Thanks to all first responders, hospital staff , TPD and all who organized this conference.

Pediatric Shock …… So What?

Michael Karadsheh, MD

- *Before I start, I got something important to say……*
  - *I was told to be accurate, to the point and brief.*
  - *So, I promise I will be as brief as possible ….no matter how long it takes*

Pediatric Shock in Review!

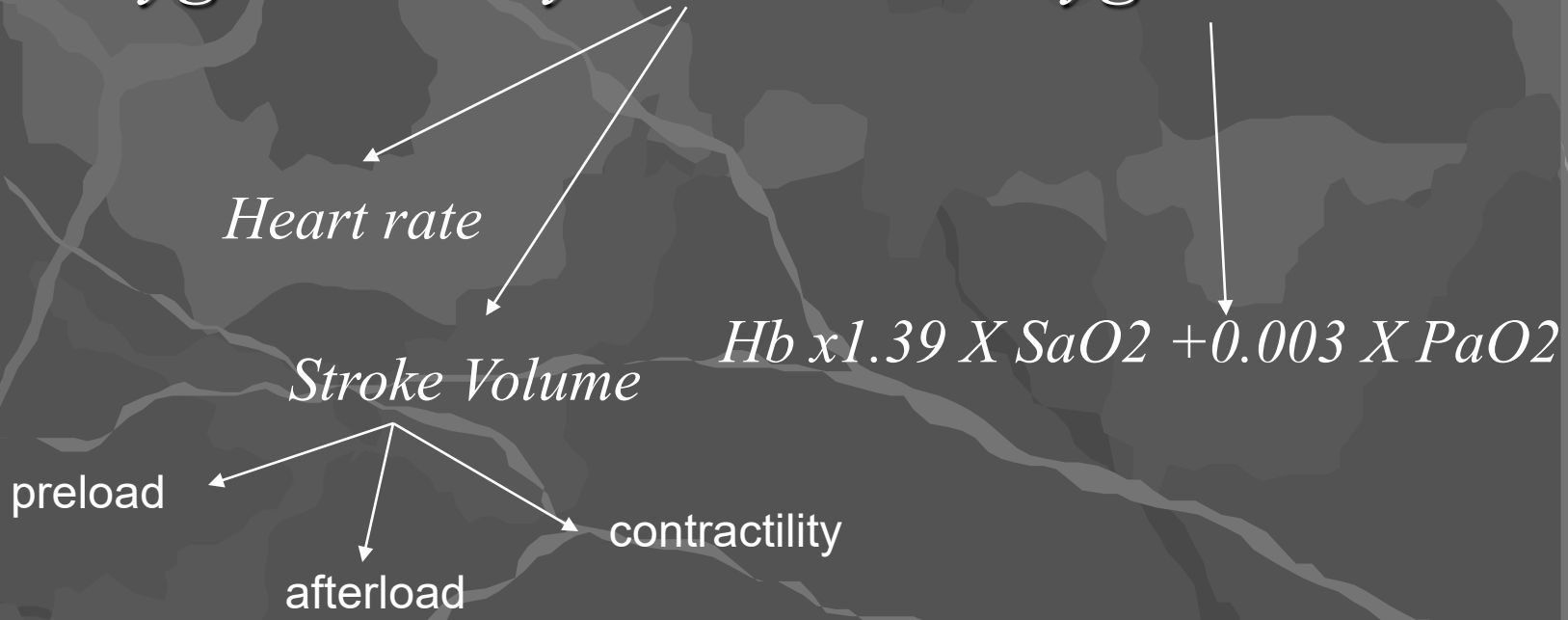
- *Agenda:*
  - *Shock.*
    - *Definition and classification.*
    - *Oxygen delivery and consumption.*
    - *Treatment, the simple and the complex.*

Pediatric Shock in Review!

- *Shock:*
  - *Definition: An acute complex state of circulatory dysfunction involving cellular oxygen deficiency.*
  - *A balance between oxygen demand and supply.*

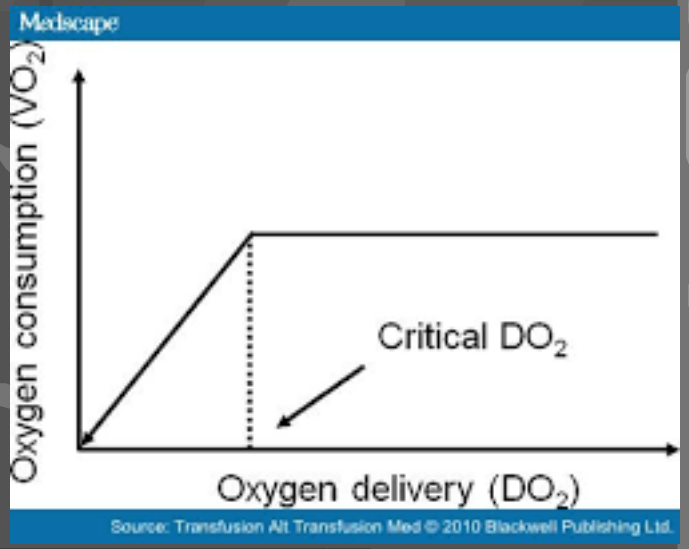
Pediatric Shock in Review!

- *Oxygen delivery= CO X Oxygen content*



Pediatric Shock in Review!

- *Oxygen delivery vs consumption*



Pediatric Shock in Review!

- *Classification of Shock:*
  - *Hypovolemic.*
  - *Septic.*
  - *Cardiogenic.*
  - *Obstructive*
  - *Endocrine*

Pediatric Shock in Review!

- *Assessment:*
  - *History:*
    - *Illness.*
      - *Intake and output*
    - *Medication.*
    - *Cardiac history*
    - *Trauma*
    - *Travel*

Pediatric Shock in Review!

- *Assessment:*
  - *BCA:*
    - *Respiratory effort, symmetry*
    - *Oxygenation.*
    - *Establish access.*
  - *Pulses:*
    - *Femoral, Brachial, Radial.*
  - *Blood pressure:*
    - *Upper and lower*

Pediatric Shock in Review!

- *Chest Xray.*
- *Lab:*
  - *CBC.*
  - *Electrolyte, accucheck*
  - *VBG/ABG.*
  - *Lactate*
  - *Blood culture*
  - *Monitor input and output.*

Pediatric Shock in Review!

- *Hypovolemic shock:*
  - *It is the most common type of shock in pediatrics population.*
  - *Gastroenteritis is the most common cause.*

Pediatric Shock in Review!

- *Hypovolemic shock:*
  - *Signs of dehydration:*
    - *Dry mouth.*
    - *Decrease urine output.*
    - *Lethargic*
    - *Tachycardia and hypotensive.*
    - *Increase capillary refill.*

Pediatric Shock in Review!

- *Hypovolemic shock:*
  - *Treatment:*
    - *Fluid, fluid and fluid*
      - *NS, LR.*
        - *20 ml/kg push up to 60 ml/kg.*
      - *No dextrose in fluid and avoid ½ or ¼ normal saline.*
      - *Blood when indicated.*
    - *Continue resuscitation till restore blood pressure.*

Pediatric Shock in Review!

- *Sepsis and Septic Shock:*
  - *Evidence of infection plus life threatening organ dysfunction with acute changes.*

Pediatric Shock in Review!

- *Septic Shock:*
  - *Stages:*
    - *Compensatory.*
      - *Blood pressure can be normal initially.*
      - *Oxygen saturation can be normal.*
    - *Uncompensatory*
    - *Irreversible.*

Pediatric Shock in Review!

- *Septic Shock:*
  - *Classification:*
    - *Cold or Warm septic shock.*
    - *Fluid refractory/Dopamine.*
    - *Catecholamine resistant shock.*
    - *Refractory shock*

Pediatric Shock in Review!

- *Septic Shock:*
  - *Sepsis with fluid unresponsiveness hypotension, serum lactate more than 2.0, and the need for pressors to maintain higher MAP.*

Pediatric Shock in Review!

- *Triad in Septic shock (SIRS):*
  - *Hypothermia and Hyperthermia.*
  - *Altered mental status*
  - *Peripheral vasodilatation.*

Pediatric Shock in Review!

- *Septic Shock:*
  - *Early resuscitation and reversal of septic shock by community ER physician and first line responders are associated with improved outcome.*
  - *Early resuscitation: normalization of blood pressure and capillary refill.*

Pediatric Shock in Review!

- *Septic Shock:*
  - *Early reversal of shock (median time=75 min) associated with 96% survival and a 9 fold increased odds of survival.*
  - *For each hour of persistent shock and for each hour of delay in resuscitation, the odds of mortality increased by 2 fold and 1.5 fold respectively.*
  - *Non-survivors received more mechanical ventilation and pressors support than survivors.*

Pediatric Shock in Review!

- *Recommendation for Pediatric septic shock by the ACCM-PALS:*
  - *0-5 minutes:*
    - *Recognize signs of poor perfusion*
    - *Recognize and maintain airway:*
      - *100% oxygen.*
      - *Early intubation if indicated.*
    - *Establish IV access*

Pediatric Shock in Review!

- *Recommendation for Pediatric septic shock by the ACCM-PALS:*
  - *5- 15 min:*
    - *Push fluid 20 ml/kg up to 60 ml/kg.*
    - *Maintain Hb more than 10 gm/dl.*
    - *FFP to correct PT and PTT.*
    - *Correct hypoglycemia and hypocalcemia.*

Pediatric Shock in Review!

- *Treatment of shock (0-60 minutes)*
  - *Immediate consideration of antibiotics.*
  - *Do not delay because of delay in obtaining cultures.*

Pediatric Shock in Review!

- *Septic Shock:*
  - *Patients who don't respond rapidly to initial fluid boluses, or with insufficient physiologic reserve should be considered for invasive hemodynamic monitoring:*
    - *Central line.*
      - *CVP-MAP .*
    - *PA line*

Pediatric Shock in Review!

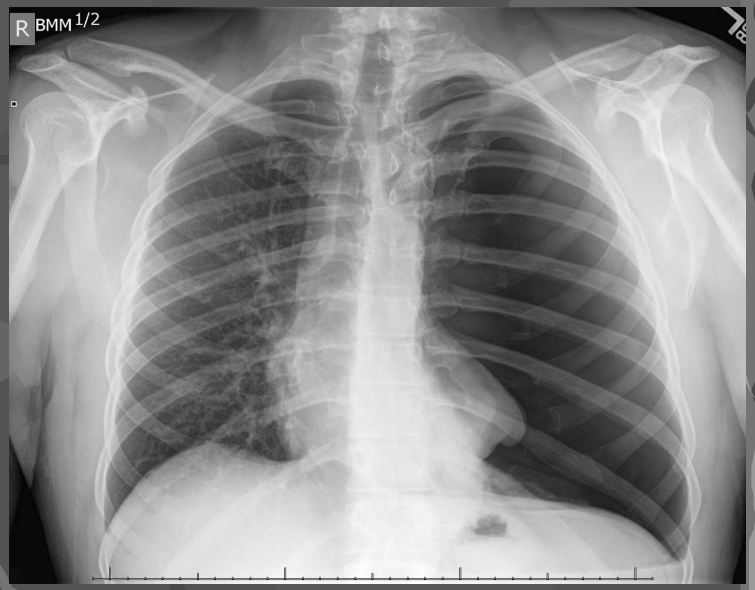
- *Recommendation for Pediatric septic shock by the ACCM-PALS:*
  - *Vasopressor therapy:*
    - *Dopamine first line of therapy.*
  - *if fluid refractory and dopamine resistant:*
    - *Epinephrine for cold, and NE for warm septic shock.*
  - *Catecholamine resistant:*
    - *start hydrocortisone(50mg/m^2/d divided Q 6 hrs).*

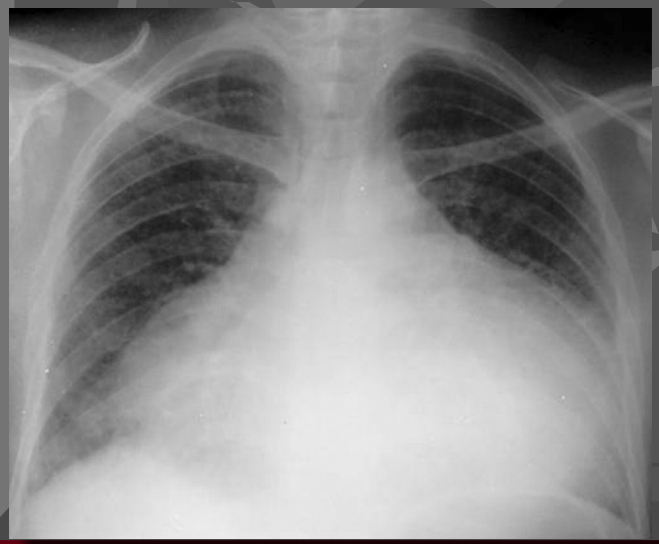
Pediatric Shock in Review!

- *Recommendation for Pediatric septic shock by the ACCM-PALS:*
  - *ECMO: Extra corporeal membrane oxygenator.*
    - *VV.*
    - *VA.*

Pediatric Shock in Review!

- *Other types:*
  - *Obstructive shock*
    - *Pneumothorax*
    - *Pericardial tamponade*





Pediatric Shock in Review!

- *Other types:*
  - *Cardiogenic shock*
    - *Newborn think of:*
      - *Congenital heart defect*
      - *Congenital adrenal hyperplasia*
  - *Endocrine shock*
    - *Medication infusion*

Pediatric Shock in Review!

- *Conclusion:*
  - *Early recognition and aggressive resuscitation of pediatric septic shock by community physicians can save lives.*

- *Thanks again to all of you as first responders for what you are doing and have done especially in this past year and during the tough time.*

  God Bless