ANALYSIS OF THE EFFICACY OF WAVEFORM CAPNOGRAPHY MONITORING USING BAG-VALVE-MASK VENTILATION

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Introduction: Microstream® capnography is applied to spontaneously breathing, assisted breathing and fully supported breathing during resuscitation. It has also been used effectively with noninvasive mask ventilation and CPAP. This analysis examines capnographic monitoring at two sites during simulated resuscitation with a bag-valve-mask (BVM) apparatus in normal subjects.

Methods: Following IRB approval and informed consent, 15 normal subjects between the ages of 20 and 57 were simultaneously monitored with two Oridion Capnostream™ 20 devices. One utilizing the Microstream® Smart Capnoline Plus™ Uni-junction™ Filterline® applied to the face per manufacturers instructions and the other connected inline with the BVM system (typical). The parameters monitored were P_EtCO_2, RR, SpO_2%, F_iCO_2, HR, and Integrated Pulmonary Index (IPI™) as well as the graphic CO_2 waveform. Subjects were monitored during nose breathing at: 3-minute baseline, mouth breathing 3-minute baseline and assisted breathing for 6-minutes with BVM during nose breathing and in the sniffing position mouth breathing with readings taken every minute.

Results: The two monitors showed P_EtCO_2 was within ±2 torr during simultaneous monitoring with BVM supported breathing throughout both nose and mouth breathing. RR was within 1 breath for all BVM monitoring sessions. F_iCO_2 greater than 0 was seen only with the Uni-junction™ appliance. There were no significant changes in P_EtCO_2 using the Uni-junction™ between nose breathing baseline, BVM nose breathing, mouth breathing baseline, or BVM mouth breathing.

Discussion: Effective and accurate measurement of ventilation is critical while monitoring patients during resuscitation. Capnographic measurement of effective ventilation and return of spontaneous circulation is paramount during CPR or while supporting ventilation. Limitations of the typical inline monitoring are that P_EtCO_2 monitoring is lost when the mask is removed after the patient returns to spontaneous breathing and F_iCO_2, indicating deadspace ventilation (rebreathing of CO_2 in mask) is not seen with the typical inline monitoring. Flexibility and continuous monitoring of capnography is enhanced using the Uni-junction™ during mask ventilation and during periods of spontaneous breathing.

Conclusion: There were no significant differences in monitoring the subjects when comparing the Uni-junction™ Filterline® to the typical inline monitoring with the BVM. The Uni-junction™ Filterline® provides continuous monitoring of patient's breathing when the BVM is removed whereas the typical inline system does not provide measurement because the system has been removed from the patient.