Paediatric Respiratory History and Examination

in today’s world of technological wonders, there is no substitute for a proper history and physical examination.
History

• Listen

• Clarification
History

• The child’s parents are usually the primary source or, at the very least, important contributors to the history.
• Useful information may be obtained from children as young as 3 years of age and from the age of 8 years, the child should be the principal source of the history
• Privacy of older children and adolescents must be respected
• Patient history is focused on the respiratory system and is adapted to patient circumstances (emergency situation, chief complaint, chronic problem, age, etc.); however, other pertinent organ systems should not be neglected and structure is important in order to avoid missing helpful clues.
Chief complaint

• the major concern that prompted consultation
• a chronological description of the problem

Clarification of its:
  • onset – age of onset
  • frequency,
  • timing,
  • duration
  • severity,
  • relation to specific circumstances, and
  • response to medication
## Noisy breathing

<table>
<thead>
<tr>
<th>Noise</th>
<th>Site of origin</th>
<th>Common causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheezing</td>
<td>Intrathoracic airways (primarily expiratory)</td>
<td>Asthma, Viral wheeze, Bronchiolitis, Foreign body, Protracted bacterial bronchitis, Tracheo/bronchomalacia</td>
</tr>
<tr>
<td>Stridor</td>
<td>Extrathoracic airways (primarily inspiratory)</td>
<td>Croup, Epiglottitis, Laryngomalacia, Tracheomalacia, Vocal cord paralysis, VCD</td>
</tr>
<tr>
<td>Snoring</td>
<td>Oro/nasopharyngeal airway</td>
<td>Collapsible airways with increased size of adenotonsilar tissue, Obesity, Craniofacial disorders</td>
</tr>
<tr>
<td>Rattle</td>
<td>Intra- and extrathoracic airways</td>
<td>Acute viral bronchitis, Protracted bacterial bronchitis, Neurologic disorders with swallowing dysfunction and/or chronic aspiration</td>
</tr>
<tr>
<td>Grunting</td>
<td>Glottis</td>
<td>Respiratory distress syndrome (neonates), Pneumonia, Bacterial infection</td>
</tr>
<tr>
<td>Snuffles</td>
<td>Blocked nasal passages</td>
<td>Upper respiratory tract infections, Allergic rhinitis</td>
</tr>
</tbody>
</table>
Asthma Control Test™ for teens 12 years and older. Know the

If your teen is 12 years or older have him take the test now and discuss the results with your doctor.

Step 1 Write the number of each answer in the score box provided.
Step 2 Add up each score box for the total.
Step 3 Take the test to the doctor to talk about your child’s total score.

1. In the past 4 weeks, how much of the time did your asthma keep you from getting as much done at work, school or at home?
   - All of the time 1
   - Most of the time 2
   - Some of the time 3
   - A little of the time 4
   - None of the time 5

2. During the past 4 weeks, how often have you had shortness of breath?
   - More than once a day 1
   - Once a day 2
   - 3 to 6 times a week 3
   - Once or twice a week 4
   - Not at all 5

3. During the past 4 weeks, how often did your asthma symptoms (wheezing, coughing, shortness of breath, chest tightness, or pain) wake you up at night or earlier than usual in the morning?
   - 4 or more nights a week 1
   - 2 or 3 nights a week 2
   - Once a week 3
   - Once or twice a week 4
   - Not at all 5

4. During the past 4 weeks, how often have you used your rescue inhaler or nebulizer medication (such as albuterol)?
   - 3 or more times per day 1
   - 1 or 2 times per day 2
   - 2 or 3 times per week 3
   - Once a week or less 4
   - Not at all 5

5. How would you rate your asthma control during the past 4 weeks?
   - Not controlled at all 1
   - Poorly controlled 2
   - Somewhat controlled 3
   - Well controlled 4
   - Completely controlled 5

The American Lung Association supports the Asthma Control Test and wants everyone 12 years of age and older with asthma to take it.
Cough

• Cough is the most common symptom of airway lung disease
• Cough is an important physiological protective reflex that clears airways of secretions and inhaled or aspirated material
• Characteristics:
  • moist or dry
  • paroxysmal – symptoms between intervals
  • early morning – disturbs sleep
  • seal bark, throat clearing
General history

- growth and development
- birth history and neonatal events
- weight loss, diarrhoea, constipation
- atopy – hay fever, eczema, asthma
- previous illness, operations
- family history
- environmental exposure – cigarette smoke
- social history
Examination

Observation
Upper Airway

• Face
  • micrognathia, retrognathia, depressed nasal bridge
  • palate, uvula and tonsils
  • nasal polyps in cystic fibrosis, allergic rhinitis
  • allergic salute and rabbit twitching
  • mouth breathing
Chest shape

- Asymmetry
- Hyperinflation
- Pectus excavatum
- Pectus carinatum
- Harrison’s sulci
- Chest expansion
- Kyphoscoliosis
Chest

- respiratory rate
  - newborn: 40-60
  - 1 week to 3 months: 30-50
  - 3 months to 2 years: 20-40
  - 2 years to 10 years: 14-24
  - > 10 years: 12-20

South, Isaacs Practical Paediatrics, 2012
Work of Breathing - Respiratory rate

<table>
<thead>
<tr>
<th>Age group</th>
<th>1st</th>
<th>5th</th>
<th>10th</th>
<th>50th</th>
<th>90th</th>
<th>95th</th>
<th>99th</th>
</tr>
</thead>
<tbody>
<tr>
<td>0--&lt;3 mo</td>
<td>22</td>
<td>27</td>
<td>30</td>
<td>41</td>
<td>56</td>
<td>52</td>
<td>76</td>
</tr>
<tr>
<td>3--&lt;6 mo</td>
<td>21</td>
<td>25</td>
<td>28</td>
<td>38</td>
<td>52</td>
<td>58</td>
<td>71</td>
</tr>
<tr>
<td>6--&lt;9 mo</td>
<td>20</td>
<td>23</td>
<td>26</td>
<td>35</td>
<td>49</td>
<td>54</td>
<td>67</td>
</tr>
<tr>
<td>9--&lt;12 mo</td>
<td>19</td>
<td>22</td>
<td>24</td>
<td>33</td>
<td>46</td>
<td>51</td>
<td>63</td>
</tr>
<tr>
<td>12--&lt;18 mo</td>
<td>18</td>
<td>21</td>
<td>23</td>
<td>31</td>
<td>43</td>
<td>48</td>
<td>61</td>
</tr>
<tr>
<td>18--&lt;24 mo</td>
<td>16</td>
<td>20</td>
<td>21</td>
<td>29</td>
<td>40</td>
<td>45</td>
<td>51</td>
</tr>
<tr>
<td>2--&lt;3 y</td>
<td>16</td>
<td>18</td>
<td>20</td>
<td>27</td>
<td>37</td>
<td>42</td>
<td>51</td>
</tr>
<tr>
<td>3--&lt;4 y</td>
<td>15</td>
<td>18</td>
<td>19</td>
<td>25</td>
<td>35</td>
<td>40</td>
<td>51</td>
</tr>
<tr>
<td>4--&lt;6 y</td>
<td>14</td>
<td>17</td>
<td>18</td>
<td>24</td>
<td>33</td>
<td>37</td>
<td>51</td>
</tr>
<tr>
<td>6--&lt;8 y</td>
<td>13</td>
<td>16</td>
<td>17</td>
<td>23</td>
<td>31</td>
<td>35</td>
<td>44</td>
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<tr>
<td>8--&lt;12 y</td>
<td>13</td>
<td>15</td>
<td>16</td>
<td>21</td>
<td>28</td>
<td>31</td>
<td>44</td>
</tr>
<tr>
<td>12--&lt;15 y</td>
<td>11</td>
<td>13</td>
<td>15</td>
<td>19</td>
<td>25</td>
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<td>33</td>
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<td>14</td>
<td>18</td>
<td>23</td>
<td>26</td>
<td>33</td>
</tr>
</tbody>
</table>

Bonafide PEDIATRICS 2013
Work of breathing

• Accessory muscles
  • Inspiration: sternomastoids, scalene
  •Expiration: rectus abdominus and other abdominal muscles, internal intercostals

• Recession
  • supraglottic – tracheal tug
  • sternal
  • intercostal
  • Hoover sign
  • paradoxical chest wall ovement
Respiratory cycle

• prolonged inspiration – extra thoracic obstruction
• prolonged expiration – intra thoracic obstruction
• tachypnoea with normal cycle – parenchymal disease
Palpation

- cervical and axillary lymph nodes
- asymmetrical chest wall expansion
- tactile fremitus - ↓ pneumothorax, ↑ consolidation

Percussion  dull - pleural fluid,  resonant - pneumothorax
Lung sounds

• vesicular
  • low frequency, non-musical sound, barely audible at rest

• bronchial / tracheal breath sounds
  • harsh sounds like those heard over the trachea – consolidation

• wheeze
  • high pitched, musical sound in expiration – intra-thoracic airway obstruction
  • flow dependent

• crackles (crepitations)
  • high pitched short duration –
    • movement of thin secretions, explosive opening of collapse small airways

• aegophony and whispered pectoriloquy
Cyanosis

Cyanosis requires at least 4-6g/dl desaturated Hb in capillary, 3g/dl in art blood

- Hb 8  SaO2 <65%
- Hb 14  SaO2 <78%
- Hb 20  SaO2 <85%

- central cyanosis
  - ear lobes, retinal, mouth

- peripheral cyanosis
  - increased O2 consumption or decreased blood flow
Box 3-4
Four Types of Hypoxia and Some Causes

Hypoxemia (Low \( \text{Po}_2 \) and Low Oxygen Content)

- Deficiency of oxygen in the atmosphere
- Hypoventilation
- Uneven distribution of alveolar gas and/or pulmonary blood flow
- Diffusion impairment
- Venous-to-arterial shunt

Deficient Hemoglobin (Normal \( \text{Po}_2 \) and Low Oxygen Content)

- Anemia
- Carbon monoxide poisoning

Ischemic Hypoxia (Normal \( \text{Po}_2 \) and Normal Oxygen Content)

- General or localized circulatory insufficiency
- Tissue edema
- Abnormal tissue demands
Finger clubbing - Schamroth’s sign

NORMAL
Phalangeal depth ratio
IPD > DPD

CLUBBING
DPD > IPD

Hyponychial angle
abc < 180°

abc > 195°

Schamroth’s sign
Finger clubbing

• suppurative lung disease
• cyanotic congenital heart disease
• liver disease
• inflammatory bowel disease
• also
  • hypothyroidism, chronic pylenonephritis, toxins, Raynaud’s, Fabry’s
End of the bed examination

• adequate oxygenation
• respiratory rate
• respiratory cycle
• accessory muscle use
• recession

• clinical history
Table 3. Arterial and venous blood gas reference values

<table>
<thead>
<tr>
<th></th>
<th>Arterial blood</th>
<th>Venous blood</th>
<th>Capillary blood</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>7.40 (7.35–7.45)</td>
<td>7.36 (7.31–7.41)</td>
<td>7.35–7.45</td>
</tr>
<tr>
<td>$P_{aCO_2}$ mmHg</td>
<td>40 (35–45)</td>
<td>42–55</td>
<td>36–45</td>
</tr>
<tr>
<td>$P_{aO_2}$ mmHg</td>
<td>95 (80–100)</td>
<td>30–50</td>
<td>50–80</td>
</tr>
<tr>
<td>Bicarbonate mEq·L$^{-1}$</td>
<td>24 (22–30)</td>
<td>24–28</td>
<td>22–27</td>
</tr>
<tr>
<td>Base excess mEq·L$^{-1}$</td>
<td>-3–3</td>
<td>-3–3</td>
<td>-3–3</td>
</tr>
<tr>
<td>$O_2$ saturation %</td>
<td>&gt;90</td>
<td>60–85</td>
<td></td>
</tr>
</tbody>
</table>

Data from Dzierba et al. (2011).
<table>
<thead>
<tr>
<th>Normal pH 7.35–7.45</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acidaemia: decreased pH &lt; 7.35</td>
</tr>
<tr>
<td>Respiratory acidosis: decreased pH, increased $P_aCO_2$</td>
</tr>
<tr>
<td>Renal compensation:</td>
</tr>
<tr>
<td>Kidneys reabsorb bicarbonate</td>
</tr>
<tr>
<td>$pH \approx$, increased bicarbonate</td>
</tr>
<tr>
<td>Metabolic acidosis: decreased pH, decreased bicarbonate</td>
</tr>
<tr>
<td>Pulmonary compensation:</td>
</tr>
<tr>
<td>Hyperventilation releases $CO_2$</td>
</tr>
<tr>
<td>$pH \approx$, decreased $P_aCO_2$</td>
</tr>
<tr>
<td>Alkalaemia: increased pH &gt; 7.45</td>
</tr>
<tr>
<td>Respiratory alkalosis: increased pH, increased $P_aCO_2$</td>
</tr>
<tr>
<td>Renal compensation:</td>
</tr>
<tr>
<td>Kidneys excrete bicarbonate</td>
</tr>
<tr>
<td>$pH \approx$, decreased bicarbonate</td>
</tr>
<tr>
<td>Metabolic alkalosis: increased pH, increased bicarbonate</td>
</tr>
<tr>
<td>Pulmonary compensation:</td>
</tr>
<tr>
<td>Hypoventilation retaining $CO_2$</td>
</tr>
<tr>
<td>$pH \approx$, increased $P_aCO_2$</td>
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</tbody>
</table>