

# P/V Tool<sup>®</sup>

## Recruitability assessment and lung recruitment

The Protective Ventilation Tool (P/V Tool) performs a quasi-static pressure-volume curve of the respiratory system that describes the mechanical behavior of the lungs and chest wall during inflation and deflation. This method can be used to assess lung recruitability and determine the recruitment strategy to apply.

The P/V Tool can also be used to perform a sustained inflation recruitment maneuver and measure the increase in lung volume. It is particularly helpful for ARDS patients, as selecting an appropriate lung-recruitment strategy and the correct PEEP setting as an anti-derecruiting force can be critical for this patient group<sup>1</sup>.

<sup>1</sup> Arnal JM, et. al. Intensive Care Medicine volume 37, pages 1588–1594 (2011).

## What is P/V Tool?

- ✓ Tool for individualized, lung-protective ventilation
- ✓ Simple and safe way to assess patients' potential for recruitment and perform lung recruitment maneuvers<sup>2,3</sup>
- ✓ No need to disconnect the breathing circuit or make changes to the mode or ventilator settings
- ✓ Easily repeatable process to monitor changes in patient condition and effectiveness of treatment over time
- ✓ Interpretation is aided by automatic calculations and cursors to assist with analysis

The P/V Tool is available as an option on the HAMILTON-G5, HAMILTON-C6, and HAMILTON-C3 mechanical ventilators and is a standard feature on the HAMILTON-S1.

<sup>2</sup> Pestana, D., et al. Acta Anaesthesiologica Scandinavica 47.3 (2003): 326-334.

<sup>3</sup> Lu, Qin, and Jean-Jacques Rouby. Critical Care 4 (2000): 1-10



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

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



### A diagnostic tool: Assess recruitability of ARDS patients (Figure 1)

Using the pressure/volume curve, it is possible to distinguish patients with low recruitability, in whom recruitment maneuvers and high PEEP are not appropriate, from patients with high recruitability, who may benefit from recruitment maneuvers and higher PEEP<sup>4</sup>.

Assessing the lung recruitability is a prerequisite for determining the optimal recruitment strategy for an ARDS patient<sup>5</sup>.

### A recruitment tool: Perform a recruitment maneuver (Figure 2)

The P/V Tool helps you perform a safe, sustained-inflation recruitment maneuver. The pressure ramp, maximum pressure, duration, and final PEEP level (after the recruitment maneuver) can be individualized for each patient.

The P/V Tool offers you a fully controllable and repeatable method to perform a recruitment maneuver, and keeps track of how effective the maneuver is.

4 Demory D. Intensive Care Med 2008; 34:2019–2025.

5 Gattinoni L. N Engl J Med 2006;354:1775-86.

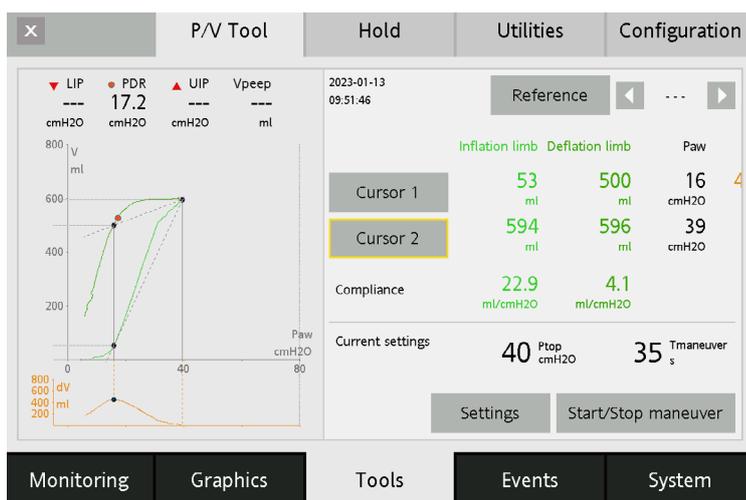


Figure 1: A cursor function enables graphical analysis of the curve, including identification of inflection points

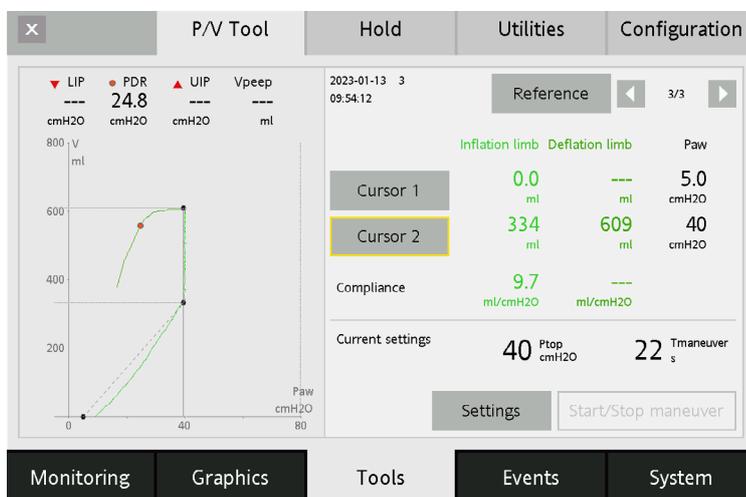


Figure 2: The increase in lung volume resulting from the recruitment maneuver can easily be measured using the cursors

# 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<sup>6</sup>. A well-conducted recruitment strategy, combining recruitment maneuvers and adequate PEEP, increases lung homogeneity<sup>7</sup>.

Lung protection not only reduces mortality in ARDS patients<sup>8</sup>, but also reduces the risk of secondary ARDS in normal lung patients, as well as the complications in post-surgery patients<sup>9,10,11</sup>.

## An advanced tool combined with esophageal pressure monitoring

In combination with esophageal pressure measurement, the P/V Tool can give you a clearer understanding of the lung and chest-wall mechanics. This enables you to apply a lung-protective ventilation strategy by titrating the PEEP level<sup>7</sup>, and optimizing the parameters for the recruitment maneuver, driving pressure and tidal volume.

6 Caironi P. Am J Respir Crit Care Med 2010; 181: 578–586.

7 Constantin JM, et al. The Lancet Respiratory medicine 7.10 (2019): 870-880.

8 Yamamoto R, et al. Scientific Reports volume 12, Article number: 9331 (2022).

9 The Acute Respiratory Distress Syndrome Network. N Engl J Med 2000; 342:1301-1308.

10 Determann RM, et al. Crit Care. 2010;14(1):R1.

11 Futier E, et al. N Engl J Med. 2013 Aug 1;369(5):428-37.



We use the P/V Tool to determine initial PEEP settings on almost all ventilated patients once they have been sedated and intubated. We also use the recruitment feature of the P/V Tool a lot, particularly for patients who are having repeated atelectasis.

Ken Hargett, Director Respiratory Care  
Houston Methodist Hospital, Houston (TX), USA

