

Lung recruitability and lung recruitment with the Protective Ventilation Tool (P/V Tool)

The P/V Tool* performs a respiratory mechanics maneuver that records a quasi-static pressure/volume curve showing both the inflation and the deflation curve. This data can then be analyzed to determine the lung recruitability and recruitment strategy to apply. The P/V Tool can also be used for lung recruitment maneuvers to display the volume of the lung that is effectively recruited. This is particularly useful for ARDS patients as appropriate lung recruitment and correct setting of PEEP is critical.

Benefits of using the P/V Tool

- Easy for the operator and safe for the patient
- No disconnection of the breathing circuit, and no changes to ventilation settings
- Simple and safe way to perform lung recruitment maneuvers
- Easily repeatable process to monitor patient change and treatment effectiveness over time
- Interpretation is assisted by automatic calculations and cursors to assist with analysis

Assess and improve recruitability

A diagnosis tool: Assess recruitability of ARDS patients

The potential of recruitability is variable and difficult to predict in ARDS patients. Assessing the lung recruitability is, therefore, a prerequisite for determining the optimum recruitment strategy for an ARDS patient.¹⁾ Using the pressure/volume curve, it is possible to distinguish patients with low potential of recruitability, in whom recruitment maneuvers and high PEEP are not appropriate, from patients with high potential of recruitability, who benefit from recruitment maneuvers and high PEEP.²⁾

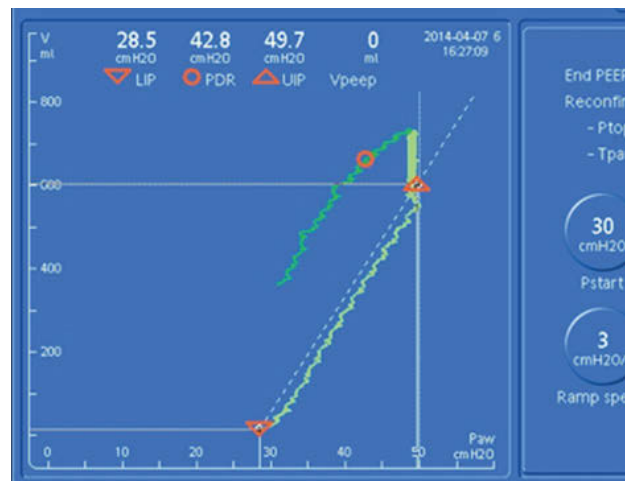
A recruitment tool: Perform a recruitment maneuver

The P/V Tool helps you perform a safe, sustained inflation recruitment maneuver. The pressure ramp, maximum pressure, and duration can be configured for each patient. The volume increase during the recruitment maneuver is displayed as an assessment of the lung volume recruited during the maneuver.³⁾

It may be necessary to perform recruitment after suctioning, after turning the patient or any time that a patient desaturates. The P/V Tool offers you a standardized, repeatable, and controllable mechanism to perform a recruitment maneuver, and keeps track of how much volume has been recruited. A successful recruitment maneuver will result in improved oxygenation, reduced end-tidal CO₂, and improved compliance.



Every year in the USA, more than 220,000 cases of ALI/ARDS are reported¹⁾ and result in considerable ICU mortality²⁾



The optimal volume-pressure relationship is between the lower inflection point (LIP) and the upper inflection point (UIP)

Apply lung-protective strategies

A lung-protection tool

Lung protection is a major objective for every patient on mechanical ventilation. Lung collapse induces regional inhomogeneity and increases the risk of atelectrauma.⁴⁾ A well-conducted recruitment strategy combining recruitment maneuvers and adequate PEEP increases lung homogeneity.

Lung protection not only reduces mortality in ARDS patients, but also reduces the risk of secondary ARDS in normal lung patients, as well as the complications in post-surgery patients.^{5) 6) 7)}

An advanced tool combined with esophageal pressure monitoring

Use of the P/V Tool together with esophageal pressure measurement is very useful for titrating the recruitment maneuver, and to properly set PEEP and tidal volume to adequately ventilate the patient without injuring the lungs.⁸⁾



Easy to use at the bedside and safe for the patient



A cursor function permits graphical analysis of the curve, including identification of inflection points

Customer feedback



“

We recommend that our respiratory therapists use the P/V Tool as soon as they put the patient on the ventilator to obtain optimal PEEP. The therapists find it very helpful, especially on the sicker patients.

Camille Neville, Critical Care Educator Respiratory Care
Florida Hospital, Orlando (FL), USA



“

We use the P/V Tool to produce a repeatable recruitment maneuver, which can be performed by anybody trained in the simple art of pushing buttons. The P/V Tool is very easy to use for nursing and medical staff, and you produce the same figures each time.

Dr. Ross Freebairn, Medical Director Intensive Care Services
Hawke's Bay Hospital, Hastings, New Zealand

* Currently, the P/V Tool is available for HAMILTON-G5, HAMILTON-S1, and GALILEO ventilators.

- 1) Lung recruitment in patients with the Acute Respiratory Distress Syndrome. N Engl J Med 2006;354:1775-86.
- 2) Recruitability of the lung estimated by the pressure volume curve hysteresis in ARDS patients. Intensive Care Med 2008; 34:2019-2025.
- 3) Optimal duration of a sustained inflation recruitment maneuver in ARDS patients. Intensive Care Med 2011; 37:1588-1594.
- 4) Lung opening and closing during ventilation of Acute Respiratory Distress Syndrome. Am J Respir Crit Care Med 2010; 181: 578-586.
- 5) Ventilation with lower tidal volumes as compared with traditional tidal volumes for acute lung injury and the acute respiratory distress syndrome. N Engl J Med 2000;342:1301-8.
- 6) Ventilation with lower tidal volumes as compared with conventional tidal volumes for patients without acute lung injury: a preventive randomized controlled trial. Critical Care 2010, 14:R1.
- 7) A trial of intraoperative low-tidal-volume ventilation in abdominal surgery. N Engl J Med 2013;369:428-437.
- 8) Mechanical ventilation guided by esophageal pressure in acute lung injury. N Engl J Med. 2008 Nov 13;359(20):2095-104