Ventilator Weaning Pathway (ICU) (Respiratory Services)

Quicklinks

Weaning Pathways #1

Weaning Pathways #2

Site Applicability

VGH

Practice Level

RT

Scope

This policy describes the Weaning Pathway Guideline for use with ventilated ICU patients, and includes a copy of the Weaning Readiness Report as well as the Trend of Weaning Readiness Reports.

Policy

The bedside RT and/or bedside RN will complete a daily screening between 0600 and 0900 and PRN on **all** ventilated patients who are not currently following a Weaning Pathway Guideline.

NOTE: Wean screening can also be done at any time during the day or night as applicable.

NOTE: An ICU physician may write an order for no wean screening to be done, if they determine the patient will never be able to wean from a ventilator due to their medical condition (examples: C2 Quadriplegia, home ventilator dependency, diaphragmatic paralysis, etc). The order for no wean screening and description of contributing patient condition should be clearly documented in the chart orders and recorded in the RT Comment Section of the Weaning Readiness Report. These patients would not require daily screening.

Patients will be screened for the following criteria

Stable Neurophysiologic status* ***(able to tolerate hypercapnia)**	
Minimal vasopressors/inotropes	☐
Core temp < 38ºC:	☐
pH > 7.25	☐
Hgb > 80 mg/dL	☐
PaO2/FiO2 > 150mmHg	_____ ☐
PEEPTOT < 10cmH20	☐
*VC	_____ ml/kg IBW
*MIP	_____ cmH20

*For patients who have a Spinal Cord Injury or documented or suspected neuromuscular or respiratory muscle weakness, record Vital Capacity in ml/kg IBW and MIP in cmH20.

Patients not meeting all of the criteria listed above will continue on their current supportive ventilation parameters. Patients that do meet all of the criteria will be started on a Spontaneous Breathing Trial (SBT) for < 5 min to assess for tolerance. The SBT will take the form of one of the following options at the discretion of the RT:

- CPAP < 10 cmH20
- PS < 5 cmH20
- PAV+ support setting < 20%
- T-Piece
- Trach Mask

Patients will be assessed during SBT for the following signs of intolerance:

f/VT >105	☐
SpO2 < 0.90	☐
HR >140 or sustained change by > 20%*	☐
Systolic BP >180 or sustained change by > 20%*	☐
Increased Anxiety	☐
Increased WOB	☐

***NOTE**: Significant changes in HR or BP may not be seen in patients with Spinal Cord Injuries due to loss of sympathetic tone.

The Weaning Algorithm Protocol sheet will be filled out by the bedside RT and given to the Charge RT before 0830. **The patient will be returned to the previous supportive ventilation while awaiting orders.**

The Charge RT and ICU Director or designate, with optional attendance by the Charge RN and physiotherapist, will complete RT/MD rounds for all ICU patients before 0830. All SBT reports will be discussed and verbal orders given by the physician for relevant Weaning Pathway Guideline or extubation as appropriate. The Charge RT will transcribe the verbal orders in the patient chart and fill out the Trend of Weaning Readiness Reports in the RT binder. Weaning Readiness Reports can then be disposed of in the appropriate document shredding box.

The bedside RT will begin the Weaning Pathway Guideline or extubation at 0830 as ordered.

The bedside RT should discuss HS sedation requirements and daily sedation needs with bedside RN to facilitate wean processes, and should communicate with the bedside physiotherapist to optimise mobilization and secretion clearance as necessary.

All patients on a Weaning Pathway will be assessed daily for weaning parameters and charted on the critical care flowsheet.

Procedure

WEANING PATHWAY GUIDELINE #1

For all patients **without** documented respiratory muscle weakness, or Spinal Cord Injuries (SCI) (ASIA A/B/C at T6 or above) with VC >15 ml/kg.

1. Place patient on PSV, and titrate PS to lowest level to achieve RR 15-25 bpm and VT >5ml/kg IBW. Maintain set PEEP level, and titrate FiO2 to achieve SpO2 > 92%. Decrease PS level in 2 cm H20 increments Q4H AND as tolerated.

   Watch patient for signs of intolerance and document, including but not limited to:

   - f/VT > 105
   - SpO2 < 0.90
   - HR > 140 or sustained change by > 20%*
   - Systolic BP >180 or sustained change by > 20%*
   - Increased anxiety
   - Increased WOB

   ***NOTE:** Significant changes in HR or BP may not be seen in patients with SCI due to loss of sympathetic tone.

2. Adjust PS following guideline above until patient tolerates PS < 5 cmH20 for > 30 minutes, then follow Extubation ICU/CSICU/CCU/ER[D-00-12-30252] to assess for extubation readiness and contact ICU physician for extubation order if indicated. If patient is on CPAP 6-10 cmH20, wean CPAP as tolerated to 5 cmH20 before removing ventilator.
3. **Patients should be assessed frequently throughout the shift for stability criteria.** If criteria for stability are no longer met (e.g. temp > 38ºC, pH < 7.25, PEEPTOT >10cmH20, etc), bedside RT should notify physician and ask for an order to discontinue Weaning Pathway if appropriate. Verbal orders to D/C pathway should be

   transcribed in the patient chart. RT will then start filling out Weaning Readiness Reports daily and PRN to check for stability.
4. If patient fails Weaning Pathway Guideline #1, assess VC and MIP (inability to generate -20 cmH20 indicates respiratory muscle weakness) and discuss with physician. Consider orders for Weaning Pathway Guideline #2.

OR

1. Place patient on PAV+, and titrate %Support to lowest level to achieve RR 15-25 and patient comfort. Maintain set PEEP level, and titrate FiO2 to achieve SpO2 > 92%. Decrease %Support level in 5% increments Q4H or as tolerated. Watch patient for signs of intolerance and document, including but not limited to:
   - f/VT > 105
   - SpO2 < 0.90
   - HR > 140 or sustained change by > 20%*
   - Systolic BP > 180 or sustained change by > 20%*
   - Increased anxiety
   - Increased WOBTOT

   ***NOTE:** Significant changes in HR or BP may not be seen in patients with SCI due to loss of sympathetic tone.

2. Adjust %Support following guideline above until patient tolerates %Support < 20% for > 30 minutes, then follow Extubation ICU/CSICU/CCU/ER[D-00-12-30252] to assess for extubation readiness and contact ICU physician for extubation order if indicated. If patient is on CPAP 6-10 cmH20, wean CPAP as tolerated to 5 cmH20 before removing ventilator.
3. **Patients should be assessed frequently throughout the shift for stability criteria.** If criteria for stability are no longer met (e.g. temp > 38ºC, pH < 7.25, PEEPTOT > 10cmH20, etc), bedside RT should notify physician and ask for an order to discontinue Weaning Pathway if appropriate. Verbal orders to D/C pathway should be transcribed in the patient chart. RT will then start filling out Weaning Readiness Reports daily and PRN to check for stability.

4. If patient fails Weaning Pathway Guideline #1, assess VC and MIP (inability to generate -20 cmH20 indicates respiratory muscle weakness) and discuss with physician. Consider orders for Weaning Pathway Guideline #2.

WEANING PATHWAY GUIDELINE #2

For patients **with** documented respiratory muscle weakness, SCI (ASIA A/B/C at T6 or above) with VC 10-14 ml/kg IBW*, or those who fail Weaning Pathway Guideline #1 due to muscle weakness.

***NOTE:** When assessing SCI patients for VC, assess for signs of abdominal movement indicating diaphragmatic function. It is possible for patients with good thoracic compliance to generate a VC with only accessory muscle use. VC measurements on SCI patients with level of injury T6 or higher should be done in the supine position. Patients without diaphragmatic function or with VC < 10ml/kg should be transitioned to a home ventilator and transferred to the Spinal Cord Unit at VGH or rehabilitation facility when stable.

1. Patients will likely require assisted cough and chest physiotherapy for pulmonary hygiene Q4H or PRN. SCI patients may also need assisted cough pre and post mobilization and after turns (see Assisted Cough Techniques[BD-00-07-40004]). Consider bronchodilator therapy for SCI patients as an adjunct to enhance mucociliary clearance due to loss of sympathetic airway innervation.
2. Consider tracheostomy if the patient will likely be ventilated > 3 weeks, has severe bulbar involvement, or is unable to effectively clear secretions despite assisted cough.
3. Consider continuous ETCO2 monitoring to assess tolerance during CPAP trials. Hypercapnia is often an early warning sign of respiratory failure.
4. Place patient on one of the following methods of unassisted breathing:
    - CPAP < 10 cmH20
    - PS < 5 cmH20
    - PAV support setting < 20%
    - T-Piece
    - Trach Mask
5. Titrate FiO2 to achieve SpO2 > 92%. Communicate with bedside RN and watch patient closely for signs of intolerance, including but not limited to:
    - f/VT > 105
    - SpO2 < 0.90
    - HR >140 or sustained change by > 20%*
    - Systolic BP >180 or sustained change by > 20%*
    - ETCO2 > 45 mmHg or increased by > 10 mmHg
    - Increased anxiety

- Increased WOB
- Decreased VC > 25%

***NOTE:** Significant changes in HR or BP may not be seen in patients with Spinal Cord Injuries due to loss of sympathetic tone.

6. When signs of intolerance are noted, return patient to previous supportive ventilation and document. Follow guideline chart below for examples of length and frequency of unassisted breathing trials until 2200. Communicate with bedside physiotherapist and RN regarding timing of unassisted breathing trials to optimize patient care and procedures. Return patient to supportive ventilation overnight and repeat with lengthening trials as tolerated each day until patient tolerates unassisted breathing for 24 hours, then remove ventilator or follow Extubation ICU/CSICU/CCU/ER[D-00-12-30252] to assess for extubation readiness and contact ICU physician for extubation order if indicated. If patient is on CPAP 6-10 cmH20, wean CPAP as tolerated to 5 cmH20 before removing ventilator.
7. **Patients should be assessed frequently throughout the shift for stability criteria.** If criteria for stability are no longer met (e.g. temp > 38ºC, pH < 7.25, PEEPTOT > 10cmH20, etc), bedside RT should notify physician and ask for an order to discontinue Weaning Pathway if appropriate. Verbal orders to D/C pathway should be transcribed in the patient chart. RT will then start filling out Weaning Readiness Reports daily and PRN to check for stability.

Guideline chart for length and frequency of unassisted breathing trials

Length	Frequency	Rest Between	Total Trial Time	Rest Overnight
10 min	5	3 hours	50 min	2200-0600
30 min	4	3 hours 30 min	2 hours	2200-0600
1 hour	3	4 hours 20 min	3 hours	2200-0600
2 hours	2	12 hours	4 hours	2200-0600
3 hours	2	5 hours	6 hours	2200-0600
4 hours	2	4 hours	8 hours	2200-0600
5 hours	2	4 hours	10 hours	2200-0600
6 hours	2	4 hours	12 hours	2200-0600
7 hours	2	2 hours	14 hours	2200-0600
16 hours	1	0	16 hours	2200-0600

References

Ball PA. Critical Care of Spinal Cord Injury. SPINE 2001 26(245):S27-S30.

Dhand R, Johnson JC. Care of the Chronic Tracheostomy. Respiratory Care September 2006 51(9):984-1004. Diepinigaitis

PV et al. Bronchial Hyperresponsiveness After Cervical Spinal Cord Injury. Chest April 1994 105(4):1073-6. Epstein SK.

Extubation April 2002 47(4):483-495.

Epstein SK. Weaning from Mechanical Ventilation. Respiratory Care April 2002 47(4):454-468.

Evidence-Based Guidelines for Weaning and Discontinuing Ventilatory Support. Respiratory Care Jan 2002 47(1):69-90.

Fleetham J, Hohndorf S, Wesenberg M. Weaning Guidelines for Spinal Cord Injured patients at Vancouver General Hospital. 2001-2002.

Gutierrez CJ, Harrow J, Haines F. Using an Evidence-Based Protocol to Guide Rehabilitation and Weaning of Ventilator-Dependent Cervical Spinal Cord Injury Patients.

Journal of Rehabilitation Research and Development Sept/Oct 2003 40(5):99-110.

Jaeger JM, Littlewood KA, Durbin CG. The Role of Tracheostomy in Weaning from Mechanical Ventilation April 2002 47(4):469-482.

MacIntyre NR. Evidence-Based Ventilator Weaning and Discontinuation. Respiratory Care July 2004 49(7):830-836.

MacIntyre NR. Respiratory Mechanics in the Patient Who is Weaning From the Ventilator. Respiratory Care Feb 2005 50(2):275-286.

Spungen AM et al. Pulmonary Obstruction in Individuals with Cervical Spinal Cord Lesions Unmasked by Bronchodilator Administration. Paraplegia 1993 31:404-7.

Thomas E, Paulson SS. Protocol for Weaning the SCI Patient. SCI Nursing June 1994 11(2):42-45.

UNIT(s) OF ORIGIN: Respiratory Services, August 2007

Alternate Search Terms

weaning guideline, weaning in ICU

Appendix A

Weaning Readiness Report

Red_____ Blue_____

DATE (M/D/Y)

_____/_____/_____ VGH ICU Bed #_____ IBW_____kg

MRN

Does this patient have a medical condition that would prohibit them from ever weaning from a ventilator? YES ☐ NO ☐
(C2 Quadriplegia, diaphragmatic paralysis, home ventilator dependency)
If **YES**, obtain physician's order for **No Wean Screen** and document in chart.
If **NO**, continue daily wean screening.

RN/RT Daily Screening (0600-0800 & **PRN**)

Stable Neurophysiologic status _____ ☐
(able to tolerate hypercapnia)
Minimal vasopressors/inotropes _____ ☐
Core temp ≤ 38°C: _____ ☐
pH > 7.25 _____ ☐
Hgb ≥ 80 mg/dL _____ ☐
PaO_2/FiO_2 >150mmHg _____ ☐
$PEEP_{TOT}$ ≤ 10cmH_2O _____ ☐

For SCI and NM Weakness:
VC_____ml/kg IBW MIP_____cmH_2O

NO → **Continue Current Supportive Ventilation**

Spontaneous Breathing Trial ≤ 5 min (0600-0800 & **PRN**)

CPAP ≤ 10 cmH_2O
PS ≤ 5 cmH_2O or PAV* ≤ 20%
(T-Piece or Trach Mask acceptable)

Signs of Intolerance:

(please indicate which parameter patient is demonstrating)

f/V_T ≥ 105 _____ ☐
SpO_2 < 0.90 _____ ☐
HR >140 or sustained change by ≥ 20%_____ ☐
Sys BP >180 or sustained change by ≥ 20 % _____ ☐
Increased anxiety _____ ☐
Increased WOB _____ ☐

RT/MD Weaning Rounds (0600-0830)

Attendance:

Charge RT	(required)
ICU Physician	(required)
Charge RN	(optional)
Physiotherapist	(optional)

Discuss all Weaning Readiness Reports.
Charge RT to write verbal orders for appropriate Weaning Pathway Guideline or extubation and complete Wean Trend Report.

Return to Previous Mode and Report to Charge RT

RT Begins Weaning Pathway Guideline #1 (0830)

For all patients **without** documented respiratory muscle weakness, or Spinal Cord Injuries (ASIA A/B/C at T6 or above) with VC ≥ 15 ml/kg.

RT Begins Weaning Pathway Guideline #2 (0830)

For all patients **with** documented respiratory muscle weakness, Spinal Cord Injuries (ASIA A/B/C at T6 or above) with VC 10-14 ml/kg, or those who fail Weaning Pathway Guideline #1 due to muscle weakness.

RTComments:_____

Revised October 2, 2007

Appendix B

TREND OF WEANING READINESS REPORTS

MRN

Assessment Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Date														
Stable neurophysiologic status														
Minimal vasopressors/inotropes														
Core temp ≤ 38°C														
pH > 7.25														
Hgb ≥ 80 mg/dL														
PaO2/FiO2 > 150 mmHg														
PeepTOT ≤ 10 cmH20														

Weaning Pathway Guideline # _____

Ordered (mm/dd/yr) _____
Discontinued (mm/dd/yr) _____
Re-ordered (mm/dd/yr) _____
Discontinued (mm/dd/yr) _____
Re-ordered (mm/dd/yr) _____

Date weaned to minimum support (mm/dd/yr): _____
(definition) CPAP, TPCE, PS ≤ 5, PAV ≤ 20%

Date extubated (mm/dd/yr): _____
Did extubation occur on the day patient weaned to min support?
YES_____ NO_____

If NO, describe why:_____

RT comments:_____