH}_2\text{O} \), PEEP 5 cmH\(_2\)O and same F\(_1\)O\(_2\) for 5-30 minute duration. If ATC is used, then set PSV to 0.

In the first 5 minutes, the RRT must monitor the patient and terminate the trial if any of the following are present. The bedside RN must also be present during this time.

RR > 38
Rapid shallow breathing index (Tobin ratio) > 105
Diaphoresis, anxiety or change in mental status
\( S_pO_2 < 90\% \) for > 5 minutes
Signs of distress or paradoxical breathing
HR > 140 bpm or a 20% change from baseline
Systolic BP < 90 or > 180 mmHg or 20% change from baseline
New dysrhythmia or myocardial ischemia
Note: If any of the above occurs, the RRT will increase PSV for patient comfort or return to previous ventilator settings as appropriate and inform the physician of the results. Duration of SBT and criteria for termination are to be properly documented in the patient’s chart.

5.0 Extubation

If the patient has tolerated the SBT, the RRT may increase the PSV for patient comfort, then discuss the possibility of extubation with the physician. This discussion should include the patient’s ability to manage secretions and the patency of the upper airway (i.e. cuff leak).

References:


Exclusion criteria:
- Acute renal insufficiency (Creatinine > 150 mmol/L)
- Severe liver disease (ALT or AST > 150 IU/L)
- Pre-op: IABP, CHF or inotropic therapy within 24 hrs before surgery
- Post-op: Excessive bleeding (> 750 ml in 6 hrs), inotropes (Dopamine or dobutamine > 5 mcg/kg/min or neosynephrine > 0.5 mcg/kg/min), uncontrolled dysrhythmia (A-fib with HR > 110, hemodynamically unstable when paced)
- Emergency surgery and valvular surgeries must be discussed with the physician on a patient specific basis

Spontaneous breathing trial criteria:
- Alert, co-operative, stable pain control
- Temperature > 36.5°C with no shivering in last hour
- $P_aO_2$ > 60 on $FO_2$ $< 0.40$ or $P_aO_2/FiO_2$ $> 150-200$
- $PEEP = 5-8 \text{ cm H}_2\text{O}$
- $pH > 7.30$ (on previous ABG)
- Screening parameters: RR $\leq 30 \text{ breaths/min}$, Tobin Ratio $\leq 105 \text{ breaths/min/L}$
- Absence of paradoxical breathing
- Clears secretions with cough
- ETT cuff leak
- NSR, stable paced or controlled A-fib (HR $< 110$)
- C.I. $> 2.2 \text{ L/min/m}^2$ and $S_pO_2 \geq 55\%$ (if previously done)
- PCWP $< 18$ (if PA catheter available)
- Urine Output $\geq 0.5 \text{ mL/kg/hr}$
- Chest tube drainage $\leq 100 \text{ mL/hr}$ in past 2 hours

Termination criteria for spontaneous breathing trial:
- RR $> 38 \text{ BPM}$
- Tobin Ratio $> 105$
- Diaphoresis, anxiety or change in mental status
- $S_pO_2 < 90\%$ for $> 5 \text{ mins}$
- Signs of distress or paradoxical breathing
- HR $> 140$ or a 20% change
- Systolic BP $< 90$ or $> 180 \text{ mmHg}$ or 20% change from baseline
- New dysrhythmia or myocardial ischemia