Prehospital $ETCO_2$ is Predictive of Death in Intubated and Non-Intubated Patients

Courtney Wham, MS, Paramedic[1]; Theresa Morin, MA[2]; Angela Sauaia MD, PhD[3]; Robert McIntyre, MD[4]; Shane Urban, BSN, RN, CCRC[4]; Kevin McVaney, MD[1]; Mitchell Cohen, MD, FACS[4]; Alexis Cralley, MD[2]; Ernest E. Moore, MD[2]; Eric M. Campion, MD, FACS[2]

[1]Denver Health Medical Center, Department of Emergency Medicine, Denver Paramedics
[2]Ernest E. Moore Shock Trauma Center at Denver Health, Department of Surgery
[3]University of Colorado, School of Public Health (AS)
[4]University of Colorado Anschutz, Department of Surgery

Background: Prehospital identification of shock in trauma patients lacks accurate markers. Low end tidal carbon dioxide ($ETCO_2$) correlates with mortality in intubated patients. The predictive value of $ETCO_2$ obtained by nasal capnography cannula (NCC) is unknown. We hypothesized that prehospital $ETCO_2$ values obtained by NCC and in-line ventilator circuit (ILVC) would be predictive of mortality.

Methods: This was a prospective, observational, multicenter study. $ETCO_2$ values were collected by a NCC or through ILVC. AUROCs were compared with prehospital systolic blood pressure (SBP) and shock index (SI). The Youden index defined optimal cutoffs.

Results: Of 549 enrolled patients, 488 (88.9%) had $ETCO_2$ measured through an NCC. Median age was 36 (27-52) years; 76.3% were male; median ISS was 12 (5-22). Mortality was 9.8%. Minimum prehospital $ETCO_2$ significantly predicted mortality with an AUROC of 0.77 (CI 0.69-0.85). In a cohort of patients that excluded those suffering prehospital cardiac arrest, minimum prehospital $ETCO_2$ was the only significant predictor of mortality (AUROC 0.65; CI 0.53-0.78; Youden index=22mmHg) and outperformed lowest prehospital SBP (AUROC 0.60; CI 0.44-0.77) and highest calculated prehospital SI (AUROC 0.50; CI 0.35-0.64), though not to a level of statistical significance.

Conclusion: Prehospital $ETCO_2$ measured by non-invasive NCC or ILVC may be predictive of mortality in injured patients.

Keywords: Acute injury; ETCO2; End-tidal capnography; Prehospital triage; Shock; Trauma triage.