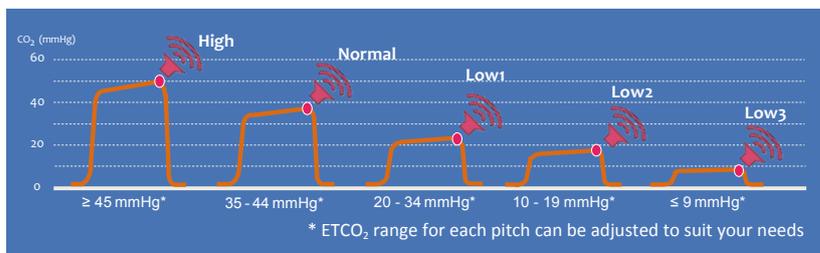


# Improve Manual Ventilation and CPR with ETCO<sub>2</sub> Audible Cue

Hear the ETCO<sub>2</sub> level – ETCO<sub>2</sub> information without needing to look at the monitor –

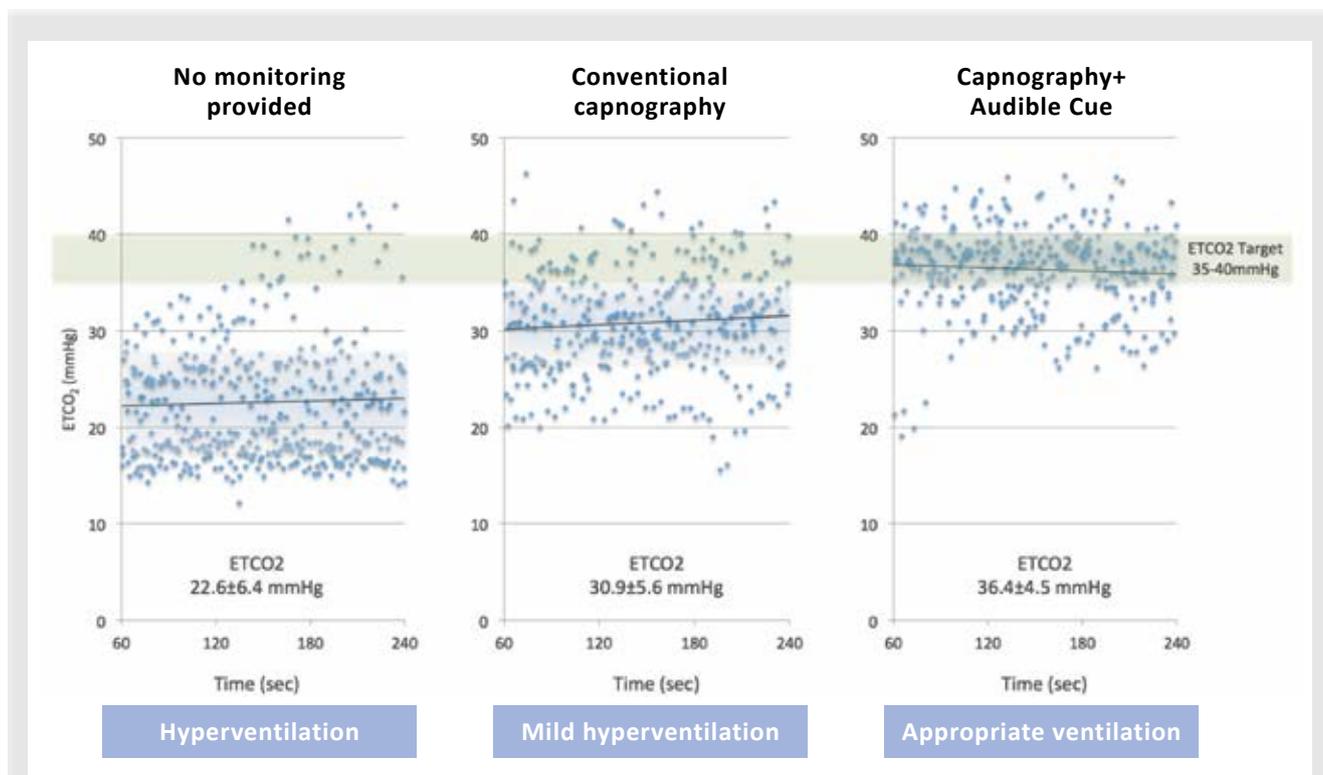
ETCO<sub>2</sub> Audible Cue helps the caregiver manage ETCO<sub>2</sub> during manual ventilation and CPR by delivering 5 different, easily recognizable sounds to indicate 5 ranges from high to low ETCO<sub>2</sub>. Audible Cue provides the caregiver with instant feedback about ETCO<sub>2</sub> level changes – without needing to look at the monitor.



## Enhanced control of manual ventilation during patient transport

Manual ventilation during interhospital transport is a vital procedure for patients who require ventilatory support. However, manual ventilation is technically demanding, requires high skill and training, and it is not always easy for even experienced professional caregivers to ventilate patients.

It has been shown that Audible Cue can be an efficient way to enable tighter control of ETCO<sub>2</sub> within the target range when performing manual ventilation during patient transport. The following figure shows the results of a study comparing manual ventilation with no capnometric monitoring and with capnometric monitoring with and without Audible Cue.<sup>1</sup>



### Comparison of control of ETCO<sub>2</sub> during manual ventilation

In a pilot study, 10 anesthesia trainees manually ventilated the simulator while transporting the stretcher for 5 minutes without any monitoring provided. Conventional capnography and conventional capnography with Audible Cue were also used. In the absence of capnometry monitoring information, the trainees tended to ventilate too aggressively. Use of conventional capnometry slightly improved the control of ETCO<sub>2</sub> but still tended towards hyperventilation. The addition of Audible Cue to conventional capnometric information enhanced the control of ETCO<sub>2</sub> during manual ventilation. (from Reference 1, used with permission)



### More effective ETCO<sub>2</sub> monitoring in CPR

According to International Liaison Committee on Resuscitation (ILCOR)<sup>2</sup> and international guidelines including AHA<sup>3</sup> and ERC<sup>4</sup>, continuous waveform capnography is recommended in addition to clinical assessment as a reliable method to confirm and monitor correct placement of endotracheal tube, CPR quality and to provide an early indication of return of spontaneous circulation (ROSC). It is also recommended that if ETCO<sub>2</sub> is lower than 10 mmHg, attempt to improve CPR quality should be considered. It is anticipated that addition of audible signals to the conventional capnometric information (numeric and waveform) could facilitate the confirmation of the quality of CPR and improve the quality of patient monitoring.

### 5 Audible Cue ranges: Rising and falling pitch indicates ETCO<sub>2</sub> level in manual ventilation and CPR

The Audible Cue consists of 2 or 3 sounds. The higher or lower pitch of the second sound indicates whether the ETCO<sub>2</sub> level is higher or lower than the normal (optimal) level.

The Audible Cue sounds are also different and easy to distinguish from other sounds such as heart rate sync. The exact ETCO<sub>2</sub> range is instantly recognizable by 5 different patterns.

Primarily designed for	ETCO <sub>2</sub> range* [mmHg]	Audible Cue sound type	Audible Cue sound design	Example of situation
Manual ventilation and ROSC confirmation	45 ≤ (High)		High  Low	<ul style="list-style-type: none"> <li>Hypoventilation is caused by insufficient manual ventilation during transport</li> <li>ROSC is achieved*</li> </ul>
	35 – 44 (Normal)		High  Low	Ventilation is sufficient
	20 – 34 (Low 1)		High  Low	Hyperventilation is caused by over aggressive manual ventilation during transport
CPR (chest compression)	10 – 19 (Low 2)		High  Low	High quality chest compressions are achieved
	≤ 9 (Low 3)		High  Low	Quality of effectiveness of chest compression may need improvement

\*ROSC may be detected in ETCO<sub>2</sub> range lower than 45 ≤

The upper 3 ranges (High, Normal, and Low) are especially designed to optimize manual ventilation and to detect ROSC. Audible Cue provides the caregiver with instant feedback if he or she is optimally ventilating the patient and if ROSC is achieved.

The lower 2 levels (Low 2 and Low 3) are especially designed to optimize CPR quality. These Audible Cue alerts the caregiver of extremely low ETCO<sub>2</sub> so he or she can immediately improve the CPR quality according to the AHA guidelines.



Audible Cue is available on OLG-3800

### References

- Miyasaka K et al. Audible capnometric cues facilitate targeted control of end-tidal carbon dioxide during manual ventilation. Annual meeting of American Society of Anesthesiologists. 2013;A1185.
- Callaway CW et al. Part 4: Advanced Life Support: 2015 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations. Circulation. 2015 Oct 20;132(16 Suppl 1):S84-145
- Link MS et al. Part 7: Adult Advanced Cardiovascular Life Support: 2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2015 Nov 3;132(18 Suppl 2):S444-64
- Soar J et al. European Resuscitation Council Guidelines for Resuscitation 2015: Section 3. Adult advanced life support. Resuscitation, October 2015, Pages 100 - 147