Review / Update

# The use of O-Two eSeries Automatic Transport Ventilators with Automated Chest Compression Devices.

While the use of Mechanical Chest Compression Devices do not provide any benefit versus manual compressions their use in certain circumstances may be a reasonable alternative to conventional CPR[1]. Because these devices deliver constant chest compressions their use in conjunction with ventilations an advanced airway is necessary.

Fig 1. Mechanical chest Compression Devices

**AHA guidelines for CPR 2015 state:**

*"Ventilation during CPR with an advanced airway.*

*It may be reasonable for the provider to deliver 1 breath every 6 seconds (10 breaths per minute) while continuous chest compressions are being performed".*

These ventilations may be provided either utilizing a BVM or an automatic transport ventilator.

**Delivery of a breath between compressions.**

At a rate of 100 compressions per minute the available time between compressions is in the decompression phase which amounts to only 0.3 seconds. With a manual ventilator, a study by Herff et al[2] that attempted to provide ventilations between chest compressions concluded that:

*"Ventilation windows of 0.25, 0.3, and 0.5 sec were too short to provide adequate tidal volumes in a simulated non-intubated cardiac arrest patient. In a simulated intubated cardiac arrest patient, ventilation windows of at least 0.5sec were necessary to provide an adequate tidal volume".*

Therefore, the only method for ventilations to be provided is over a series of chest compressions so that at least a part of the ventilation is delivered during each decompression phase. The additional negative pressure created by the chest recoil should also assist in entraining of the delivered portion of the breath.

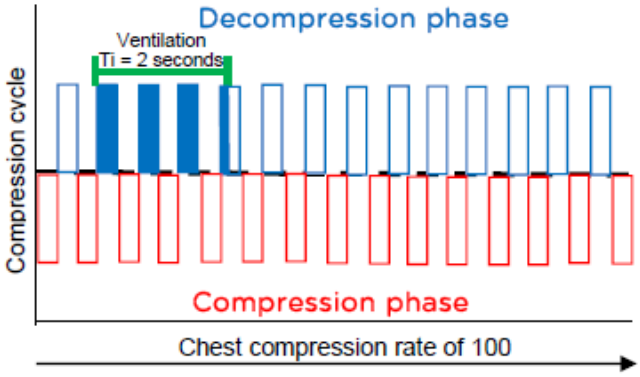


Fig 2. Portion of breath entering the lungs.

**Selecting the right ventilator mode**

When using an ATV in conjunction with an automated chest compression device the ventilator must be set in a mode that does not allow for any patient triggering, which may be caused by the chest recoil during the decompression phase of the chest

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compression cycle. This means that the selected mode must have any patient trigger or pressure cycling mode turned off.

The primary mode on a ventilator which offers these conditions is CMV (continuous mandatory ventilation). In this mode the ventilator provides both the delivered volume and respiratory rate without any possible action on the part of the patient.

**Setting the eSeries ventilators to CMV**

On the eSeries ventilators this is not a selectable mode but is easily set by selecting the A/C V mode.

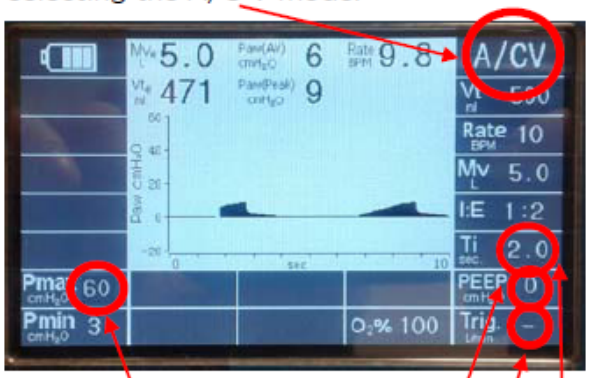


**Fig3. eSeries Ventilator settings for CPR with a mechanical chest compression device**

The patient trigger must be set to "-".
The peak airway pressure is recommended to be set to 60 cm $H_2O$ so as to reduce the risk of barotrauma during the compression phase when the ventilation overlaps the "down stroke" of the compression.
Turn the PEEP setting to "0".
Ensure the inspiratory time (Ti) is set to 2.0

These settings will enable the chest compression device to provide continuous compressions in line with the Resuscitation Guidelines without the ventilator function being affected.

References:


1. American Heart Association 2015 Guidelines for CPR and ECC
2. Effects of a Decreased Inspiratory Time on Tidal Volumes in a Bench Model Simulating Cardiopulmonary Resuscitation. H. Herff, M.D., K. Bowden, M.A., P. Paal, M.D., T. Mitterlechner, M.D, A. von Goedecke, M.D., M.Sc., K. H. Lindner, M.D., V. Wenzel, M.D., M.Sc. University of Innsbruck, Germany 2009

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