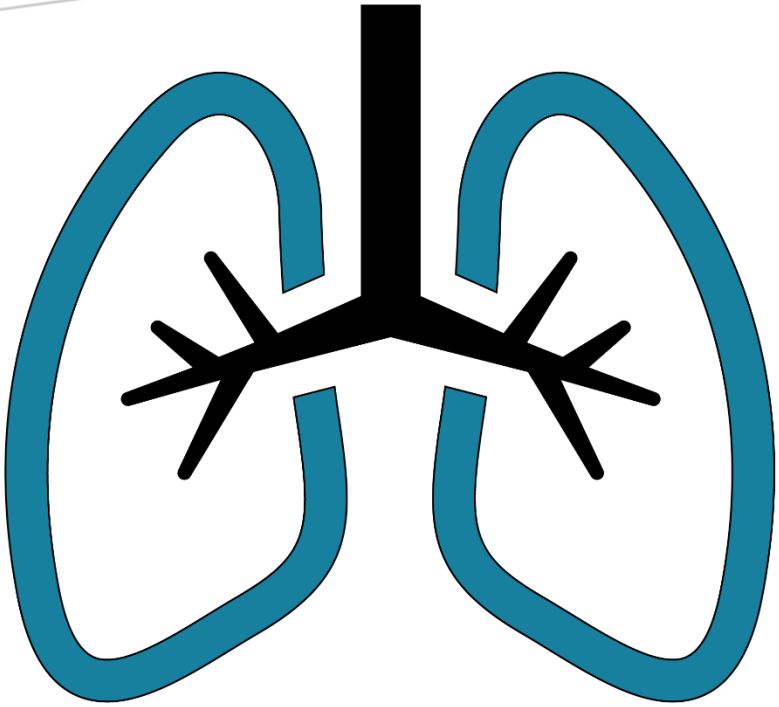

Venting Wisely

HRF & ARDS Pathway

FREQUENTLY ASKED QUESTIONS

(FAQ'S)

Alberta Health Services

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A. General Screening of Patients

1. **Do I need to re-screen my patient in 24 hours if they are excluded from the pathway with the diagnosis of cardiogenic pulmonary edema/heart failure?**

   Yes, all mechanically ventilated patients should be screened daily for HRF/ARDS and assessed for inclusion/exclusion. If heart failure is a diagnosis, the patient is excluded from the Pathway. Please document the last PF ratio completed in a steady state between 00:00-08:00 hours. Be cognizant that the diagnosis may change throughout the patient's ICU stay (i.e. the patient may develop a VAP which may lead to ARDS) so it is important the patient be screened daily and the health record reviewed.

2. **What if the patient is not on a minimum PEEP of +5 cmH2O? Are they excluded from the Pathway?**

   Yes, if the patient is on a PEEP less than +5 cmH2O, they are excluded from the Pathway. Rescreen the patient in 24 hours.

3. **Shouldn't we adjust the PF ratio for altitude, why are we using a PF of 300 to screen patients?**

   From an ARDS definition standpoint, the PF ratio should be adjusted for altitude. From a pragmatic real life standpoint to keep things simple, the PF ratio of 300 without adjustment was adopted by a large multidisciplinary committee that came to a consensus through a Delphi process. It is easier to recall for the bedside clinician.

4. **If a Chest x-ray (CXR) is needed, can the RT/RN order a CXR based on the HRF/ARDS Pathway?**

   Follow site based guidance. Typically at most sites an order from the MRHP is required for a CXR.

5. **The Pathway tells me to obtain a CXR but one was done recently. Do I need to obtain another CXR?**

   If the patient has been stable over the last few days and a CXR was obtained in the last 12-24 hours, then you can forego that intervention. However, if the patient's (oxygenation) is getting worse then a CXR may be warranted.

6. **If I know that my patient is getting worse, do I have to wait until they are screened overnight to initiate the interventions?**

   No, if your patient has increasing FIO2 requirements, decreasing PF ratio, worsening respiratory acidosis, or violation of lung protective ventilation: discuss this with the MRHP and initiate the recommended interventions. We should not withhold therapy "just for the sake of screening at night". Patients should be routinely screened overnight with an ABG (00:00 – 08:00) in a clinical steady state and additional therapies applied (if applicable/recommended).

B. Arterial Blood Gases (ABG's)

7. What is a clinically steady state ABG?

A clinically steady or homeostatic ABG should reflect a patients' current oxygenation and is not due to an unstabilizing event such as a repositioning, suctioning, or recent changes on the ventilator. It is best to collaborate with nursing and RT colleagues to determine an appropriate time to draw an ABG by communicating any events that may have impacted the patient's oxygenation. A patient will enter a steady state within 15 minutes of the last intervention performed.

8. What if the patient was unstable all night (00:00-08:00) and we couldn't obtain an ABG in a clinical steady state—can we use an ABG outside those times?

Yes, if a clinical steady state ABG was unobtainable within the designated timeframe, an ABG outside of that timeframe is acceptable. Ensure you document this in the electronic health record. The ABG is meant to be reflective of the patients' current oxygenation that is not due to an unstabilizing event (e.g., temporary mucous plugging or desaturation due to turning etc.).

9. My patient is on PSV and the morning ABG indicated a PF of 280. Do I really need to sedate and switch to a controlled mode of ventilation and ventilate at 6-8 mL/kg?

If the patient is improving or being weaned then it could be safe to leave them on PSV. (e.g., PSV and FIO2 less than or equal to 40%). This should be discussed at daily rounds and the plan documented. In some instances, it may be appropriate to sedate and place the patient in a controlled mode of ventilation if the trajectory of the patient's PF ratio (oxygenation) is worsening or as per clinical judgement by the multidisciplinary team.

10. Do we really need daily ABGs?

The frequency of ABG draws is based on patient status, trends, and clinical judgment. It is appropriate to discuss the need for daily screening with your team if there are improvements in the patients' status. There are certain circumstances where decompensation is seen after the patient appeared to be improving. This was something we observed in the COVID-19 patient population. We want to avoid missing an opportunity to provide early interventions to prevent progression of HRF into ARDS. If you notice a worsening respiratory status such as increasing FIO2 requirements, decreasing PF ratio, worsening respiratory acidosis, or inability to meet lung protective goals, then we should continue with daily screening to inform our interventions.

11. What if my patient does not have an arterial line? Do I really need to "poke my patient?"

If the patient is on mechanical ventilation they should be screened daily for HRF/ARDS which requires an ABG. However if the patient is being actively weaned, in a spontaneous mode for example, on low FIO2 and is improving towards extubation then make a note in the patient's health record as to why screening was not completed and discuss at daily rounds.

It is important that the trajectory of the patient be monitored closely. If the patient's oxygenation is worsening, an ABG should be procured to trend the PF ratio. Also, if the plan is to provide mechanical ventilation for the next few days, a discussion with the MRHP should be had for insertion of an arterial line to avoid "repeated pokes."

C. Lung Protective Ventilation (LPV): Tidal Volume, Plateau Pressure, Driving Pressures, & Ventilator Modes

12. How is the "ARDSNet Protocol" incorporated into Venting Wisely?

ARDSNet (short for ARDS Network) is a group of ICUs/researchers that studied ARDS. ARDSNet has now been replaced by the Prevention & Early Treatment of Acute Lung Injury (PETAL) network. A landmark study by the ARDSNet group, the ARMA trial by *Brower RG et al.* (2000), is often referred to as the "ARDSNet protocol". The ARMA trial focused on the benefits of low tidal volumes when compared to high or "traditional" tidal volumes.

Venting Wisely includes the findings from the ARMA trial and incorporates other literature on lung protective ventilation, NMBA, and prone positioning in a comprehensive multidisciplinary evidence-informed care pathway. This supports recognition of Hypoxemic Respiratory Failure and ARDS and reduces evidence-care gaps by emphasizing optimal and appropriate use of lifesaving therapies, while de-emphasizing less efficacious expensive treatments (e.g., inhaled pulmonary vasodilators).

13. Why is Airway Pressure Release Ventilation (APRV)/Bi-level mode NOT part of the Venting Wisely Pathway? Can we place this mode on a patient that is included in the Pathway?

The APRV/Bi-level mode is not a mandatory breath-controlled mode. Current evidence of the indications, method of titration and parameters associated with LPV remain unclear while using APRV. Therefore, the use of this mode is not a specific recommendation for this patient population. Decisions regarding the use of APRV should be a multidisciplinary

discussion based on current evidence on a case by case basis and clinician competency as per site-specific guidelines.

14. What is the best way to measure my patient to get the predicted body weight?

There is no specific evidence-based recommendation at this time that shows how to best measure a patient's height. For spontaneously breathing patients it may be best to ask "how tall are you?" if they are able to speak and enter this into the health record or review their pre-operative records for height if applicable. If measurement is required, it is best to use a long tape measure that is at least 150 cm. One method that is accurate is to measure from head to shoulder, shoulders to hip, hip to knee, then knee to heel.

An accurate height will ensure we dose and prescribe an appropriate tidal volume. This should be documented in the patient's health record to support the calculation for tidal volume in mL/kg and to justify why the prescribed tidal volumes were chosen.

15. When calculating the driving pressure, which PEEP should we use to calculate—total PEEP or the set PEEP?

For the purpose of the calculation we use set peep; however, before starting we should make sure the set peep is similar or higher than the total peep. Before being able to interpret an accurate driving pressure, you should have a good explanation as to why your set peep is different than your auto peep. In the literature driving pressures were calculated using the set PEEP. However significant air trapping can cause changes to the actual total PEEP which can drastically affect the driving pressure.

16. I thought ARDS tidal volume (ventilation) targets were 4-6 mL/kg predicted body weights (PBW), why are we using 6-8 mL/kg PBW?

Research has demonstrated that in general, tidal volumes greater than 8.0 mL/kg have been shown to be detrimental, but this is likely due to unsafe driving pressures often associated with these volumes. 4-6 mL/kg has not been shown to be superior to 6-8 mL/kg in RCT's. Driving pressures (Pplat – PEEP) have been shown to provide a more accurate estimate of the patient's functional lung size. Targeting an initial tidal volume of 6-8mL/kg usually provides safe ventilation for HRF/ARDS patients; however, tidal volumes both lower than this or higher may be necessary or even safe depending on the settings required to maintain a driving pressure less than or equal to 18 cmH_20. Driving Pressure can help determine appropriate volumes and pressures personalized to the patient. If the patient's ventilation

needs to be tailored to a more protective strategy i.e. lower tidal volumes, this should be discussed during daily rounds and documented in the health record.

17. How often should we measure plateau pressures?

Plateau pressures should be obtained at least once per shift (Q12H) with patient assessments or sooner (e.g. Q4H) if there are concerns about the plateau pressure being greater than 30 cmH2O. The Q12H plateau pressure measurement requirement is a minimum guidance. If there are any significant changes (e.g., changing position from prone to supine or vice versa, decreasing SpO2, increased FiO2 requirements, drainage of pleural effusions, post abdominal surgery) it is recommended that the study be repeated more frequently than Q12H. As per the Venting Wisely Pathway, the plateau pressure must be obtained within one hour after the patient is screened and meets the HRF threshold of a PF ratio of less than or equal to 300.

18. Would we ever want to maintain a driving pressure of less than or equal to 18 cmH2O on patients that are on non-invasive ventilation e.g., BiPAP?

The role of driving pressure with non-invasive ventilation (NIV) is not clear. There is a validated "occlusion test method" that exists for spontaneous and NIV patients however this is beyond the scope of Venting Wisely.

Currently the measurement of driving pressure is only for invasively ventilated patients that are sedated enough for a plateau pressure measurement.

19. In some literature it mentions to keep driving pressure less than 15 cmH2O. Why does the pathway guide us with a driving pressure (DP) of less than or equal to 18 cmH2O?

There was debate about this when the pathway went through the Delphi process and survey. Expert clinicians across Alberta landed on a driving pressure of less than or equal to 18 for a couple of reasons. **Note: This has not been tested prospectively in a RCT.**

a) In order to decrease DP, patients will require more sedation and neuromuscular blockage agents, so we want to balance the risks and provide room for physicians and clinicians to personalize care based on patients' status.

b) The study from Amato et al. (2015) showed driving pressures above 18 associated with median tidal volumes of 8 mL/kg and a range all the way up to 12.1 mL/kg. In this study, the risk of death exponentially increased at a driving pressure of 19. With the Venting Wisely pathway we want to stay out of harm's way with ventilator settings right from the start, so we aim to eliminate driving pressures of 19 and higher. Clinicians are encouraged to start with 18 or lower, but not higher, and then titrate to a driving pressure that is best for the patient.

D. Sedation & Neuromuscular Blockade Agents (NMBA's)

20. If continuously sedating our patients leads to delirium, then why are we sedating them?

Prevention of ICU delirium is important as it is associated with mortality and long-term post ICU complications. Unnecessary sedation can lead to delirium. It is important to balance sedation with minimizing delirium. For patients with moderate or severe HRF/ARDS, sedation allows the patient's lungs to rest, prevents ventilator dyssynchrony and prevents excess work of breathing. In the early part of their treatment plan, the patient is in the acute phase of their disease process and sedation helps facilitate ventilation by preventing further injury to the lungs. When the patient's lung injury is recovering minimizing sedation is an important tool to ensure a patient uses the least amount of sedation possible. The Venting Wisely pathway provides parameters to when sedation is helpful and when it can be minimized.

21. I've heard that the use of neuromuscular blockade agents (NMBA's) can be controversial—why are we providing this therapy?

The Venting Wisely Pathway standardizes care for mechanically ventilated patients with HRF and ARDS. In most cases the use of NMBA is appropriate; however, this does not replace clinical judgement and personalization should a scenario arise where other treatments need to be considered.

NMBA's provide skeletal muscle relaxation and facilitate oxygenation and ventilation in patients with severe ARDS. This also helps with patients that are dyssynchronous on the ventilator despite deep sedation. Escalating NMBA in a stepwise fashion balances the risk of paralysis.

22. What is the best strategy for NMBA's—bolus dosing or infusions?

The most recent rapid practice guidelines from Alhazzani et al. (2020) recommend optimizing ventilation prior to the use of NMBA and using lighter sedation if the patient is tolerating ventilation.

If we need to facilitate lung protective ventilation with NMBA in patients with moderate to severe ARDS, it is recommended to start with bolus dosing and deep sedation, with frequent assessments of the patient and their ventilation goals. If ongoing NMBA is required to

facilitate lung protective ventilation, moving to a continuous infusion is suggested for up to 48 hours. This is all in line with the rapid practice guidelines from Alhazzani et al. (2020).

E. Recruitment Maneuvers (RM), Inhaled Vasodilators & Optimal PEEP Studies

23. If recruitment maneuvers and inhaled (pulmonary) vasodilators are controversial—why are we providing these therapies?

The goal is to improve oxygenation and thus patient outcomes with HRF/ARDS. These adjunctive therapies may be beneficial to the patient. Discussion should occur on daily rounds on the appropriateness of these therapies and documented in the electronic health record. Individual scenarios may lead to individual treatments. The Pathway provides guidance for when these interventions should be considered.

24. Didn't a recent study prove that recruitment maneuvers (RM) lead to increased mortality in patients, so why is the VW Pathway recommending them?

Yes, a recent study in JAMA by Cavalcanti et al. (2017) concluded that "*In patients with moderate to severe ARDS, a strategy with lung recruitment and titrated PEEP compared with low PEEP increased 28-day all-cause mortality. These findings do not support the routine use of lung recruitment maneuver and PEEP titration in these patients. RM's increased mortality in patients."* It is important to note that the recruitment maneuvers used in this study were very aggressive.

However when thinking about when a RM should be performed, it is typically done as a rescue intervention for **therapeutic** purposes (e.g. Q4H RM) to enhance oxygenation, recruit atelectatic lung, and improve compliance. This should be considered on a case by case basis.

With reference to an optimal PEEP study, RM is a **diagnostic** intervention to aid in determining the best (optimal) PEEP in a decremental study.

If the optimal PEEP is determined appropriately and set, the use of therapeutic RM's will likely not be required.

25. Why is a recruitment maneuver (RM) recommended before and after an optimal PEEP study procedure?

In order to determine the optimal PEEP during the decremental study, the lungs need to be fully expanded (open) for the final (established) optimal PEEP to be accurate. This is done by

performing a RM immediately preceding the study. In consequence, if a RM is not performed prior to the decremental PEEP study, a falsely low optimal PEEP of the "ARDS baby lung" may be inadvertently set. This will not help improve oxygenation in the long-term.

On the same note, the lungs may de-recruit during the decremental PEEP study (especially if the PEEP has decreased significantly from its optimal level during the procedure, causing atelectasis). It would be prudent to re-inflate the lungs via a RM prior to setting the PEEP at the determined optimal PEEP setting.

It is important to be cognizant of the contraindications of a RM. A discussion should be had with the MRHP if there are any concerns with performing this procedure or an optimal PEEP study. In some instances, a modified RM may be warranted (e.g. 30 cmH2O for 40 seconds vs the standard 40 cmH2O for 40 seconds).

F. Proning

26. How do we know if proning was successful? What about the COVID patient who was improving then deteriorates again, as well as what about the patient at day 20 who is still hypoxemic?

When assessing if prone positioning was successful in patients with severe ARDS, assess how the patient responds once supine after prone positioning. Initially, oxygenation may be fine, but derecruitment may occur throughout the day or over the next 48 hours. If successful, we should see that the improvements in the PF ratio and FIO2 after prone positioning are maintained while supine.

We suggest monitoring driving pressure in the supine and prone position as oxygenation can change quite a bit with positioning due to derecruitment. We also suggest not making too many changes at once. For example: maintaining paralysis while assessing if the patient can tolerate the supine position after a proned period.

The inability to sustain the PF ratio and FIO2 when supine requires close attention from the ICU team. These scenarios require decisions from the MRHP and may not follow the pathway, especially in the event that other diagnoses begin to be considered. In most cases, management for mechanically ventilated patients with HRF and ARDS can be standardized however this should not take away from clinical judgment and personalization should a scenario arise where other treatments need to be considered.

27. If we initiate proning, do we need to continue with the practice for the next 3 days or "flips" even if the patient's oxygenation has significantly improved?

Proning increases ventilation to dependent lung zones by matching gravity dependent perfusion to ventilated alveoli, thus decreasing the shunt. This in turn improves compliance and oxygenation. With regards to how many times a patient should be proned, we suggest following what was done in the PROSEVA trial. The decision to prone should be based on the criteria from PROSEVA and the Venting Wisely pathway. **PROSEVA did not mandate that a patient should be proned and supinated for three days minimum.** This should be a daily assessment and decision. Proning should continue as long as necessary with position changes recommended every 16 hours or as per unit guidelines/discretion of the MRHP.

Remember the VW Pathway suggests to consider proning with a PF less than or equal to 150 with an FIO2 of ≥ 0.60 & strongly recommends proning with a PF ratio of less than or equal to 100 with an FIO2 of ≥ 0.60

A systemic review & meta-analysis of proning therapy in ARDS by Munshi et al. (2017) indicated that proning the patient before the VW Pathway thresholds (mild ARDS patients) showed no outcome benefit. Similarly there was no benefit if the patient was proned for less than 12 hours.

Finally, there is some risk with proning both for the patient and the staff as well as significant resources usage, so it is important that the proning criteria in the PROSEVA trial is used so as not to perform an unnecessary procedure.

G. Extracorporeal Life Support (ECLS)

22. What is the process if the patient requires Extracorporeal Life Support (ECLS) & how or when do we do this?

ECLS is the final advanced intervention in the Venting Wisely Pathway. In order for the patient to be considered, the CVICU Team will check if all of the elements in the Pathway were utilized appropriately prior to considering this therapy. Only then, barring contraindications will the Team consider ECLS.
An ECLS referral is a Physician to Physician consultation initiated by the ICU Attending to the closest center that can provide this service.

H. Miscellaneous

28. What outcomes are we measuring in this study?

There are a number of indicators and outcomes being measured. More details can be provided at the in-service. Some of the big ones include:

i. Mechanical ventilation duration, ICU and Hospital Length of Stay

ii. Ventilator mechanics, including tidal volumes and plateau pressures

iii. Proning rates

iv. ICU and hospital mortality

29. Who else is involved with the Venting Wisely study?

A multidisciplinary team has been involved with the implementation and dissemination of the project. Champions are involved at each site. Since this study is directly related to Respiratory Therapy, RRT's will be the primary drivers and advocate the interventions recommended in the HRF/ARDS Pathway.

30. We are providing the interventions recommended in the pathway already. Why are we basically doing the same thing in the study?

One of the goals of the HRF/ARDS Pathway is to standardize the interventions at specific PF ratios to optimize patient care rather than providing varying interventions. The goal is to be proactive with therapies vs. reactive to improving oxygenation.