

**Traumatic Events:**  
***Cautions about  $ETCO_2$  Analysis in Trauma***

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**COVIDIEN**



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# Barney Style

- **End-Tidal CO<sub>2</sub> Measures:**
  - Concentration of CO<sub>2</sub>
  - In exhaled breath
  - At end of exhalation
- **Must Have:**
  - Metabolism
  - Perfusion
  - Ventilation





**Perfusion**

**Ventilation**

**ETCO<sub>2</sub>**

**Metabolism**

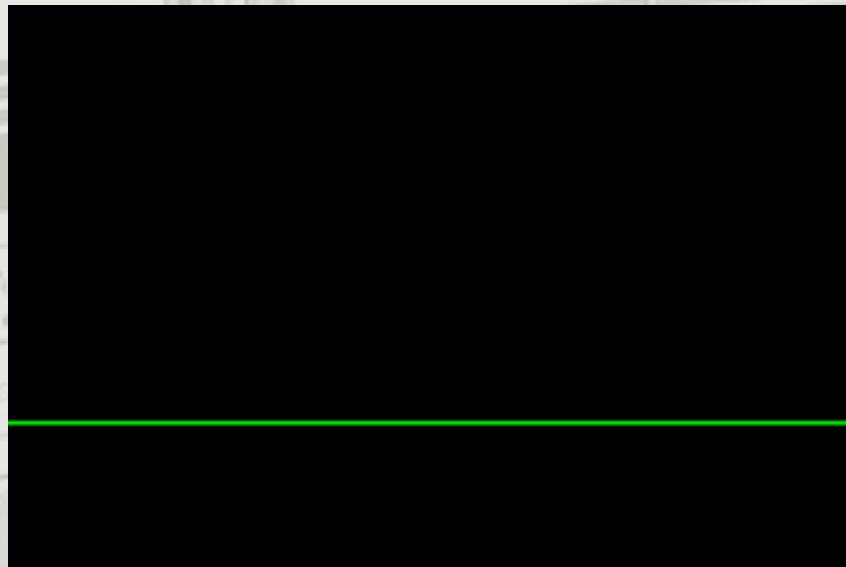
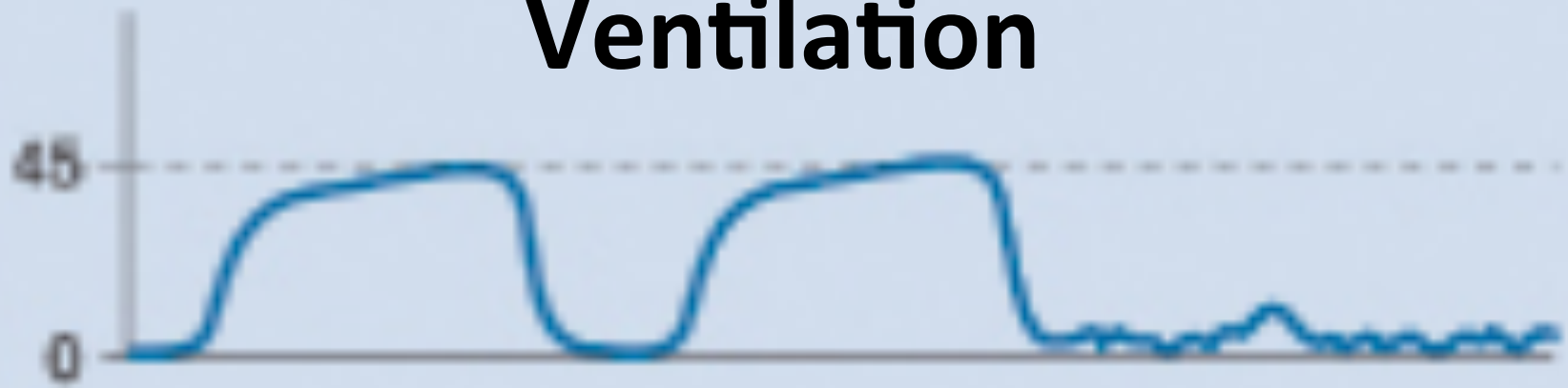
# Metabolism



51450



# Ventilation



# Ventilation

- Capnography allows visualization of respiratory rate

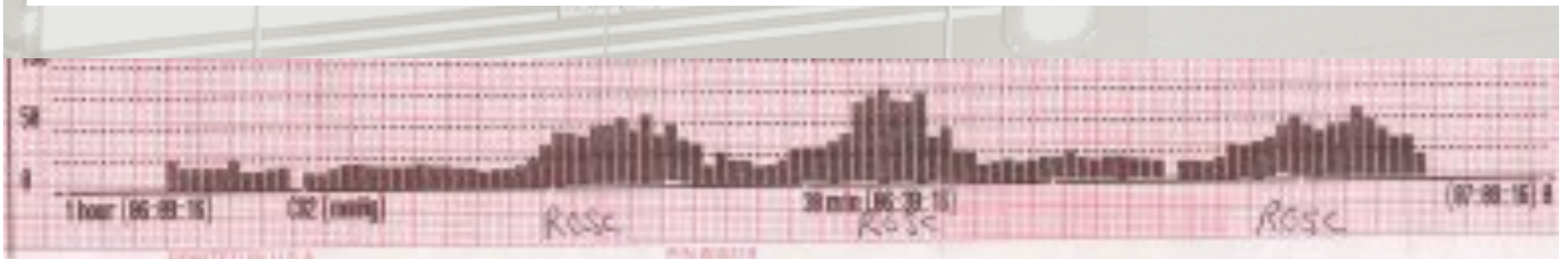




# Perfusion

- **Cardiac output must be enough to:**
  - **Perfuse the tissues**
  - **Return venous blood to the lungs**
- **Decreased cardiac output → decreased perfusion → low ETCO<sub>2</sub>**

# Perfusion



51450



## Hemorrhage

Variable	Baseline	Mild	Severe
PaO <sub>2</sub> (torr)	85.4 ± 7.5	105.2 ± 9.6*	116.0 ± 6.3*
PaCO <sub>2</sub> (torr)	38.0 ± 4.8	28.5 ± 4.8*	17.2 ± 3.0*
PeCO <sub>2</sub> (torr)	46.3 ± 6.2	42.8 ± 5.0	36.9 ± 3.0*



**Totapally et al. Critical Care 2003 7:79**

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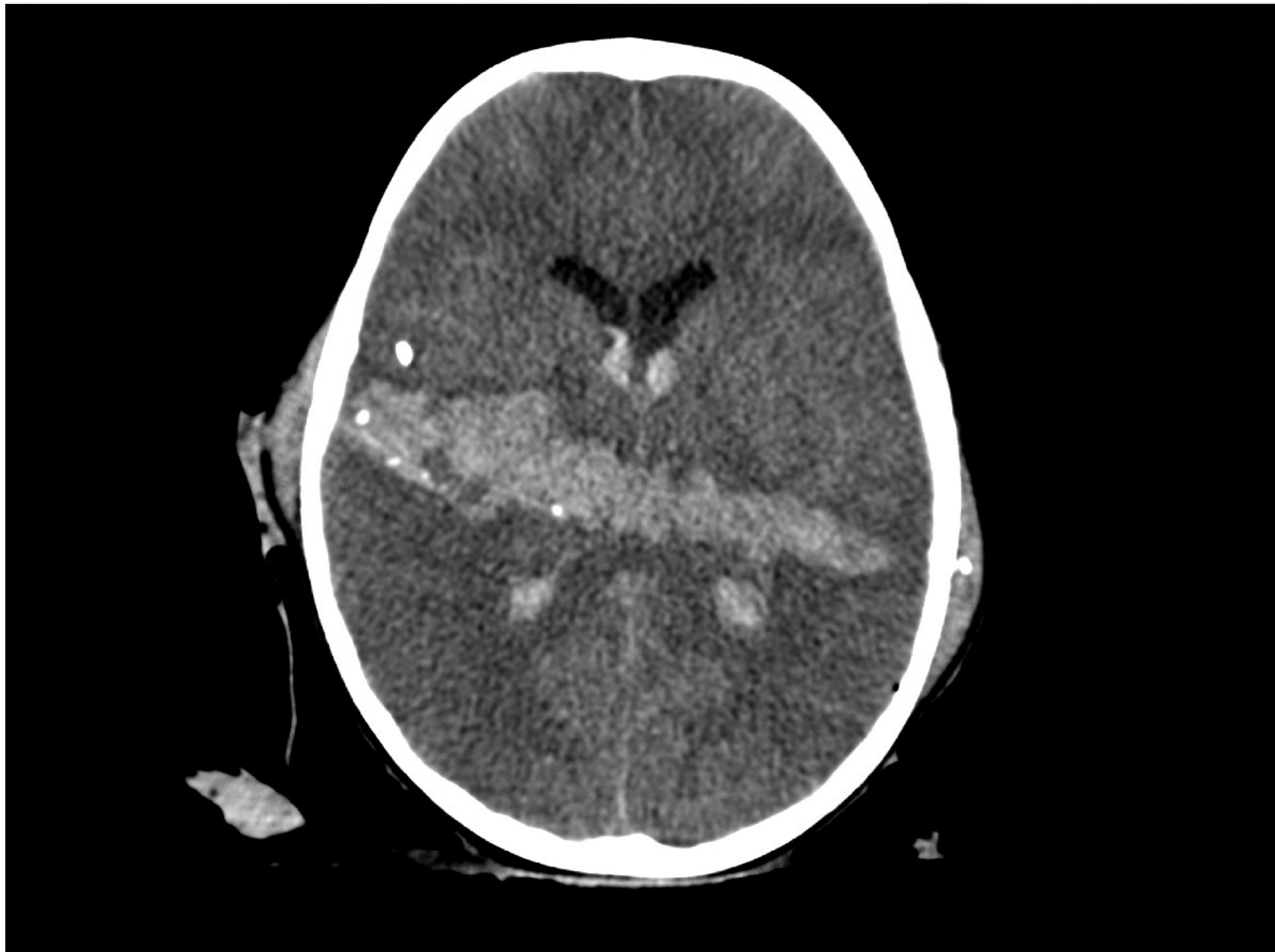


**Perfusion**

**Ventilation**

**$paCO_2 \approx$   
 $ETCO_2$**

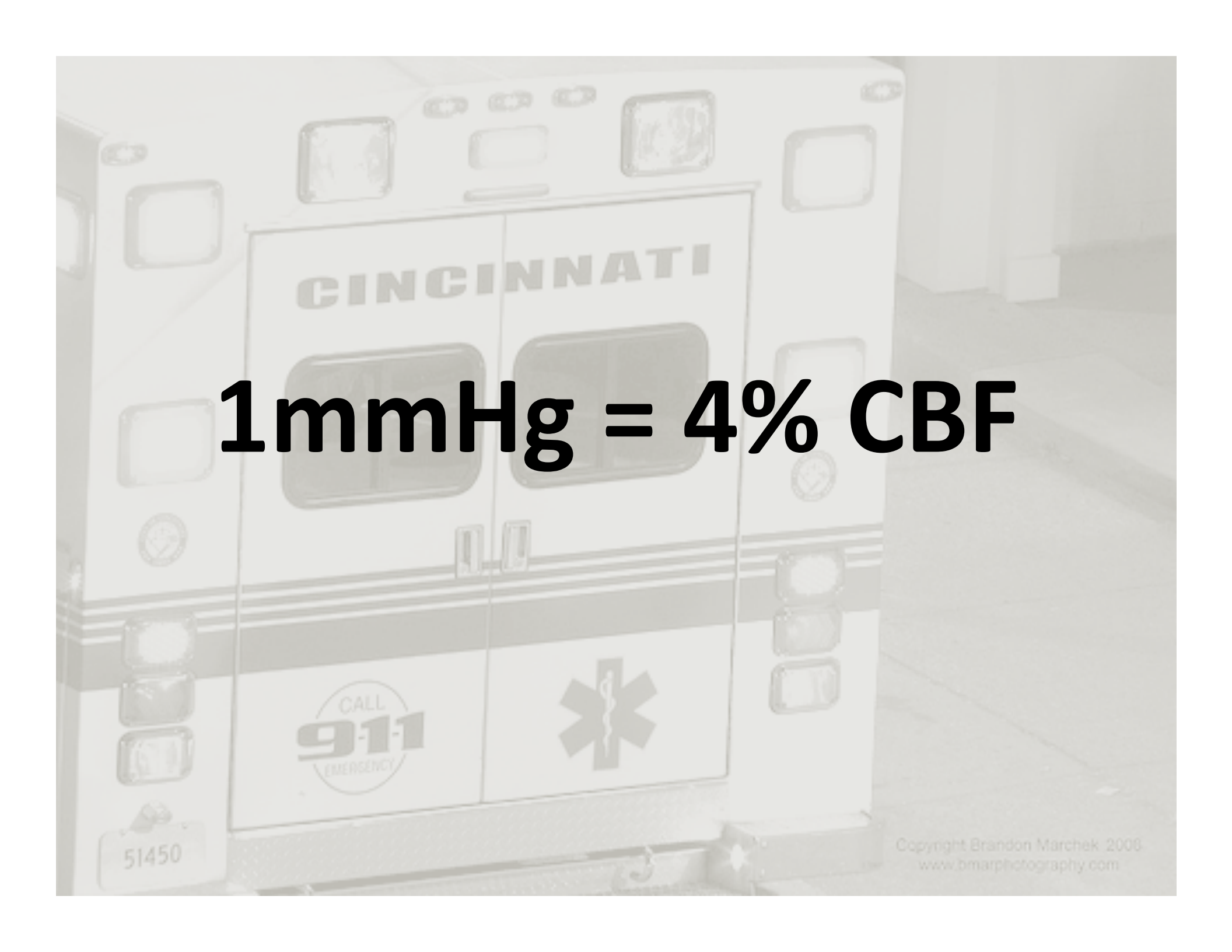
**Metabolism**



A photograph of a man dressed as the devil. He has red body paint on his chest and arms, black horns, and is holding a pitchfork. He is smiling. The background is a plain, light-colored wall. The image is framed by a grey border with a keyboard overlay on the left side.

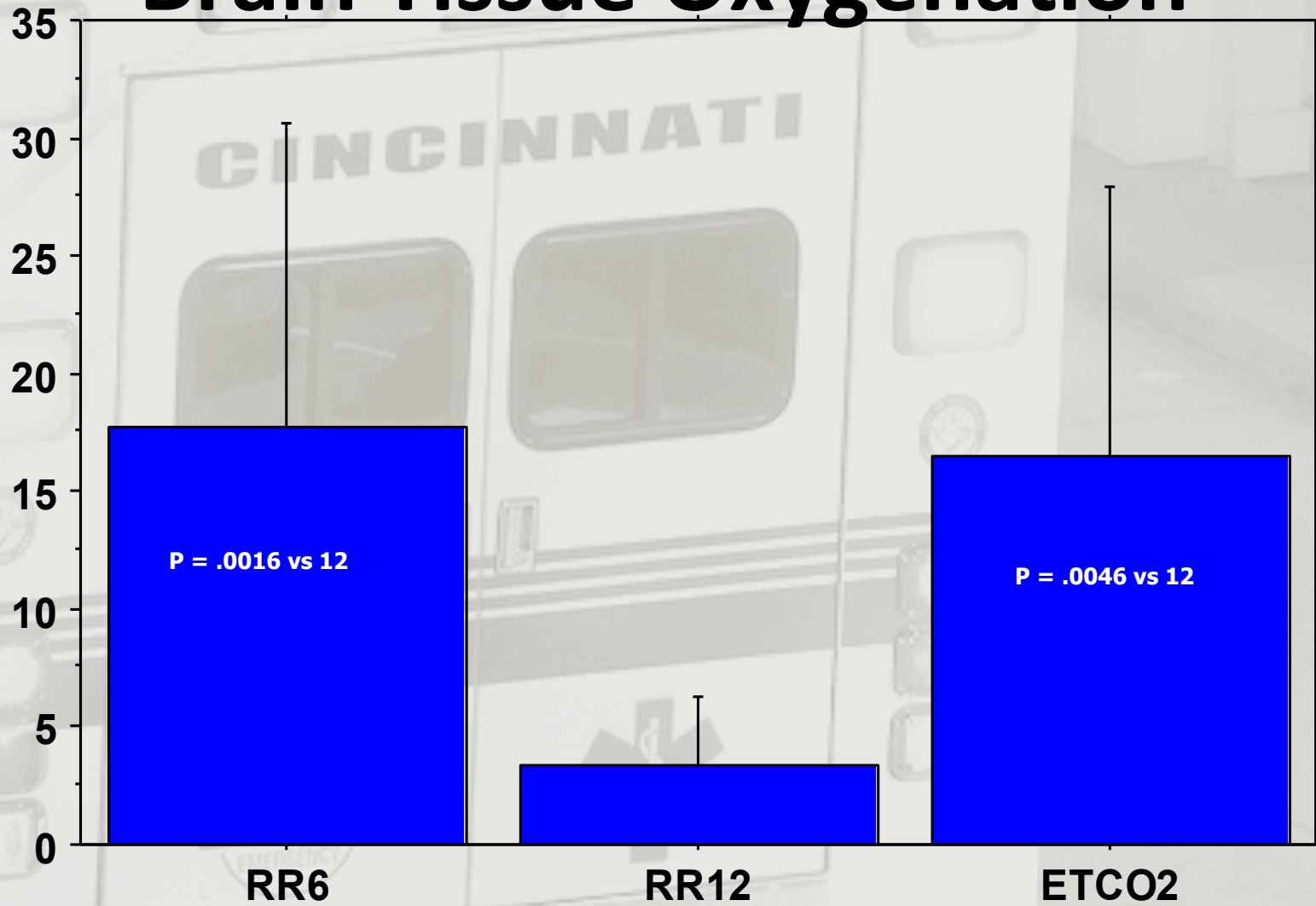
**PPV and Hyperventilation is the Devil**



A grayscale photograph of the rear of an ambulance. The ambulance has "CINCINNATI" written on the top door, a "CALL 9-1-1 EMERGENCY" logo on the bottom left door, and a Star of Life symbol on the bottom right door. The number "51450" is visible on a small sign at the bottom left. The text "1mmHg = 4% CBF" is overlaid in large, bold, black font in the center of the image.

**1mmHg = 4% CBF**

# Brain Tissue Oxygenation




# Capnography in TBI

- **Hyperventilation = assassination**
- **No herniation**
  - no benefit from hyperventilation
  - goal 35-40mmHg
- **Herniation**
  - ? benefit
  - goal 30-35mmHg





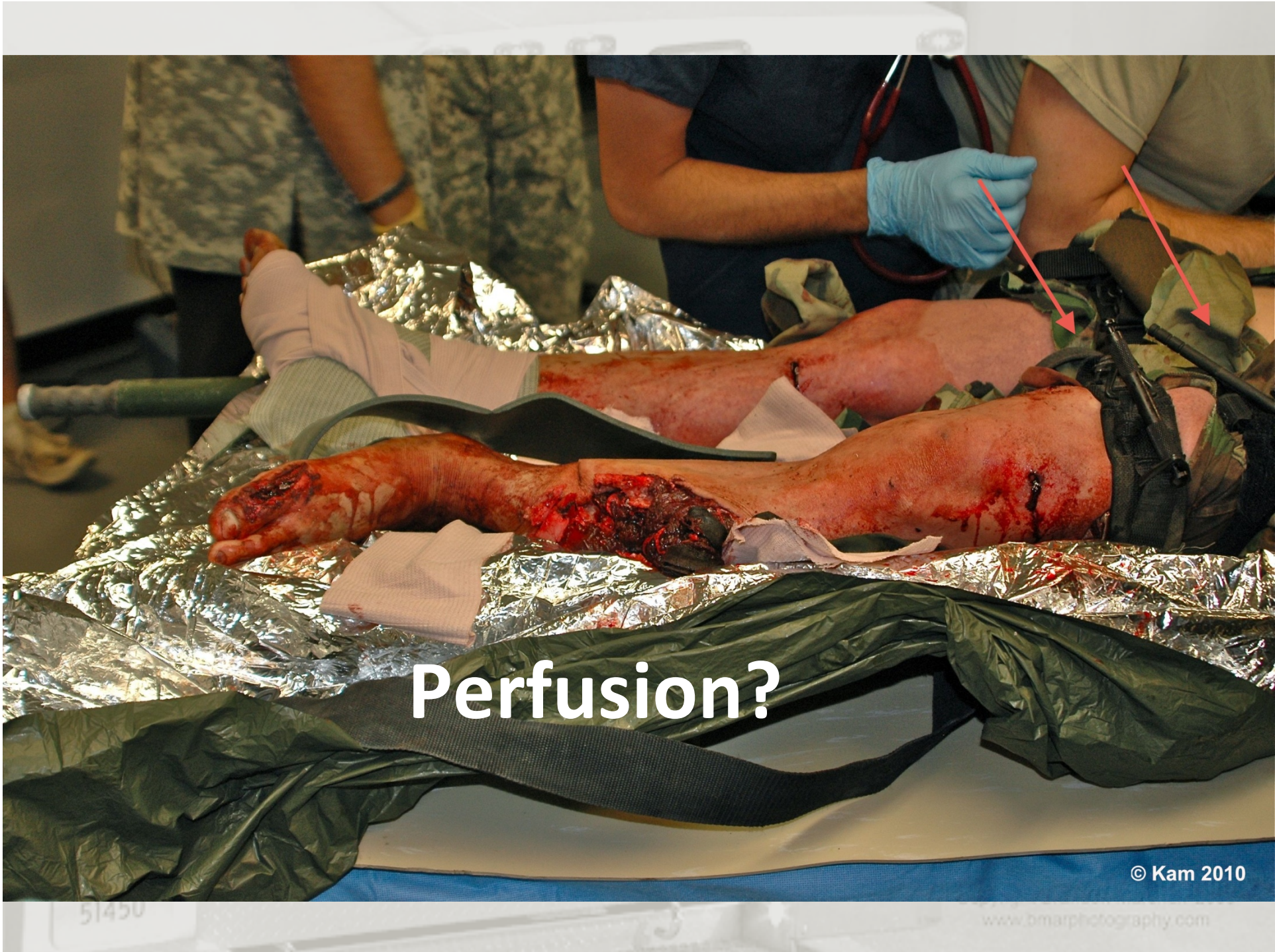


**Extreme care must be taken in  
the polytrauma patient with  
suspected head injury**



**Ventilation?**





Perfusion?



**Perfusion**

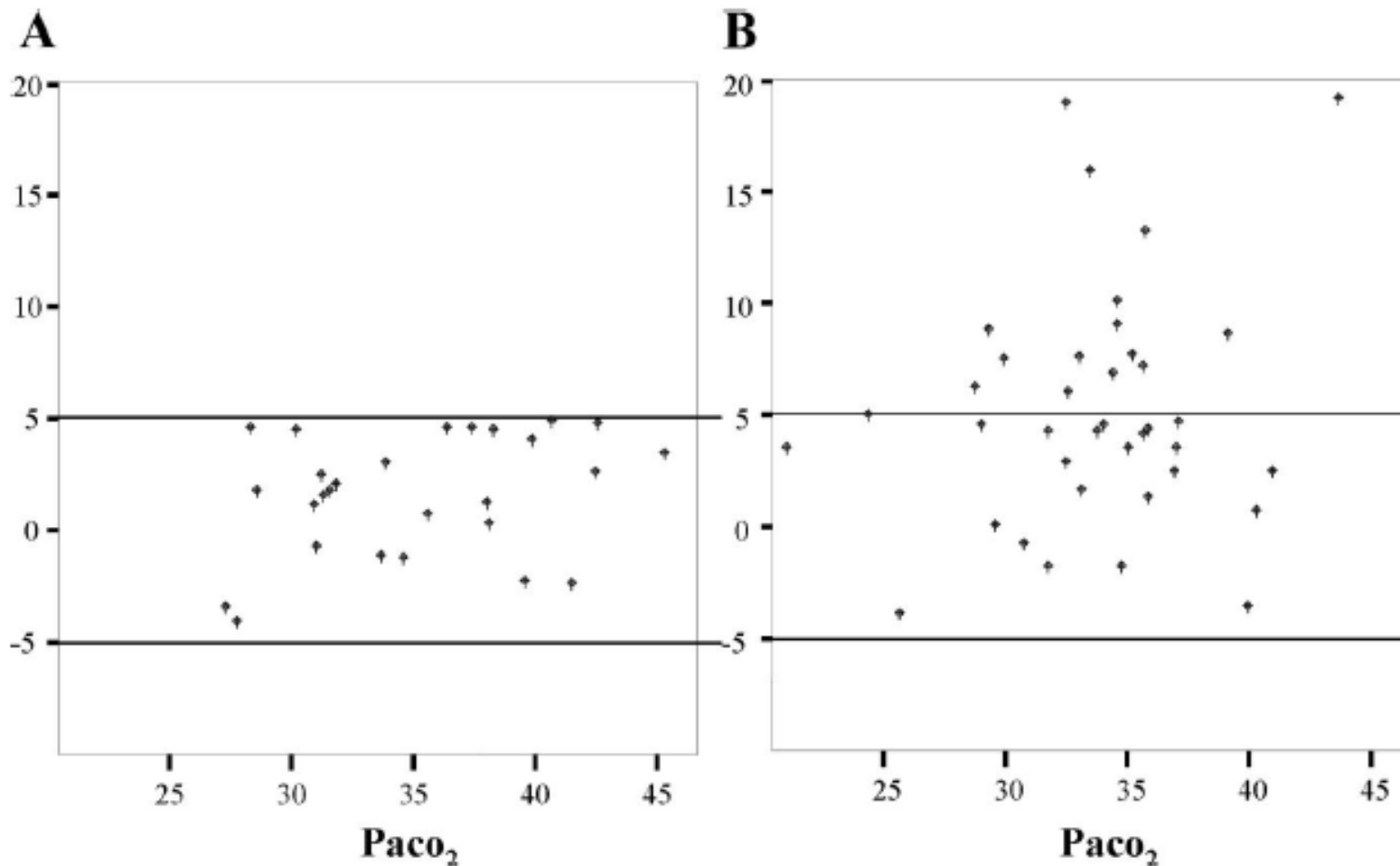
**Ventilation**

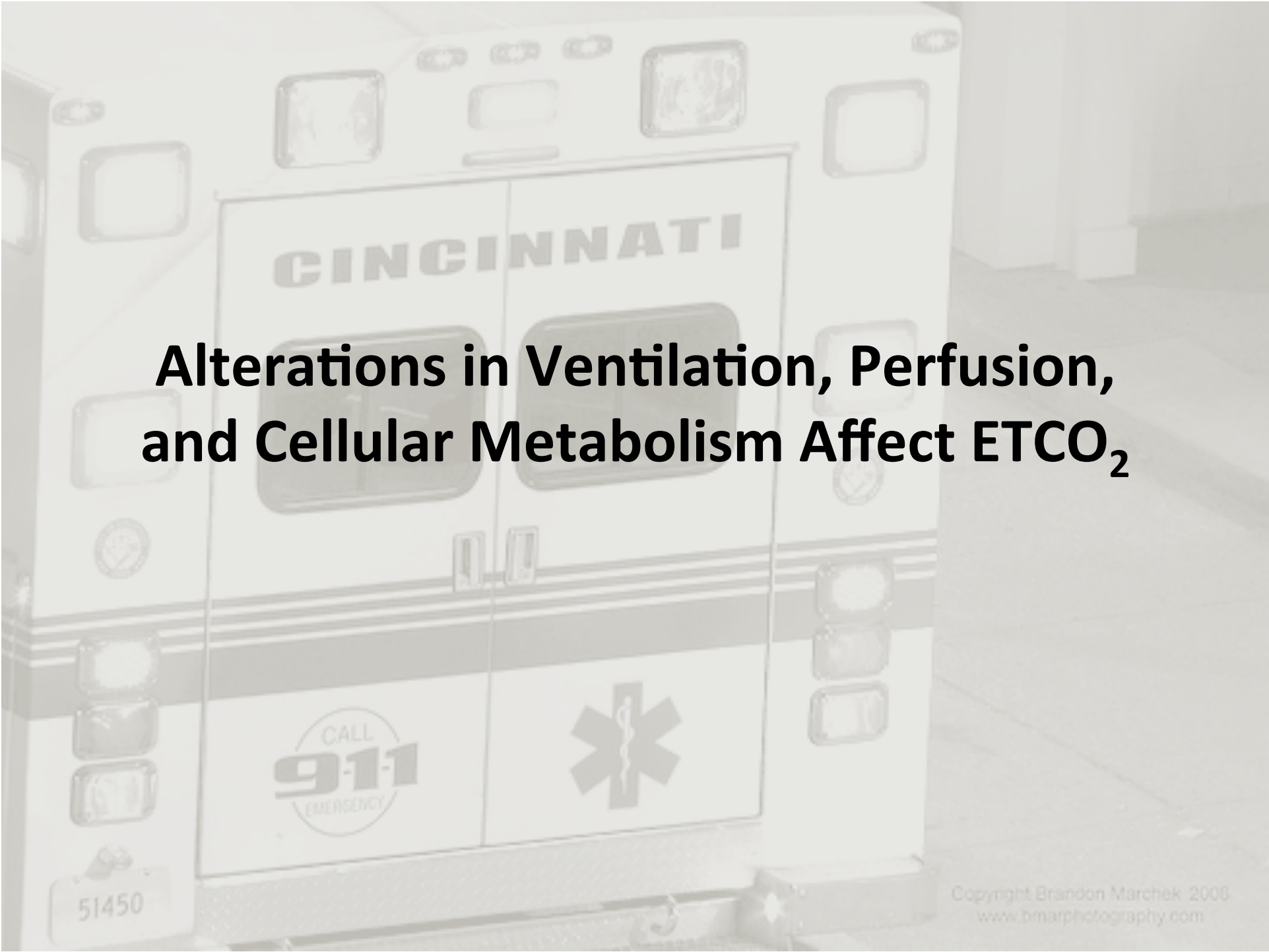
**$paCO_2 \approx$   
 $ETCO_2$**

**Metabolism**

# Concordance of End-Tidal Carbon Dioxide and Arterial Carbon Dioxide in Severe Traumatic Brain Injury

*Sung-Woo Lee, MD, PhD, Yun-Sik Hong, MD, PhD, Chul Han, MD, Su-Jin Kim, MD, PhD, Sung-Woo Moon, MD, Jung-Ho Shin, MD, and Kwang-Je Baek, MD, PhD*

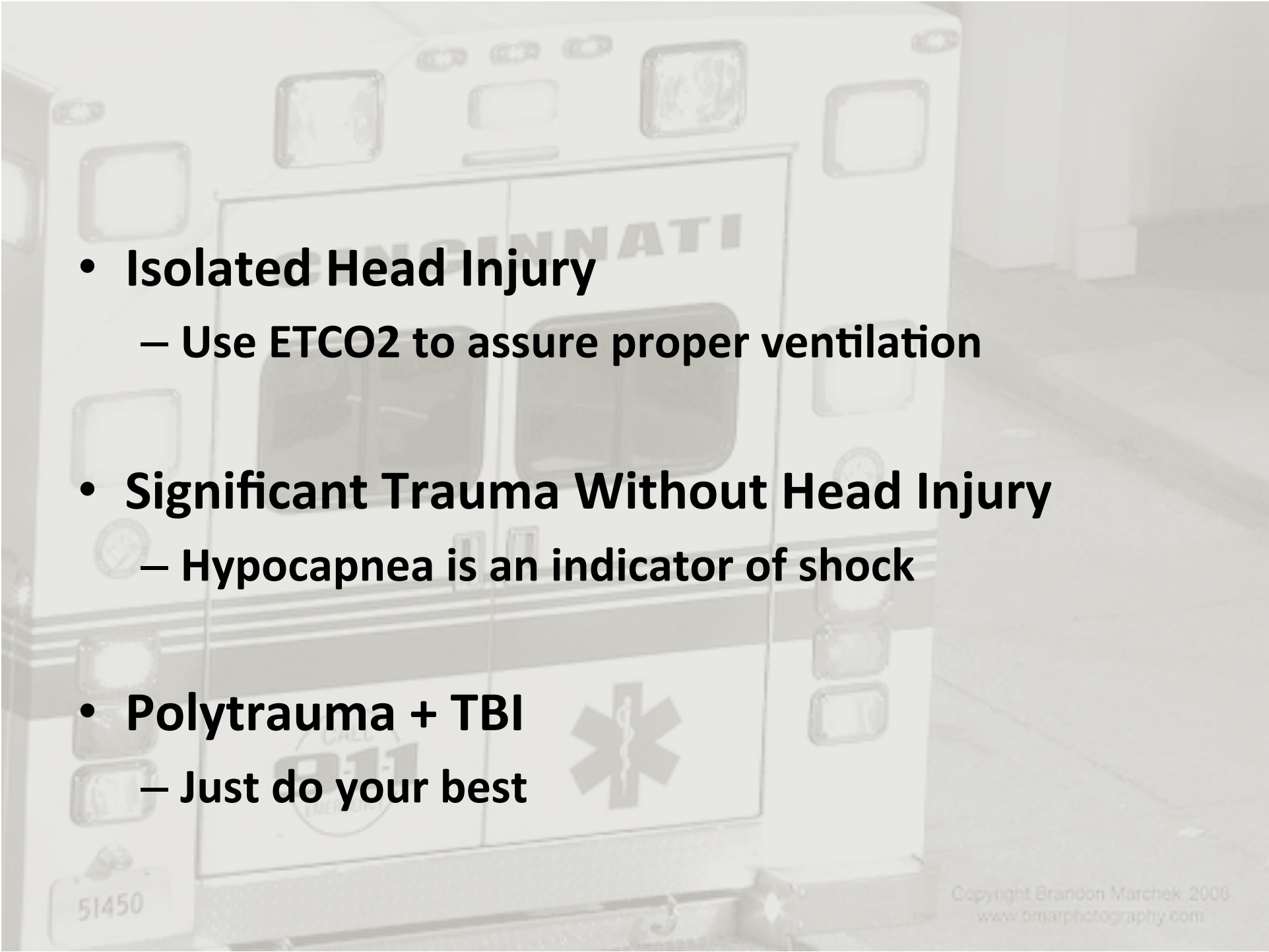





**Alterations in Ventilation, Perfusion,  
and Cellular Metabolism Affect ETCO<sub>2</sub>**





- 
- **Isolated Head Injury**
    - Use ETCO<sub>2</sub> to assure proper ventilation
  - **Significant Trauma Without Head Injury**
    - Hypocapnea is an indicator of shock
  - **Polytrauma + TBI**
    - Just do your best



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