Recognition of the Seriously Ill Child

Alison Oliver 2009
Principles

- Outcome for children following cardiac arrest is poor
- Early recognition and management is vital
- Must be able to recognise potential respiratory, circulatory & neurological failure
Why do children arrest?

- Hypoxia
- Bradycardia
- Asystole
Arrive in ER in cardiac arrest (N = 80)

Admit PICU (N=43) 54%  
- Died in ER (N=37) 46%

Mod Deficit (N=3)  
- PVS at 12 mos (N=2)
- Dead at 12 mos (N=1)

Died in ICU (N=37) 46%

Children are very different from adults !!!
Airway – what’s different about a child?

- >6mths nasal breather
- Large tongue
- Soft palate
- Soft short trachea
- Easily compressible floor of the mouth
- Loose teeth
Airway – What’s different about a child’s airway?

- Adenotonsillar Hypertrophy
- Horseshoe shaped epiglottis
- Larynx is high and anterior
- Cricoid ring is the narrowest part
cricoid

Child

Cricoid

Narrowest point

Adult
Airway positioning for children <2yrs
Breathing - what’s different about the child?

- Small total surface area
- Ten fold increase in small airways from birth to adulthood
- Narrow so easily obstructed
- Infants breathe using the diaphragm
- Muscles are more likely to fatigue
Breathing What’s different about the child?

- Ribs are horizontal (contribute less to rib expansion)
- Serious lung injury can occur with no evident rib fracture on x-ray.
- If rib fractures do occur in infants, parenchymal damage is likely to be severe.
Recognition of potential respiratory failure

- Effort of breathing
- Efficacy of breathing
- Effects of respiratory inadequacy on other organs
Effort of breathing

- Respiratory rate
- Recession
- Inspiratory or expiratory noises
- Grunting
- Accessory muscle use
- Flaring of the alae nasi
Effort of breathing
subcostal recession

» severe recession
Effort of breathing

EXHAUSTION IS A PRE–TERMINAL SIGN
Respiratory rate by age at rest

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Respiratory rate / minute</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1</td>
<td>30 –40</td>
</tr>
<tr>
<td>1 -2</td>
<td>25 –35</td>
</tr>
<tr>
<td>2 -5</td>
<td>25 –30</td>
</tr>
<tr>
<td>5 -12</td>
<td>20 –25</td>
</tr>
<tr>
<td>&gt; 12</td>
<td>15 -20</td>
</tr>
</tbody>
</table>
Exceptions

3 exceptions to an increased work of breathing

- Exhaustion
- Cerebral depression from raised ICP
- Neuromuscular disease
Efficacy of breathing

- Auscultation
- **Silent chest is extremely worrying**
- Chest expansion
- Pulse oximetry
Effects of respiratory inadequacy on other organs

- Heart rate
  - Bradycardia is a pre-terminal sign

- Skin colour
  - Cyanosis late and pre-terminal sign

- Mental status
Recognition of potential circulatory failure

- Cardiovascular status

- Effects of circulatory inadequacy on other organs
Cardiovascular status

- Heart rate
- Pulse volume
- Capillary refill time
- Blood pressure
## Heart rate by age

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Heart rate / minute</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1</td>
<td>110 – 160</td>
</tr>
<tr>
<td>1 - 2</td>
<td>100 – 150</td>
</tr>
<tr>
<td>2 - 5</td>
<td>95 – 140</td>
</tr>
<tr>
<td>5 - 12</td>
<td>80 – 120</td>
</tr>
<tr>
<td>&gt; 12</td>
<td>60 – 100</td>
</tr>
</tbody>
</table>
Bradycardia is a pre-terminal sign

Hypotension is a late and pre-terminal sign of circulatory failure
Cardiovascular signs

capillary refill
Effects of circulatory inadequacy on other organs

- Increased respiratory rate

- Mottled, cold, pale skin

- Mental status – agitation, drowsiness leading to unconsciousness

- Decrease urine output
Recognition of potential central neurological failure

- Neurological function
- Respiratory effects of central neurological failure
- Circulatory effects of central neurological failure
Neurological function

- Conscious level
- AVPU
- Posture
- Pupils
# Modified Glasgow Coma Scale for Infants and Children

<table>
<thead>
<tr>
<th>Area Assessed*</th>
<th>Infants</th>
<th>Children</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Eye opening</strong></td>
<td>Open spontaneously</td>
<td>Open spontaneously</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Open in response to verbal stimuli</td>
<td>Open in response to verbal stimuli</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Open in response to pain only</td>
<td>Open in response to pain only</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>No response</td>
<td>No response</td>
<td>1</td>
</tr>
<tr>
<td><strong>Verbal response</strong></td>
<td>Coos and babbles</td>
<td>Orientated and appropriate</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Irritable cries</td>
<td>Confused</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Cries in response to pain</td>
<td>Inappropriate words</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Moans in response to pain</td>
<td>Incomprehensible words or nonspecific sounds</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>No response</td>
<td>No response</td>
<td>1</td>
</tr>
<tr>
<td><strong>Motor response</strong></td>
<td>Moves spontaneously and purposefully</td>
<td>Obey commands</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Withdraws to touch</td>
<td>Localizes painful stimuli</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Withdraws in response to pain</td>
<td>Withdraws in response to pain</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Responds to pain with decorticate posturing</td>
<td>Responds to pain with flexion</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>(abnormal flexion)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Responds to pain with decerebrate posturing</td>
<td>Responds to pain with extension</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>(abnormal extension)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>No response</td>
<td>No response</td>
<td>1</td>
</tr>
</tbody>
</table>
Potential Central Neurological Failure postures

decorticate posture
Potential Central Neurological Failure postures

- decerebrate posture
Respiratory effects of central neurological failure

- Hyperventilation
- Cheyne-Stokes
- Apnoea
Circulatory effects of central neurological failure

- Cushing’s response – late and pre-terminal sign
- Hypertension
- Sinus bradycardia
Rapid Clinical Assessment

- **Airway & Breathing**
  - Effort of breathing
  - Respiratory rate/ rhythm
  - Stridor / wheeze
  - Auscultation
  - Skin colour
Rapid Clinical Assessment

- **Circulation**
  - Heart rate
  - Pulse volume
  - Capillary refill time
  - Skin temperature
Rapid Clinical Assessment

- **Disability**
  - Mental status / conscious level
  - Posture
  - Pupils
ABCD should be reassessed at frequent intervals