SUPPLEMENTARY MATERIAL

Noninvasive ventilation automated technologies: a bench evaluation of devices responses to sleep-related respiratory events.

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SUPPLEMENTARY METHODS

Bench model

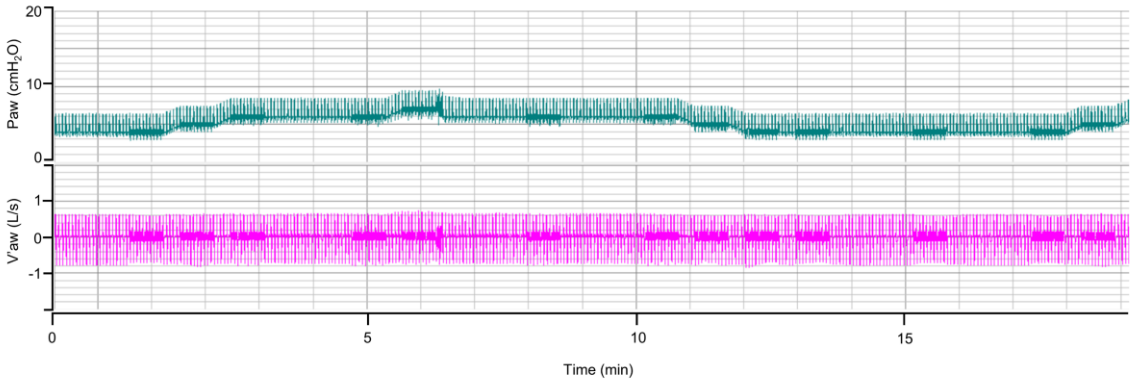
The driving ventilator was an Elisee 150 (ResMed Ltd, Bella Vista, NSW, Australia) and was set in pressure-controlled mode with inspiratory pressure, 10 cmH2O; positive end-expiratory pressure, 5 cmH2O (total inspiratory pressure, 15 cmH2O); respiratory rate (RR) 16 breaths/min; and inspiratory time 1.2 s (Inspiration:Expiration ratio, 1:2). PEEP in the driving chamber was set at 5 cmH_2O and was adjusted when needed in order to prevent chambers separation at end-expiration.

During inspiration and depending on the tested ventilator pressurization intensity, the experimental chamber could independently rise above the driving chamber. Therefore, at the beginning of inspiration (while both chambers were connected to each other), the flow and volume measured in the experimental chamber depended both on the simulated effort and the tested ventilator output. During the second part of inspiration, the tidal volume generated only resulted from the tested ventilator output, accordingly with inspiratory muscle relaxation which may occur before the end of insufflation.[1]

SUPPLEMENTARY FIGURES

Supplementary Figure 1. BiPAP A40 Pro (Philips) behavior in the absence of event simulation.

BiPAP A40 Pro adjusts EPAP independently from the occurrence of an event. Pressure oscillations are periodically generated by the device to assess the resulting amplitude of flow variations. This algorithm allows for identifying the conductance of the system as a surrogate of airway resistance. The device automatically increases EPAP up to a level at which there is no further reduction in the resistance of the system. From this level, step by step reduction of EPAP is generated and so on. V'aw, respiratory flow; Paw, airway pressure.



Supplementary Figure 2. Diagram of dynamic device behavior from the first to the last cycle of each period of interest – Simulation of the events over a 1-minute duration.

The tidal volume (V_T) values presented are derived from the pneumotachograph, and presented as a percentage of the target V_T (set on the tested NIV device) or of the mean *pre-event* V_T (measured by the pneumotachograph).

Figure 2A: Vivo45 (Breas)

Figure 2B: Prisma VENT40 (Löwenstein)

*: V_T = 276% of target V_T

Figure 2C: BiPAP A40 Pro (Philips)

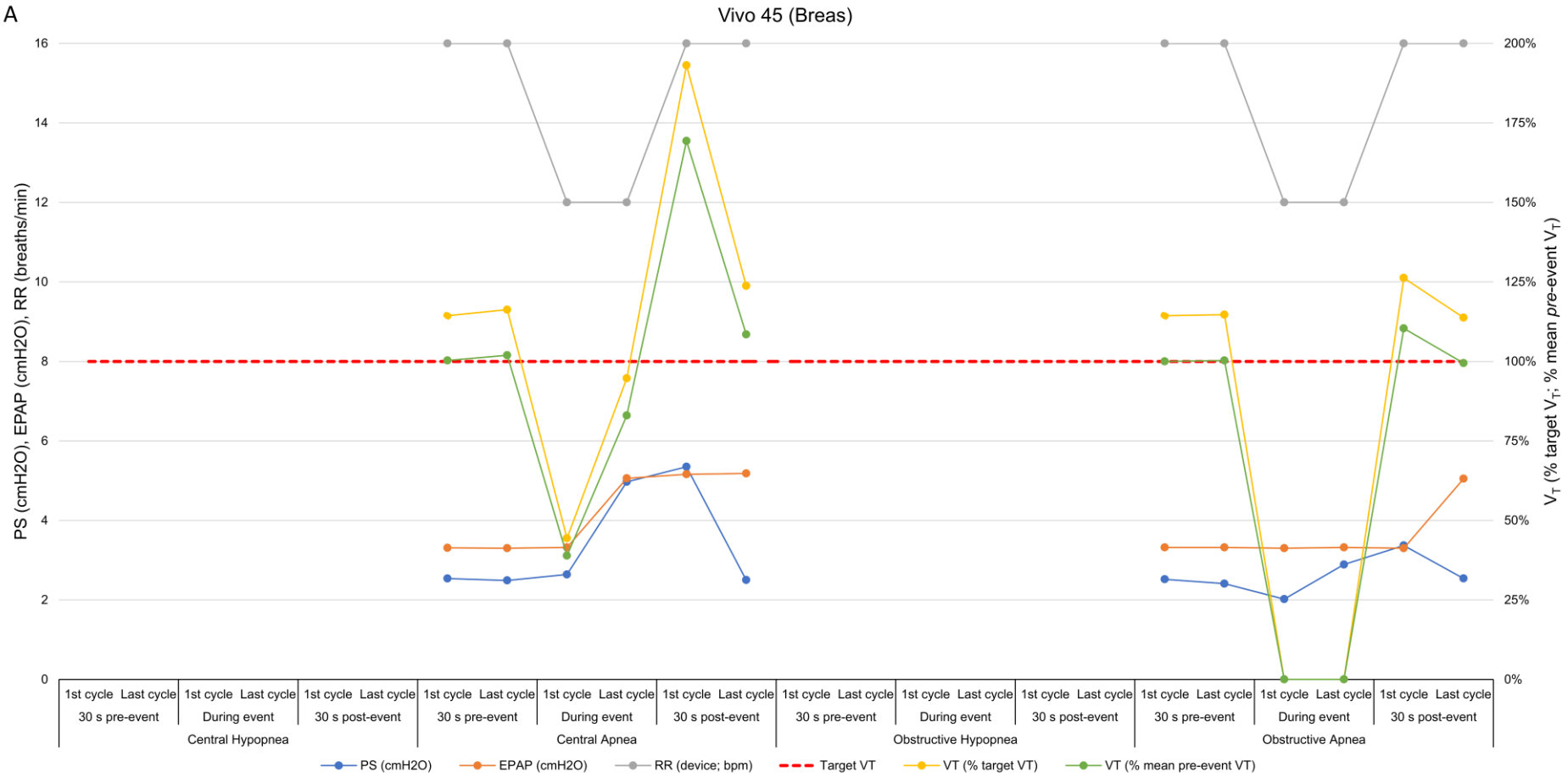
* Note that the greater EPAP level at the beginning of the CA simulation was not induced by the event, but was related to the algorithm of the device as described in supplementary Figure 1.

Figure 2D: Stellar 150 (ResMed)

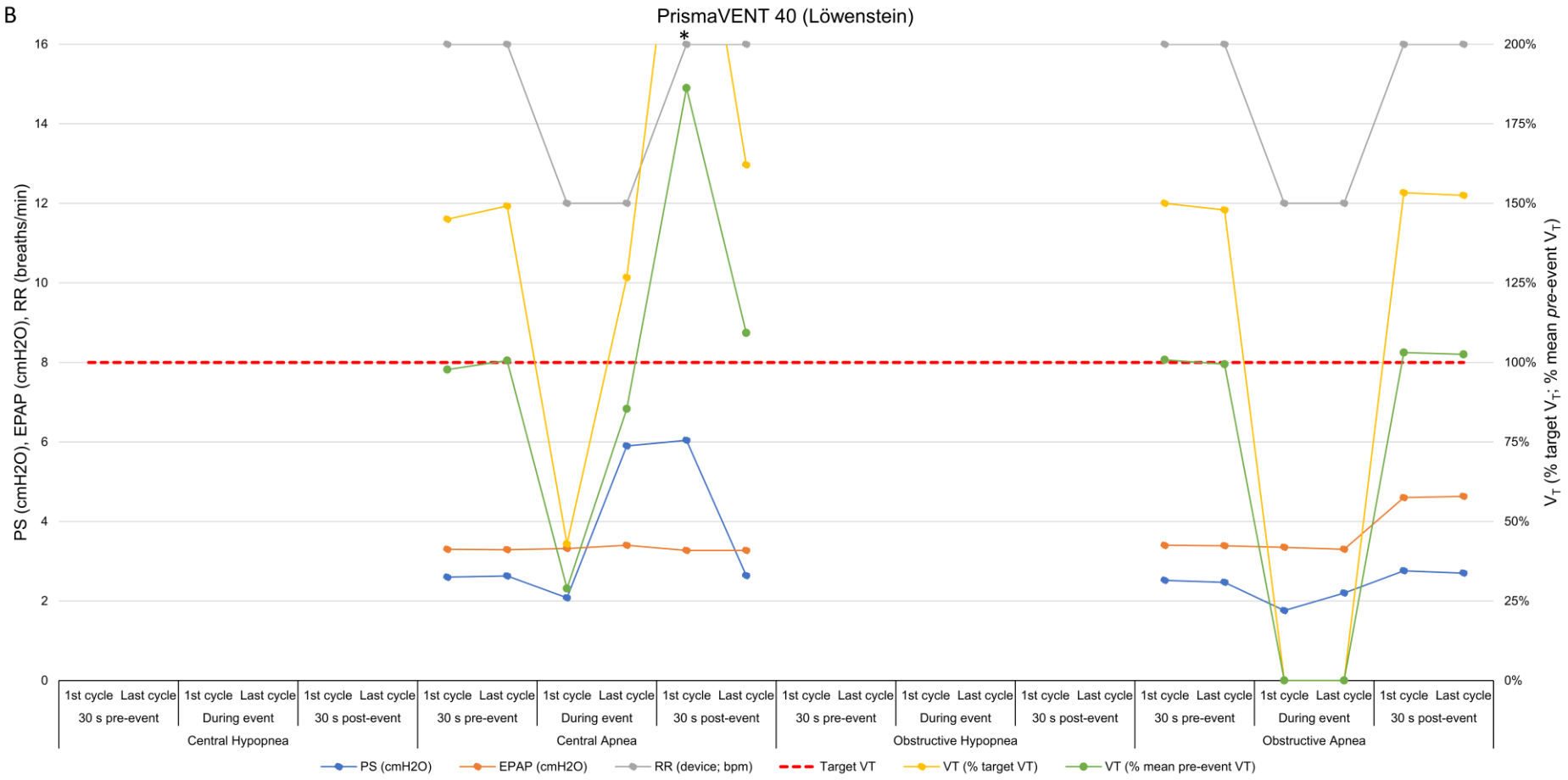
*: V_T = 255% of target V_T; 231% of mean *pre-event* V_T

PS, pressure support; EPAP, expiratory positive airway pressure; RR, respiratory rate; V_T, tidal volume.

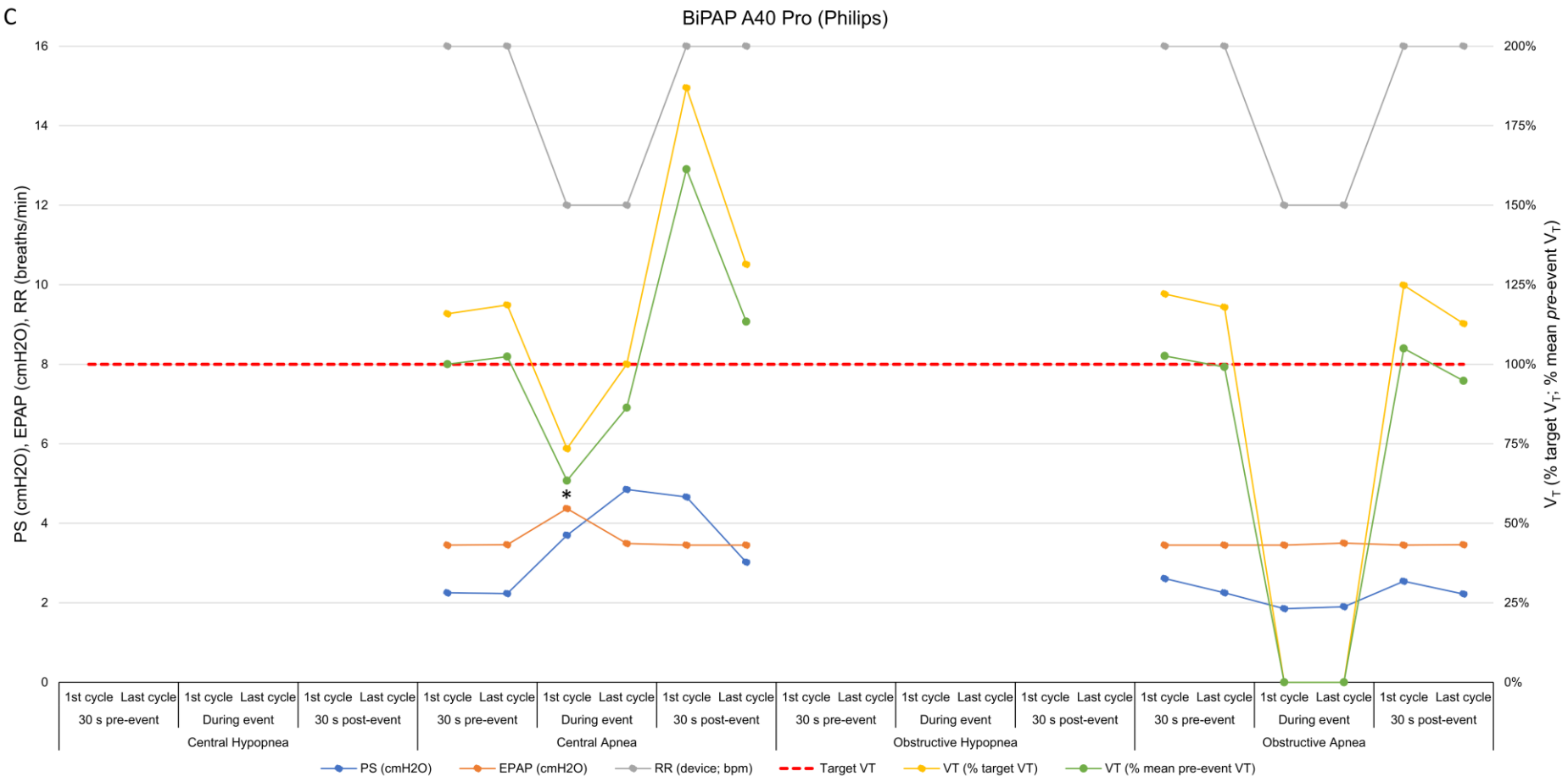
Supplementary Figure 2A



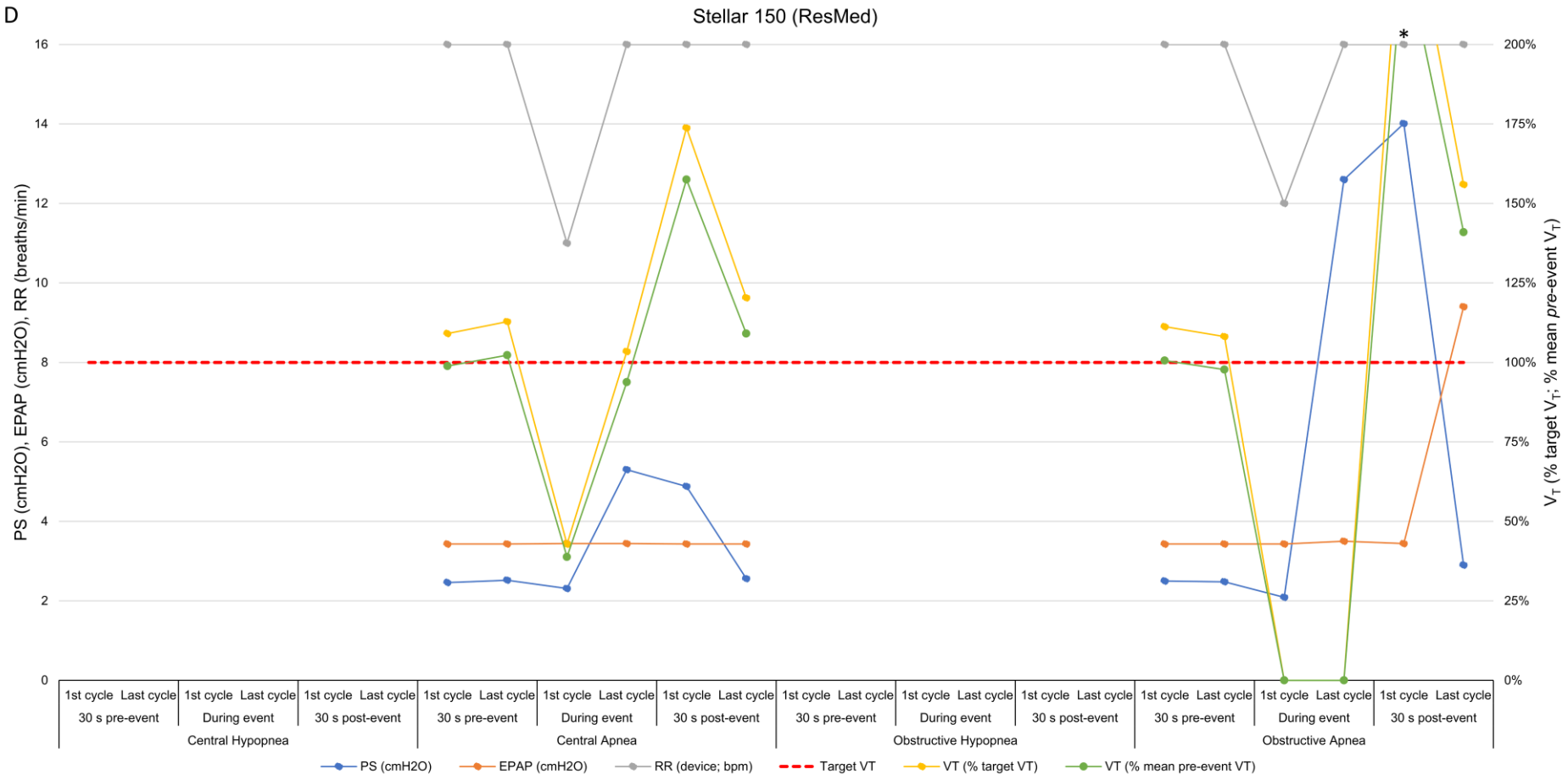
Supplementary Figure 2B



Supplementary Figure 2C



Supplementary Figure 2D



SUPPLEMENTARY REFERENCES

1. Prinianakis G, Plataki M, Kondili E, Klimathianaki M, Vaporidi K, Georgopoulos D. Effects of relaxation of inspiratory muscleson ventilator pressure during pressure support. *Intensive Care Med*. 2008;34:70-74.