

Acute Lung Injury in Trauma and Critical Illness - Reducing Unsafe Manual Ventilation Practices
with a Mechanical Flow Limiter

Authors

Presenting author: Randy S. Carpenter, BA, University of Tennessee Health Science Center

College of Medicine

Co-Authors: Mark F. Brady, MD, UTHSC Dept. of Emergency Medicine

J. Richard Walker, III, MD, UTHSC Dept. of Emergency Medicine

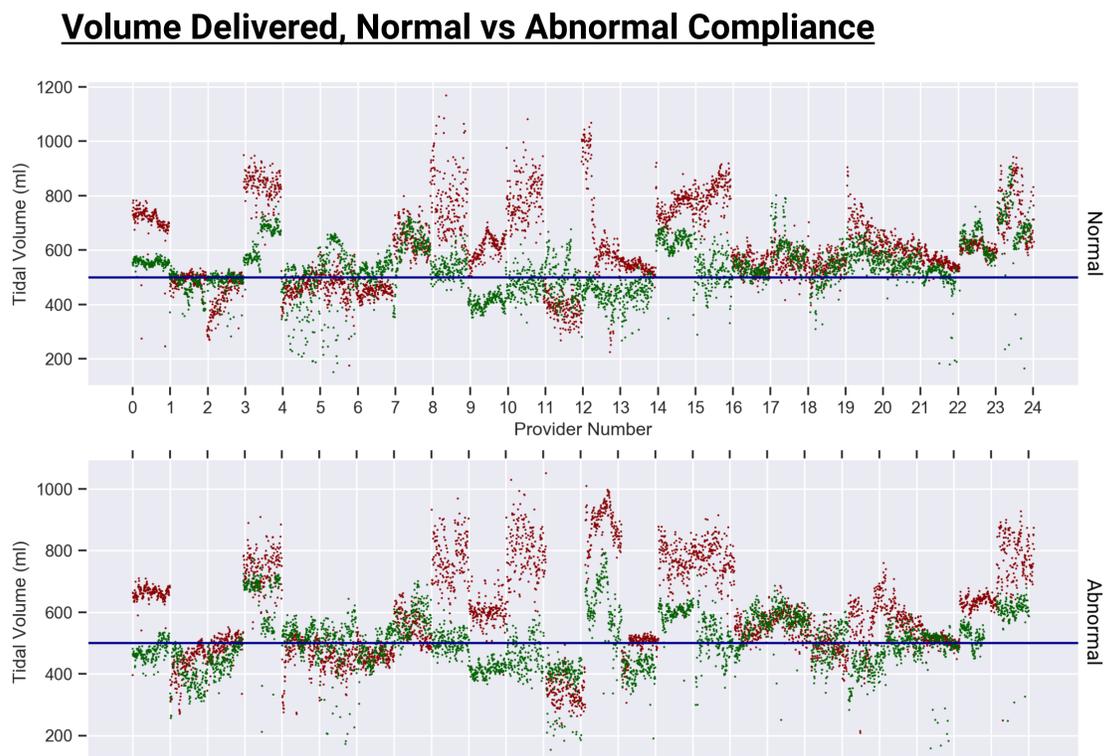
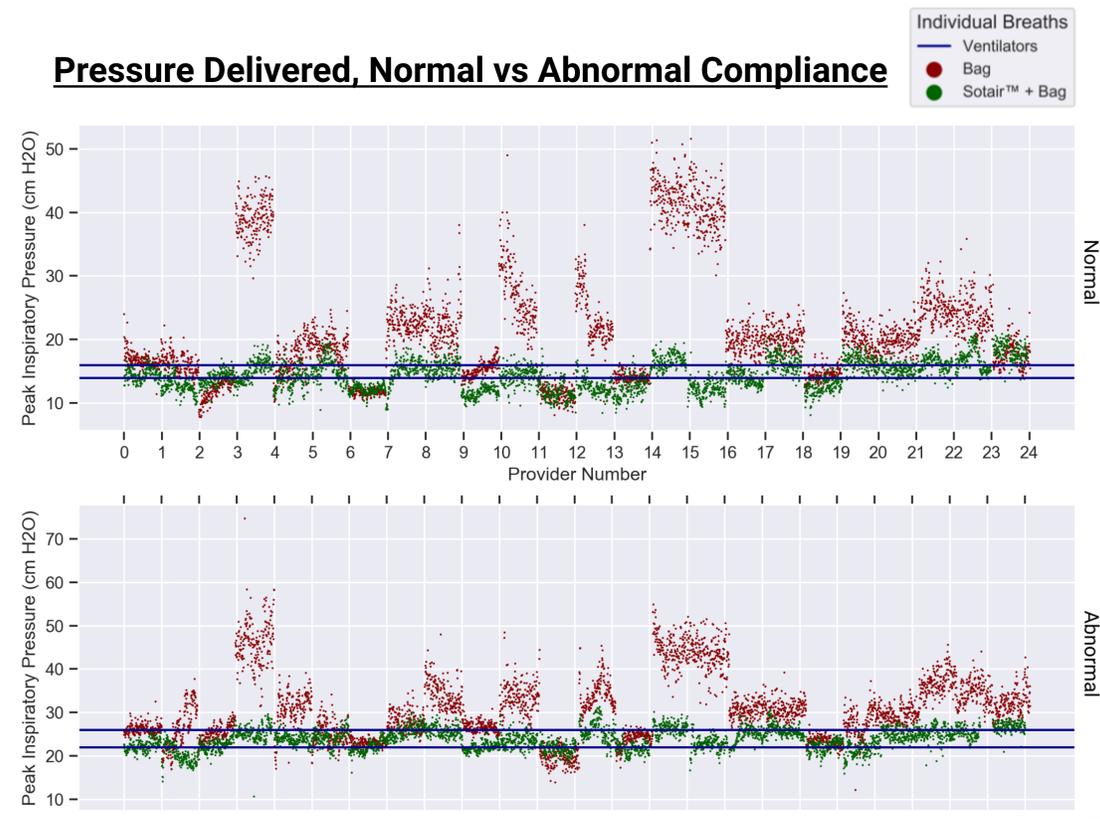
Samantha A. Ni, MD, UTHSC Dept. of Emergency Medicine

Shane Young, MD, UTHSC Dept. of Emergency Medicine

Ethan D. Monhollon, MD, UTHSC Dept. of Emergency Medicine

Ventilating with a BVM is considered a basic skill that the most inexperienced provider is expected to perform proficiently. (2) However, there is no feedback mechanism or method of control for the volume, pressure, or frequency of ventilation. (1) During positive pressure ventilation, peak inspiratory pressure (PIP) and Tidal Volume (TV) must be kept at optimal levels to achieve appropriate ventilation without causing complications, such as trauma to the lung parenchyma (3,8), aspiration (9), or stomach insufflation. (4,6,7) In the first component of this 2-part study we aim to quantify the ventilation parameters of each breath delivered by EMS personnel in a simulated model. Volunteers were requested to manually ventilate a simulated manikin using a BVM while observing chest rise. Ventilation parameters including respiratory rate, tidal volume, and peak pressure were gathered every 10 milliseconds. We found that the majority of providers delivered inadequate breaths that were outside of desired TV and PIP levels. The second leg of this study used a lung simulator and volunteer medical students, medics, and nurses to assess whether the pressure and flow limiting Sotair™ safety accessory (5) resulted in more appropriate TVs and PIPs during manual ventilation. Using mechanical ventilation as a base line, we compared BVM only ventilation in both normal and abnormal compliance settings to simulate healthy and diseased lung states. We found that the Sotair™ safety accessory helped maintain PIP and TV closer to mechanical ventilator baseline levels than BVM only ventilation across lung compliance settings. The Sotair™ safety accessory also helped providers maintain PIP levels below the threshold of pressures known to cause gastric insufflation and barotrauma. Together this data indicates the need for a BVM ventilation mitigating device as well the efficacy of the Sotair™ device as a safer option than unmitigated BVM only ventilation in both normal and decreased lung compliance conditions.

Figure 1: Peak Inspiratory Pressure (PIP) and Tidal Volume (TV) delivered at normal and decreased lung compliance conditions, both with and without the Sotair™ device. Each dot represents an individual breath delivered. PIP and TV with the Sotair™ device (Green dots) more closely resembles mechanical ventilator baseline data (blue lines) than bag only ventilation (Red dots).



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