



## Accurately Setting PEEP with Transpulmonary Pressure



Choose an optimal PEEP setting with the help of the transpulmonary pressure measurement on our high-end ventilators, HAMILTON-G5 and HAMILTON-S1.

Acute respiratory distress syndrome (ARDS) is characterized by a decrease in respiratory system compliance due to a collapsed lung and/or a decrease in chest wall compliance. When mechanical ventilation is used, the pressure shown on the ventilator display is the airway pressure and does not distinguish between the lung and chest wall components. The measurement of esophageal pressure, used as a surrogate for pleural pressure, allows calculation of the pressure required to distend the lung and the chest wall. The distending force applied to the lung, called the transpulmonary pressure, is the pressure difference between the alveoli and the esophagus, measured during an end-inspiratory or end-expiratory occlusion. For a given alveolar pressure, transpulmonary pressure decreases when esophageal pressure increases; that is, as the chest wall becomes stiffer, the proportion of airway pressure that distends the lung decreases.

### Transpulmonary pressure measurement in use



“For the most severe patients, we like to add transpulmonary pressure measurement. It’s not so complicated to use. In my unit, even fellows use it. It allows us to partition between the lung pressure and the chest wall components. This is very important for titrating the recruitment maneuver, and to set PEEP and tidal volume properly so that we ventilate the patient without injuring the lung.”

Dr. Jean-Michel Arnal

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### Scientific evidence on transpulmonary pressure measurement

Recently, interest in transpulmonary pressure has increased, resulting in a number of important studies.

These studies show that:

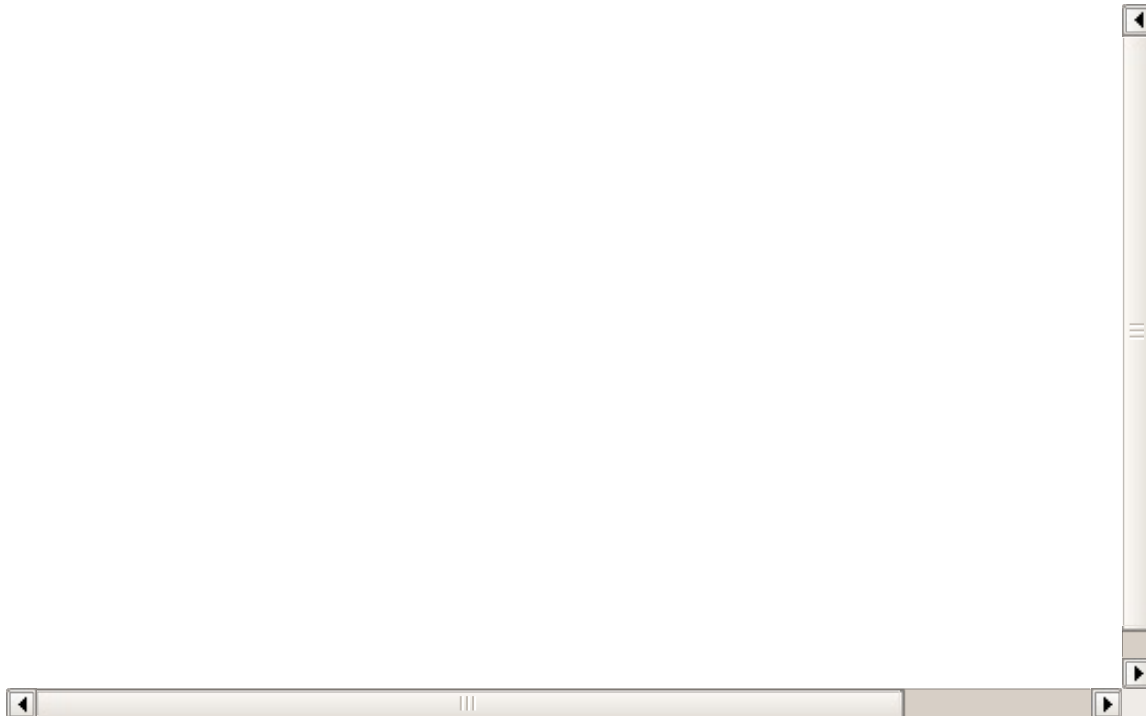
- Chest wall mechanical properties contribute substantially and unpredictably to the respiratory system <sup>1, 2</sup>
- Plateau pressure is an inadequate surrogate for lung stress. <sup>3</sup>
- PEEP set based on esophageal / transpulmonary pressure improved compliance and oxygenation in ARDS patients. <sup>4</sup>
- Esophageal pressure measurement can avoid the use of ECMO in the most severe patients (Grasso 2012). <sup>5</sup>
- Current physiological and technical knowledge on esophageal pressure measurements in patients receiving mechanical ventilation was summarized by an expert working group named "PLUG". <sup>6</sup>

### How transpulmonary pressure measurement works

The ventilators provide an auxiliary port allowing the connection of an esophageal balloon catheter. The esophageal catheter is inserted through a nostril to the stomach, and is then withdrawn into the esophagus. The balloon is positioned in the lower third of the esophagus.

The ventilator display can show esophageal (Peso), and transpulmonary pressures (Ptranspulm). Transpulmonary pressure can be used in combination with the Protective Ventilation Tool (P/V Tool) for assessing recruitability and performing recruitment maneuvers.

### Link Video



### Availability

Transpulmonary pressure measurement is standard on the [HAMILTON-G5](#) and [HAMILTON-S1](#) mechanical ventilators.

## References

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- 3) **Chiumello** D, Carlesso E, Cadringer P, Caironi P, Valenza F, Polli F, Tallarini F, Cozzi P, Cressoni M, Colombo A, Marini JJ, Gattinoni L. Lung stress and strain during mechanical ventilation for acute respiratory distress syndrome. *Am J RespirCrit Care Med*. **2008** Aug 15;178(4):346-55
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- 5) **Grasso** S, Terragni P, Birocco A, Urbino R, Del Sorbo L, Filippini C, et al. ECMO criteria for influenza A (H1N1)-associated ARDS: role of transpulmonary pressure. *Intensive Care Med*. **2012** Mar;38(3):395-403
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