Comparison of Central Venous CO2 and EtCO2 using a Novel Mainstream Capnometer System for Non-intubated Children in the Post Anesthesia Care Unit (PACU)

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Background:
- Monitoring of end tidal CO2 (EtCO2) in non-intubated patients is challenging
- A novel mainstream capnometer system (cap-ONE® mask; Nihon Kohden)1 which measures EtCO2 while administering oxygen has been successfully used in children
- Purpose was to compare EtCO2 with Venous CO2 (PvCO2) utilizing cap-ONE mask and validate its use as an apnea monitor

Methods:
- Ongoing prospective study is being conducted at Children’s Hospital Los Angeles
- Inclusion criteria: ASA 3 patients (weighing between 7-40 Kg), undergoing minor procedures with preexisting or intraoperative placed central venous access
- Exclusion criteria: abnormal facial anatomy, cardiac pulmonary/neurological instability anticipated to cause acute changes in respiratory status, baseline SpO2 < 88%, and/or, baseline respiratory rate less than 15 or more than 60 breaths per minute
- Per manufacturer’s recommendations- the infant mask was used for patients in weight range 7-20 kg and pediatric mask for those between 20-40 kg
- Plan to enroll a total of 74 patients, 37 patients each in small weight group A (7-20 Kg) and medium weight group B (20-40 kg)

Data Sampling Period:
- Post-operative period from entry to PACU till completion of 5 minutes.

Analysis:
- Comparison of EtCO2 value detected by cap-ONE system and PvCO2 from venous blood gas.

Results:
- No complications including hypoxia were observed
- To date, 33 subjects have been enrolled, 15 in group A and 18 in group B (Fig. 1)
- Cap-ONE mask reliably measured EtCO2 in mouth breathers as well as nose breathers
- Average difference between PvCO2 and EtCO2 were 5.1 (SD 3.3) and 6.1 (SD 3.1) in groups A and B respectively (Fig.2)
- There was linear correlation between PvCO2 and EtCO2 with a pearson coefficient of 0.7 and 0.8 in the groups A and B respectively (Fig 3).

Discussion and conclusion:
- Conventional side-stream capnometry with nasal cannula may not accurately measure EtCO2 due to dilution with high flow O2
- Side-stream capnometers are also limited by potential occlusion of sampling line and mouth breathing
- In the adult study using similar mainstream compared to sidestream system, mainstream system performed better (2)
- We conclude that mainstream capnometer cap-ONE mask correlates with PvCO2 with capability to safely and effectively measure EtCO2 and detect apnea in PACU, regardless of nose or mouth breathing for pediatric population

References: