

# Tools to aid Respiratory Therapists in Assessment and Stabilization of Pediatric Patients

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## Disclosures

I have no conflicts of interest to  
disclose.

## Objectives

- ▶ Differentiate Respiratory Distress from Respiratory Failure
- ▶ Discuss Pediatric Assessments and Scoring Systems
- ▶ Describe signs and classifications of shock

## Respiratory Failure

- ▶ The number one reason for cardiopulmonary arrests in children is due to respiratory failure.

## Distress vs. Failure

- ▶ Respiratory abnormalities seen in children consist of many signs and symptoms.
- ▶ Different RT's could see the same child as:
  - Respiratory distress
  - Respiratory failure

## Distress vs. Failure

- ▶ **Example**
  - An 8 year old patient with reactive airway disease reports progressive dyspnea.
  - RR = 30
  - Patient is using accessory muscles and wheezing
  - Room air SpO<sub>2</sub> 88%

## Distress vs. Failure

- ▶ When attempting to identify the issue:
  - **Respiratory Distress** = Increased WOB
  - **Respiratory Failure** = Ineffective gas exchange (oxygenation or ventilation)

## Respiratory Failure Signs

- Agitation
- Lethargy
- Increased work of breathing
- Retractions or Paradoxical breathing
- Tachypnea
- Hypertension
- Tachycardia
- Diaphoretic
- Altered mental status
- Cyanosis

## Respiratory Failure

- Infants and children consume 2–3 times more oxygen / kg of body weight than adults in similar circumstances.

## Respiratory Failure

- ▶ Decreasing respiratory rate and diminished retractions in a child with a history of distress is an indication of impending respiratory arrest.

## PEDIATRIC EARLY WARNING SCORE (PEWS)

- ▶ The Pediatric Early Warning Score (PEWS) uses objective data to predict patient deterioration early.
  - PEWS is meant to be used along with clinical judgment.
  - PEWS looks at three categories: behavior, cardiovascular, respiratory.

## PEDIATRIC EARLY WARNING SCORE

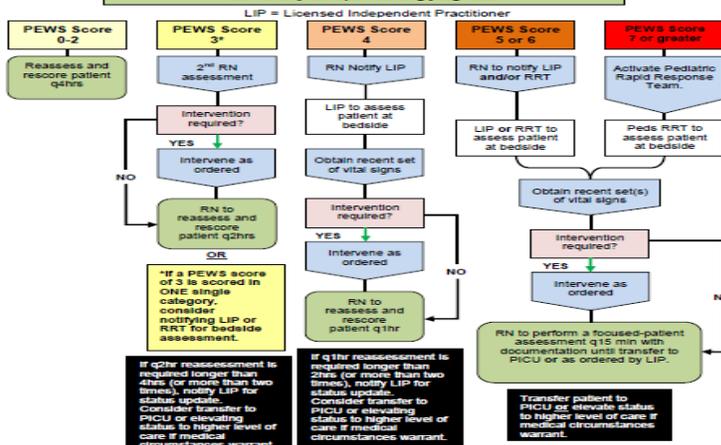
**Pediatric Early Warning System (PEWS) scoring tool**

Score/Category	0	1	2	3
<b>Behavior</b>	Playing/ Appropriate	Sleeping	Irritable	Lethargic/confused <i>OR</i> Reduced response to pain
<b>Cardiovascular</b>	Pink <i>OR</i> Capillary refill 1-2 seconds	Pale or Dusky <i>OR</i> Capillary refill 3 seconds	Grey or cyanotic <i>OR</i> Capillary refill 4 seconds <i>OR</i> Tachycardia of 20 above normal rate	Grey or cyanotic AND mottled <i>OR</i> Capillary refill 5 seconds or more <i>OR</i> Tachycardia of 30 above normal rate <i>OR</i> Bradycardia
<b>Respiratory</b>	Within normal parameters, no retractions	RR > 20 above normal parameters <i>OR</i> Using accessory muscles <i>OR</i> 30+% FiO <sub>2</sub> or 3+ liters/min	RR > 20 above normal parameters <i>OR</i> Retractions <i>OR</i> 40+% FiO <sub>2</sub> or 6+ liters/min	RR 5 or more below normal with retractions or grunting <i>OR</i> 50+% FiO <sub>2</sub> or 8+ liters/min
*Score 2 extra points for every 15 minute or continuous nebulizations				
**Score 2 extra points for persistent vomiting after surgery				

# PEDIATRIC EARLY WARNING SCORE

## Pediatric Early Warning System (PEWS) Action Algorithm

Assign PEWS score upon admission/transfer to Pediatric Unit and at a minimum of q4hrs. Nurse may activate the Pediatric RRT/Code Blue Team at any time per nursing judgment.



\*This PEWS Action Algorithm was modified for use by Wesley Medical Center's Department of Pediatric services in 2013. This PEWS Action Algorithm, or tiered response to scores, is to be used as a guideline for the minimum response required for each aggregate PEWS score. Based on clinical judgment, the nurse and/or caregiver could request an assessment by a senior clinical leader or LIP, and/or activate the RRT at any time regardless of the patient's PEWS score.

# Pediatric Respiratory Assessment Tool (PRAT)

PEDIATRIC RESPIRATORY ASSESSMENT TOOL (PRAT) Asthma Scoring System						
	Respiratory Rate	Accessory Muscle Use	Air Exchange	Wheezes	I:E Ratio	SpO2 / O2 Use
0	6-12 mo. ≤40 1-2 yr. ≤30 3-5 yr. ≤26 6-12 yr. ≤24 >12 yr. ≤20	None	Normal	None/End Expiratory	Less than or equal 1:2	90 - 94% on Room Air Infants less than 6 mo. > 95%
1	6-12 mo. 41-49 1-2 yr. 31-39 3-5 yr. 27-35 6-12 yr. 25-31 >12 yr. 21-27	Retractions: Suprasternal/ Sub costal/ Intercostals	Localized; Decreased	Entire Expiratory	1:3 or greater	Sats < 90% on Room air or requiring oxygen
2	6-12 mo. ≥50 1-2 yr. ≥40 3-5 yr. ≥36 6-12 yr. ≥32 >12 yr. 28	Neck and Abdominal Muscles	Multiple areas decreased	Entire Inspiratory & Expiratory		

## Respiratory Assessment Score (RAS)

*RESPIRATORY ASSESSMENT SCORE (RAS)				
	Respiratory Rate	Accessory Muscle Use	Air Exchange	Wheezes
0	Less than 50	None	Normal	None / End Expiratory
1	Greater than 50	Retractions - Substernal / Subcostal / Intercostal	Localized, decreased	Entire Expiratory
2		Neck or Abdominal Muscles use	Multiple areas decreased	Entire Expiratory and Inspiratory

## AIR

- ▶ Assessment
- ▶ Intervention
- ▶ Reassessment

## Everyone Still Awake?



## SHOCK

- ▶ A state of circulatory dysfunction that fails to provide sufficient oxygen and nutrients to meet the metabolic needs of vital organs and peripheral tissues.
  - Classified as either:
    - Compensated (Early Stage)
    - Decompensated (Late Stage)

## SHOCK

- ▶ There are 6 categories of shock:
  1. Hypovolemic
  2. Cardiogenic
  3. Distributive
  4. Obstructive
  5. Septic
  6. Anemic
  
- ▶ \*Tachycardia and Tachypnea are early signs of shock in children.

## SHOCK

- ▶ **Hypovolemic Shock**
  - Fluid Loss
  - Blood Loss
  - Capillary Leak
  
- ❖ Acute hypovolemia resulting from fluid and electrolyte loss, is the most common cause of shock in pediatric patients.

## SHOCK

### ▶ Hypovolemic Shock

- Hypovolemia causes a decrease in the preload which adversely affects cardiac output.
- The bodies initial response:
  - Activate the peripheral and central baroreceptors
  - Promotes catecholamine-mediated vasoconstriction and tachycardia.

## SHOCK

### ▶ Hypovolemic Shock

- Children can maintain a normal blood pressure longer than adults.
- Therefore blood pressure is not a clear indicator of perfusion status in children.

## SHOCK

### ▶ Hypovolemic Shock

- Capillary refill time and temperature of extremities are more reliable indicators of hypovolemia than monitoring for hypotension.

## SHOCK

### ▶ Hypovolemic Shock

- Signs and Symptoms
  - Tachycardia
  - Narrowed pulse pressure
  - Delayed capillary refill time
  - Orthostatic changes
  - Hypotension
- Treatment: IV fluid resuscitation

## SHOCK

### ▶ Cardiogenic Shock

- Characterized by a significant decrease in cardiac output, often due to myocardial dysfunction.
- Congenital heart anomalies most often causes congestive heart failure in children.
  - Low cardiac output syndrome

## SHOCK

### ▶ Cardiogenic Shock

- Congenital heart lesions
- Myocardial dysfunction (Cardiomyopathies)
- Infectious myocarditis
- Systemic inflammatory processes

## SHOCK

### ▶ Cardiogenic Shock

- Signs and Symptoms
  - Vary depending on the type of lesion
    - Cool extremities
    - Tachycardia
    - Narrow pulse pressure
    - Respiratory distress
    - CXR – Cardiomegaly
    - Enlarged Liver on exam

## SHOCK

### ▶ Cardiogenic Shock

- Signs and Symptoms
  - Ductal Dependent lesions will usually present in profound shock. With a history of poor or absent urine output, poor feeding, tachypnea, lethargy, cyanosis, and thread pulses.

Treatment: Prostaglandin E1

## SHOCK

### ▶ Cardiogenic Shock

- Signs and Symptoms
  - Non Ductal Dependent lesions will usually present with a history of galloping heart rhythm, tachycardia, heart murmur, tachypnea, hepatomegaly, and failure to thrive.
  - Treatment: Optimizing intravascular volume

## SHOCK

### ▶ Cardiogenic Shock

- Other causes of Cardiogenic Shock:
  - Hypoxic–ischemic episodes
    - Near drowning
    - Strangulation

## SHOCK

### ▶ Distributive Shock

- Caused as a result of abnormality of vasomotor tone.
- Blood volume is redistributed and flow to the periphery causes a relative hypovolemia.

## SHOCK

### ▶ Distributive Shock

- Neurogenic Shock
  - Head or spinal cord injury
- Anaphylaxis
- Early Septic Shock
- Drug Toxicity
- Adrenal insufficiency
  - Congenital adrenal hyperplasia

## SHOCK

### ▶ Distributive Shock

- Signs and Symptoms
  - Tachycardia
  - Bounding pulses
  - Flushed appearance
  - Warm extremities
  - Wide pulse pressures
  - Brisk capillary refill

## SHOCK

### ▶ Distributive Shock

- Treatment:
  - Reversal of the underlying etiology when possible.
  - Rapid infusion of intravascular volume.
  - Vasopressor with predominantly  $\alpha$ -adrenergic activity. (Norepinephrine or phenylephrine)

## SHOCK

### ▶ Obstructive Shock

- Extrinsic forces on intrathoracic great vessels on cardiac chambers
- Cardiac output is limited
  - Normal intrathoracic volume
  - Normal myocardial contractility.

## SHOCK

### ▶ Obstructive Shock

- Pneumothorax
- Pulmonary embolism
- Pericardial effusions
- Cardiac tamponade
- Aortic stenosis
- Coarctation of the aorta
- Left heart obstructive lesion (<6mo)

## SHOCK

### ▶ Septic Shock

- Complex
- Encompasses features of hypovolemic, distributive and cardiogenic shock.

## SHOCK

### ▶ Septic Shock

- Bacterial
- Viral
- Fungal
- Parasitic
  
- Treatment: Must be broad until the causative agent is known.

# SHOCK

## ▶ Septic Shock

- Signs and Symptoms
  - Changes in mental status
  - Fever or hypothermia
  - Perfusion abnormalities
    - Vasodilation (Warm Shock)
    - Vasoconstriction (Cold Shock)

# SHOCK

## ▶ Septic Shock

- Vasodilation (Warm Shock)
  - Low systemic vascular resistance
  - High Cardiac output
- Clinical Presentation:
  - Tachycardia
  - Bounding pulses
  - Brisk capillary refill
  - Widened pulse pressures

# SHOCK

## ▶ Septic Shock

- Vasoconstriction (Cold Shock)
  - High systemic vascular resistance
  - Low Cardiac output
  - Poor peripheral perfusion
- Clinical Presentation
  - Tachycardia, Prolonged Capillary Refill Time, Mottled Skin, Weak Pulses

# SHOCK

## ▶ Septic Shock

- Treatment:
  - Restore and maintain optimal organ perfusion
  - Restoration of mental status and urine output
  - Aggressive fluid resuscitation
  - Vasoactive agents (fluid refractory shock)
  - Corticosteroids (catecholamine refractory shock)
  - Antibiotics

## SHOCK

### ▶ Anemic Shock

- Affects children with chronic severe anemia.
  - These patients have high cardiac output failure.
  - Acute anemic shock that is not caused by trauma, will respond better to blood transfusion than to fluid boluses.

## SHOCK

### ▶ Key Points

- Oxygen should be provided to all pediatric patients with suspected shock.
- Hypotension is a late finding of shock in pediatric patients.
- Vascular access should be established as soon as possible in children with signs of shock.

## SHOCK

### ▶ Key Points (cont)

- Fluid resuscitation should be started early.
  - Continuous monitoring and frequent reassessment are recommended.
  
- Infants at risk for hypoglycemia should receive fluids containing dextrose after initial fluid resuscitation has been administered.

## SHOCK

### ▶ Key Points (cont)

- Early antibiotic administration is a priority for any pediatric patients suspected of septic shock.
- CXR Results
  - Any patient with hypovolemia will have a small normal appearing heart.
  - A large cardiac silhouette suggest myocardial dysfunction, hypervolemia, or pericardial effusion.

## Case Study

- 9 yo Male- Mild case of gastroenteritis 10 days ago.
- Presents with sudden decrease in activity, fever, difficulty breathing, chest pain, and swollen feet.
- Physical exam- Gray in color, listless, tachypneic (RR 35), enlarged liver and new onset of heart murmur.

## Case Study

- 18 mo male admit to peds for Observation of respiratory distress at 1730.
- 3 day hx of cough and runny nose.
- Today mom noted that he looked like he was having trouble breathing.
- Pt presented to the ED where he was suctioned and found to have a moderate amount of thick cloudy secretions.

## Case Study

- Hx- NICU Grad 29 week Twin, intubated while in NICU for 2 weeks.
- Upon admit to Peds floor - Dr. ordered Pediatric Bronchiolitis Protocol.
- RT to see patient and upon entering the room hears pt's audible stridor breathing
- Noted to have a slightly barky cough.

## Case Study

- Therapist performs complete assessment of pt and notes the following:
  - BS- SL Diminished & Coarse Bilaterally
  - Upper airway mild stridor
  - Patient has mild retractions
  - RR is less than 50 so RAS score is 3.

## Case Study

- RT decides to speak with Dr. about concerns for stridor before deep suctioning patient.
- RT and Dr. decide based on the assessment, RAS score of 3, and recent suction in ED
  - Nasal aspiration only
  - Continued reassessment

## Case Study

- During the night PT has increase in WOB and PEWS score. Decision is made to transfer patient to PICU.
- Once in PICU Patient CODES due to Respiratory Failure.
- Pt is noted to have a very difficult airway upon intubation.

## Case Study

- Pt was DX with Tracheobroncho malacia,
- Weaned from vent
- Dismissed home with parents and twin sister.

## Summary

- ▶ Pediatric scoring systems
- ▶ Shock
- ▶ AIR

## References

- ▶ Pediatric Fundamental Critical Care Support (PFCCS); Society of Critical Care Medicine, copyright 2013.

## Questions???

