

Evaluation of End-Tidal CO<sub>2</sub> Levels  
Before, During and After  
Return of Spontaneous Circulation in  
Out-of-Hospital Cardiac Arrest

Ryan Murphy, BS  
For the SHARE Team  
Medical Student

University of Arizona College of Medicine-Phoenix



---

---

---

---

---

---

---

---

SHARE TEAM

- Bentley J. Bobrow, MD
- Daniel W. Spaite, MD
- Uwe Stolz, PhD, MPH
- Gary Smith, MD
- Annemarie Silver, PhD
- Ryan A. Murphy, BS
- Madalyn Karamooz, BS
- John Tobin, CEP
- Margaret Mullins

---

---

---

---

---

---

---

---

DISCLOSURES

- ZOLL Medical provided support for training and data collection in this study
- Medtronic Foundation provides support for data collection in the SHARE program

---

---

---

---

---

---

---

---

### BACKGROUND

- In out-of-hospital cardiac arrest (OHCA), little is known about the changes in circulatory parameters around return of spontaneous circulation (ROSC)
- Previous work has shown good correlation between chest compression (CC) metrics and End-Tidal CO<sub>2</sub> (ETCO<sub>2</sub>)
- Changes in ETCO<sub>2</sub> levels occurring around ROSC may be clinically important

---

---

---

---

---

---

---

---

### PURPOSE

- To measure and describe the patterns of EtCO<sub>2</sub> levels before, during and after ROSC in out-of-hospital cardiac arrest

---

---

---

---

---

---

---

---

### STUDY APPROVAL

- This study is part of the SHARE Program, approved by:
  - University of Arizona IRB
  - ADHS Human Subjects Review Board
- Public Health Initiative

---

---

---

---

---

---

---

---

### SETTING

- Data collection from Utstein-Compliant Registry by two EMS agencies in Arizona (10/08/08 - 09/09/11)
  - Large suburban fire department
  - Medium-sized private ambulance agency
  - Consecutive, intubated, adult, non-traumatic OHCA patients who achieved ROSC
- EMS agencies utilized Minimally Interrupted Cardiac Resuscitation (MICR) Protocol

---

---

---

---

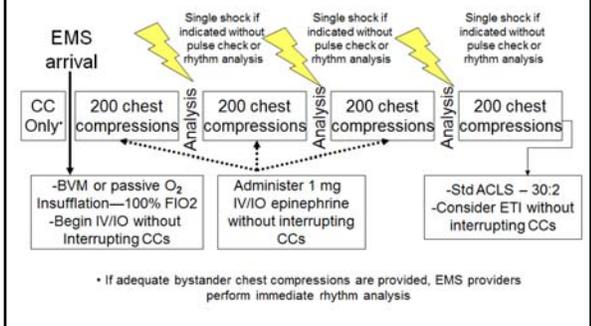
---

---

---

---

### Minimally Interrupted Cardiac Resuscitation (MICR)



---

---

---

---

---

---

---

---

### METHODS

- Utstein-Style database linked data from 9-1-1 dispatch call to hospital discharge
- Chest compression quality/event data were collected using accelerometer-equipped defibrillators (E Series, ZOLL Medical)
- Capnography data on intubated patients
- CC metrics and ETCO<sub>2</sub> data were compiled for each minute

---

---

---

---

---

---

---

---

### ANALYSIS

- Evaluated ETCO<sub>2</sub> levels before, during and after ROSC
- ROSC was determined from:
  - patient care reports (presence of carotid pulse and EKG change to a sustainable rhythm)
  - defibrillator-verified CC cessation
- Statistics:
  - One-way ANOVA, Kruskal-Wallis,  $\alpha \leq 0.05$ .

---

---

---

---

---

---

---

---

### LIMITATIONS

- Not all patients had ETCO<sub>2</sub> data available
  - Potential for selection bias
- ETCO<sub>2</sub> data not available upon hospital arrival
- In the setting of MICR, intubation occurs late in the resuscitation – consequently:
  - Little information about the correlations very early in the arrest
  - Small sample size
- Minute Ventilation data not available

---

---

---

---

---

---

---

---

### CONCLUSIONS

- In this preliminary study:
  - Longer sustained ROSC was associated with:
    - ETCO<sub>2</sub> increases prior to ROSC and ETCO<sub>2</sub> > 30mmHg at the minute of ROSC
  - Immediate re-arrest (within 2.5 minutes) was associated with:
    - Lower ETCO<sub>2</sub> levels (<30mmHg) at minute of ROSC without a significant increase prior to ROSC
- Future studies needed to evaluate:
  - if it is appropriate to continue CPR in “ROSC patients” with low ETCO<sub>2</sub> since flow may be minimal and the risk of immediate re-arrest may be very high

---

---

---

---

---

---

---

---