

Using P/V Tool makes it much simpler to understand the condition of patients with early stage ARDS



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Interview with Dr Ross Freebairn, Consultant, Intensive Care Services & Director of Intensive Care Services, Hawke's Bay Hospital, Hastings, New Zealand about P/V Tool

The Hawkes Bay Hospital is a 400-bed accredited facility and is the major hospital for the east coast of the North Island, serving a population of 155,000 people. The hospital provides all services excluding cardiac surgery and neurosurgery.

The intensive care unit is a general unit with a combination of 11 beds that provide full critical care support and high dependency care.

Ten years ago the hospital was using Servo 300 ventilators when Dr Ross Freebairn decided to purchase HAMILTON MEDICAL ventilators – most recently eight HAMILTON-G5s.

Dr Ross Freebairn also holds the only ventilation courses for New Zealand; he runs this as part of the

basic course in intensive care where trainee doctors or ICU nurses attend a two to three day course and gain more in-depth knowledge of ICU care, which includes ventilation.

"P/V Tool 2 on the then Galileo Gold was unique"

Question: You have changed to using a HAMILTON MEDICAL fleet. What was the main reason for this change?

Answer: As a trainee in intensive care medicine I spent a year in Christchurch Hospital learning from Dr Keith Hickling, who, most experts would acknowledge, was a leading light in the management of ARDS patients with unique ventilation strategies at the time. Dr Hickling changed the way we managed ARDS patients. His clinical approach was "ground-breaking," where he demonstrated that reducing tidal volume to prevent VILI was very important and that allowing the patient to develop a permissive hypercapnea was also beneficial for improved survival. Dr Hickling was one of the top experts in this area, and he believed that the PV loop could tell the

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user a lot more about the patient's lung condition, especially how this would impact which ventilation strategy to use. P/V Tool 2 on the then Galileo Gold was unique as it was not just a PV loop, but also a tool that could show the user whether there was any recruitment, and importantly allowed for a reliable reproducible way to recruit lungs.

"The philosophy for treating patients at risk of developing ARDS is to start treatment early"

Q: Over the past twenty years the mortality of ARDS has steadily reduced from a high of about 70%, where today it may be as low as the mid-20s in many top ICUs. What do you think has reduced the mortality?

A: The intensive care units in New Zealand and Australia are all "closed" units, meaning that the patients are managed by trained Intensive Care physicians who have a comprehensive understanding of the strategies to manage critical illness, and their clinical practice is to exclusively care for intensive care patients. The training and assessment for intensive care physicians in our part of the world is a dedicated six-year specialty-training pathway, which is overseen by the College of Intensive Care Medicine. This training scheme has developed and matured significantly since it was started in the 1970s, and Intensive Care Medicine is recognised as a "standalone" medical discipline in New Zealand and Australia. The standard of care is very consistently applied across both countries as a result of not only comparing intensive care management practices and outcomes using the ANZICS Core outcome database, but also the development of research and clinical protocols by the CTG, ANZICS, and the College, and standardised comprehensive training coupled with ongoing regular monitored updating of intensive care practice undertaken by Fellows of the College. From this, the philosophy for treating patients at risk of developing ARDS is to start treatment early, including fluid management, early appropriate use of targeted antibiotics, and, if need be, early use of mechanical ventilation. Lung-protective strategies are employed early, which means that when we combine all of the above, the prognosis for the patient is much improved.

"P/V Tool allows us to see the lung mechanics in a different light"

Q: In your ICU do you use P/V Tool to assess recruitability?

A: Yes, I believe this is the best method as it allows us to see the lung mechanics in a different light.

We would normally start from the standard PEEP (usually 5 cmH₂O) on day one and use a low ramp speed of 2 cmH₂O per second up to a pressure of 50-60 cmH₂O. The shape of the curve is important and I also look at the deflation limb to see if there is a closing pressure point, as this would be helpful in setting PEEP. I also look at the delta volume measurement to see if the patient has a large hysteresis, as this would indicate to me that the patient would have a high potential.

"P/V Tool to help determine what would be a safe tidal volume"

Q: Based on what you see from using P/V Tool, would you change your ventilation strategies?

A: In patients who have consolidated lungs, I would use P/V Tool to help determine what would be a safe tidal volume and how the tidal volume would impact the patient if we were to increase PEEP. There is a lot of risk in these patients and it is easy to increase the risk of VILI. In a patient with atelectasis, I want to see how much PEEP can be used to prevent the lung from derecruiting. This is a different philosophy from the nonrecruiting patient.



"Measurement of recruitable volume is something we should talk more about"

Q: Do you use P/V Tool for recruitment maneuvers in the ARDS patient?

A: Yes, I believe that P/V Tool is very helpful for recruitment maneuvers as it can dramatically reduce the time to do the maneuver. Additionally, the important measurement of recruitable volume

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is something I believe we should talk more about. Many clinicians use other techniques that also work, however, many of the patients are never properly assessed for recruitability and the volume of recruitability is never known. The screenshot shows a patient who requires 15 cmH₂O of PEEP. Note the additional recruitable volume and the benefit of measuring the volume of PEEP.

"P/V Tool can be used to reliably and repeatedly measure recruitability with minimum effort"

Q: Does this mean that P/V Tool provides maybe more accurate information when you combine recruitment maneuvers and optimal PEEP together?

A: Using P/V Tool on a regular basis is very important to understand two controversial topics: a) the benefits of recruitment maneuvers and b) how much PEEP is required. In my opinion, the other techniques that are used don't combine this information accurately enough. I would encourage all trainees who are going to spend their career working in intensive care to look at these aspects. Using FiO₂ and PEEP based on a PaO₂ mmHg without looking at the patient's lung mechanics may be denying patients an opportunity for an improved outcome. P/V Tool on the HAMILTON-G5 is a very powerful tool. I believe that more users should adjust the ventilator based on using P/V Tool. They will see improvements as we have.

Not only does P/V Tool allow detection and measurement of recruitability, but the tool also allows for repeated recruitment maneuvers to be applied in a standardised way simply by setting P/V Tool to pre-specified settings and applying them.

While there are a number of different techniques described to recruit lungs, many are time consuming or technically difficult to perform. Defining P/V

Tool settings of an inflation pressure of 40-60 cmH₂O, slow inflation rate, and pause time titrated to a total time of 45-55 seconds seems to provide improved oxygenation and higher compliance in the period following the maneuver. It is worth noting that we use higher inflation pressures than the standard settings for recruitment, because, in the case of patients with ARDS, the pressure needed to open many alveoli may be above the nominal 40 cmH₂O mark. We also hold the inflation to make the total procedure time 45-55 seconds to allow time for alveoli inflation. Care needs to be taken as this high inflation pressure, while opening more alveoli, may decrease venous return and therefore, cardiac output. Adverse effects on the circulation need to be closely monitored and, if they occur, the procedure can be immediately abandoned at any time simply by canceling P/V Tool.

With care and close attention, P/V Tool can be used to reliably and repeatedly measure recruitability with minimum effort. And, when required, P/V Tool provides a recruitment maneuver to reopen collapsed lungs, improve compliance, and improve the patient's oxygen delivery at lower inspired oxygen fractions.

For more information about P/V Tool, please visit www.hamilton-medical.com/pv-tool



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