**Pediatric Case Studies**

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http://www.geocities.com/jonesapjr/index.html

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**Learning Objective**

- Presented with patient scenarios, including relevant data, identify important diagnostic findings and explain their implications.

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These cases are available, at no cost, at this web address: http://www.hawaii.edu/medicine/pediatrics/pemxray/pemxray.html

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**Volume 1 case 6**

**Diminished breath sounds**

Loren G. Yamamoto, MD, MPH

This is a 23-month old female with a history of vomiting 3-4 times per day for three days. She has a past history of reactive airway disease and congenital heart block (maternal systemic lupus) requiring a permanent implanted pacemaker. She was seen three days prior to this in the emergency department for wheezing and stomach pain. She was noted to have bilateral wheezing. Her respiratory rate was 32. An oxygen saturation was not recorded. Her abdominal exam was benign.

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**Volume 1 case 6**

**Diminished breath sounds**

The wheezing was treated with beta adrenergic agents resulting in improvement, and the patient was discharged. At discharge, her lungs were noted to be clear. She was instructed to continue albuterol and theophylline.

Admission exam: VS T36.6 (ax), P110, R32, BP 112/70, weight 10.1kg (10th percentile). Her weight three days ago in the ED was 10.66kg. Oxygen saturation was 98-99% in room air.

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**Volume 1 case 6**

**Diminished breath sounds**

She was noted to be crying, but somewhat lethargic. HEENT exam significant for somewhat sunken eyes, dry oral mucosa, and absence of tears when crying. Neck supple. Heart regular without murmurs. Lungs clear with decreased breath sounds at the left base. No wheezing was noted. There was a left thoracotomy scar and a left subcostal scar. Abdomen noted to have a palpable pacemaker in the left anterior abdominal wall and a reducible umbilical hernia.
Diminished breath sounds

The abdomen was flat and soft without masses, organomegaly, or tenderness. Bowel sounds were active. Capillary refill time in the extremities was two seconds and the skin turgor was good. An admission work-up included the following laboratory results: CBC WBC 8.9, 56 segs, 32 lymphs, 12 monos, Hgb. 12, Hct 38, platelets adequate. Na 132, K 4.2, Cl 100, Bicarb 21, BUN 14, Cr 0.7, glucose 94. A chest radiograph was obtained.

Teaching points

- Diaphragmatic hernia is not always diagnosed at birth.
- Diaphragmatic hernia may present with signs of airway obstruction and/or pneumothorax.
- Crying, bag-mask ventilation worsen condition by causing swallowing of air and inflation of intestines in the chest.

Foreign Body Aspiration in a Child

A 17 month old male presents to the ED in the evening with a one hour history of noisy and abnormal breathing after a choking episode while he was eating a chocolate and almond bar. He was able to speak and drink fluids without difficulty. Exam: VS T36.8, P200 (crying), R28 (crying), oxygen saturation 99% in room air. He appeared alert, with no signs of respiratory distress. He was able to speak, had no cyanosis, no drooling, and no dyspnea.

His lung sounds showed mild wheezing with possible mild inspiratory stridor. An albuterol aerosol was administered but no improvement was noted. A chest radiograph was ordered.

Foreign Body Aspiration in a Child

Diaphragmatic hernia

Intestinal air

Radiology Cases In Pediatric Emergency Medicine

Volume 1, Case 8  Rodney B. Boychuk, MD
Foreign Body Aspiration in a Child
Volume 1, Case 8 Rodney B. Boychuk, MD

This CXR is within normal limits; however, when a clinical suspicion of an airway foreign body is present, a standard PA and lateral CXR are an insufficient evaluation. A lateral neck film should be obtained to examine the upper airway for evidence of swelling or foreign body. Decubitus films and/or expiratory films should also be obtained to look for evidence of air trapping.

Teaching points
- Aspirated particles, like food, may not be visible on the chest x-ray.
- Aspiration often presents with localized wheezing and/or stridor.
- Suspected aspiration indicates bronchoscopy.
- This patient would have developed recurrent pneumonia, with the potential of severe complications if he were not properly managed.

Respiratory Distress - That's a Tension Pneumothorax...Isn't It?
Volume 1, Case 9 Linda M. Rosen, MD

A two and one half week old male infant presents with a history of distressed noisy breathing for several hours, progressively worsening with periods of apnea and cyanosis. Birth history was that of a full term, NSVD, 7lb. 8oz. born to a 23 y/o G3P2 mother without sepsis risk factors. He seemed to be doing well since discharge but had been noted by his parents to have "funny breathing" since birth.

Exam VS T36.7, P160, R60, BP 100/70. Oxygen saturation 86% in room air.

He was alert and anxious, with obvious tachypnea and retractions. Skin color was intermittently dusky until oxygen was administered and then remained pink (oxygen saturation 96-100%). Intercostal, and subcostal retractions present. Breath sounds are faint throughout the chest, without auscultatory rales, wheezes, or stridor heard.
Teaching points
- This CXR shows hyperlucency of the left chest with a mediastinal/cardiac shift to the right.
- Management Questions: This looks like left tension pneumothorax.
- Should you perform an emergency needle thoracostomy?
- Diagnosis- congenital lobar emphysema
- A needle thoracostomy would harm the patient

Wheezeing and Cyanosis in a 16-Month Old
Volume 2, Case 3  Collin S. Goto, M.D.

The patient is a 16 month old male who presents to the Emergency Department with a one day history of coughing, congestion, and runny nose. His only medications were acetaminophen and a cough syrup. His mother stated that he had a heart murmur, for which he had been seen by a cardiologist and told that he had a hole in his heart that would close on its own.

Exam: VS T37.1R, P170, R48, BP 112/74, oxygen saturation 78% on room air. The patient appeared pale and irritable, with moderate respiratory distress. Peripheral and central cyanosis were present. Diffuse wheezes were heard bilaterally. The patient was treated with 100% oxygen, subcutaneous terbutaline, and albuterol aerosols.

The patient's oxygen saturation decreased to the 50's with crying, but returned to the 70's when he was calmed down. He was placed in the knee chest position and a dose of morphine was given IV. He continued to have inspiratory and expiratory wheezes. Albuterol and ipratropium bromide aerosols were given. A CXR and an EKG were done.

This CXR shows a boot-shaped heart with an upturned apex secondary to right ventricular hypertrophy and a concavity of the left upper heart border (pulmonary outflow tract hypoplasia).
Volume 2 Case 3  Wheezing & cyanosis
Tetralogy of Fallot

Teaching points
- Congenital heart disease often presents as a respiratory condition:
  - arterial desaturation
  - wheezing
- Knee-to-chest (fetal) position is part of the management of tetralogy (tet) spells.
- Excessive FIO2 can only harm patients with cyanotic congenital defects.

Wheezing and distress in 7 wk. child - coarctation
Volume 2, Case 6  Collin S. Goto, M.D.

This is a 7 week old term female infant who presented in mid November with wheezing, coughing, and two episodes of non bilious emesis. She was seen by her pediatrician, who suspected that she had bronchiolitis, and she was treated with oral albuterol syrup. The patient's condition worsened, and she was brought to the Emergency Department later that evening.

Exam: VS T37, P168, R70, BP126/86, oxygen saturation 96% on room air. The infant was fussy, with moderate respiratory distress. The lungs had diffuse wheezes and crackles bilaterally with intercostal retractions. Capillary refill time in the extremities was 3 seconds. Blood pressures in the extremities showed 126/86 (left arm), 69/41 (left leg),

Wheezing and distress in 7 wk. child - coarctation
Volume 2, Case 6  Collin S. Goto, M.D.

Coarctation of the aorta

cardiomegaly
Teaching points

- Congenital heart defects are not always diagnosed at birth.
- Congenital heart defects may cause congestive heart failure and pulmonary edema, with:
  - wheezing
  - crackles
  - arterial desaturation
- Coarctation causes greater blood pressure and pulses in upper body than in lower body.

Sweeping the Airway for a Foreign Object
Volume 2 Case 16  Martin I. Herman, MD

A 4 month old male infant is brought to the emergency department by a fire and rescue squad after responding to a 911 call for respiratory distress. He was sucking on a pacifier when his caretakers noticed that he had sucked the pacifier into his mouth. A home health nurse was present and unsuccessfully attempted to retrieve the pacifier using a blind finger sweep. 911 was called.

At the scene, paramedics found the infant with a tracheostomy and a home ventilator (former 28 week twin with a stormy neonatal course). Ventilation through the tracheostomy was continued with a self inflating bag.

Teaching points

- Blind finger sweeps may push aspirated material further into the airways and should not be done.
- If the infant did not have a tracheostomy, this could have caused grave injury.

Severe chronic lung dx: BPD.
Volume 3 Case 2  Loren G. Yamamoto, MD, MPH

This is a 15 year old male with a history of severe chronic lung disease and bronchopulmonary dysplasia since birth. He was premature, and since then has required multiple hospitalizations for acute exacerbations of his chronic lung disease.
Exam VS T38.4 (oral), P110, R40, BP 120/70. Oxygen saturation 75% in room air. On oxygen by mask, his oxygen saturation increases to 90%. He is in severe respiratory distress. His color is pale and cyanotic. Lungs rhonchi, wheezing, and diminished aeration throughout. Moderately severe retractions. Perfusion good. Capillary refill time 2 seconds.

Teaching points
- The chronic stage of BPD resembles COPD in clinical signs and radiographic appearance.
- Respiratory therapists may encounter many patients with residual disease from the perinatal period, including bronchopulmonary dysplasia (BPD).

A 14 year old boy is brought into the Emergency Department just after midnight after having woken from sleep approximately ten minutes ago because of severe back pain and abdominal pain radiating into his throat. The pain is also described as “pressure” pain. Exam: VS T35.8 C, P86, R32, BP 110/74, O2 saturation 100% on room air.

Weight approximately 70 kg. He is obviously wincing in intense pain. Heart regular without murmurs. Lungs sounds are clear on auscultation with equal breath sounds bilaterally. Peripheral pulses are normal and equal bilaterally. Skin is warm and dry. Abdominal exam is also unremarkable with good bowel sounds, and no palpable masses or costovertebral tenderness.

At this point, the father settles down enough to be able to give you more of a coherent history. He relates to you that he had another son who had died at about 12 years of age from an aortic dissection and subsequent rupture.
Severe Acute Chest Pain in an Adolescent
Volume 3, Case 12 Andrew K. Feng, MD

The mainstay of medical treatment revolves around controlling blood pressure (systolic and pulse pressure). Antihypertensives should be instituted immediately if the blood pressure is high, or as soon as possible once the pressure is stable and the diagnosis is confirmed. The combination of sodium nitroprusside and propranolol is most commonly used. Labetolol can also be used as monotherapy or in place of propranolol.

Surgical intervention should be started emergently in aortic dissection if pericardial tamponade is suspected, if there are any signs of shock, or if the dissection is progressing. Outcome remains relatively poor, but is improving with a current mortality rate of 5-30%.

Teaching points
- Dissecting aortic aneurysm presents with severe chest pain.
- Diagnosis achieved by radiography, angiography, transesophageal echocardiography.
- Aortic aneurysm associates with Marfan's syndrome. Tall people, with long fingers. (Abraham Lincoln??)

Acute Chest Pain in a Tall Slender Teenager
Volume 3 Case 13 Loren G. Yamamoto, MD, MPH

A 15 year old male presents to the E.D. with a one hour history of pain in his chest and back occurring after lifting his mother. He describes the pain as knife like and non radiating. His pain worsens with deep inspiration. His pain is currently less severe than at onset. He has a past history of chest pain episodes, usually at night while sleeping in bed.
Acute Chest Pain in a Tall Slender Teenager
Volume 3 Case 13  Loren G. Yamamoto, MD, MPH

He is tall and thin. Heart regular, no murmurs. Lungs clear, but diminished breath sounds bilaterally. Peripheral pulses are full. Color and perfusion are good. Hands significant for long thin fingers (arachnodactyly). Suggesting Marfan's Syndrome.

Teaching points

- Spontaneous pneumothorax also associates with tall, slender young male, resembling aortic aneurysm.
- Weak area of lung ruptured by increased intrathoracic pressure; e.g., Valsalva maneuver.
- Small pneumothorax (<20%) requires no thoracostomy.

Near Drowning
Volume 5, Case 15 Meri-Mika Morisada, MD

This is a 5 year old boy who almost drowned at the beach. He got into deep water and was struggling to stay afloat. His aunt noticed that he was in trouble and managed to pull him to shore. Lifeguards administered CPR briefly, and then oxygen after he began breathing spontaneously.

Exam: VS T 36.5, P 120, R 45, BP 130/50, oxygen saturation while on supplemental oxygen (exact FiO2 not known) and continuous positive airway pressure was 98%.

Near Drowning
Volume 5, Case 15 Meri-Mika Morisada, MD

He was crying and active. Head without signs of trauma. Eyes normal. Pupils equal and reactive. Neck supple. Heart regular. Lungs spontaneous respirations with bilateral wheezing and rales. Good air exchange. Initial ABG:
pH 7.11, pCO2 27, pO2 140, bicarb 9.
Near Drowning
Radiology Cases In Pediatric Emergency Medicine
Volume 5, Case 15  Meri-Mika Morisada, MD
He was treated with sodium bicarbonate for metabolic acidosis, aerosolized albuterol for wheezing and furosemide for pulmonary edema. The CXR shows small patchy basilar pulmonary infiltrates. He improves clinically and the chest radiograph is repeated two days later.

Teaching points
- Near-drowning victims may appear healthy immediately following the incident; then, develop acute lung injury hours later; so, hospitalization is mandatory.
- Near-drowning victims may develop hypoxic-ischemic encephalopathy with elevated intracranial pressure.

TB in the ED
Volume 4, Case 6  Craig T. Nakamura, MD
This is a three-year old Korean male who presents to the emergency department with respiratory distress. Ten days ago, he had developed a cough, rhinorrhea, sore throat, and temperature of 39.4 degrees. The cough, rhinorrhea, and sore throat resolved after a three day period. However, he continued to spike fevers. Three days ago, he was seen by his primary care physician. A PPD was placed. He was then started on oral cefuroxime.

TB in the ED
Volume 4, Case 6  Craig T. Nakamura, MD
He was previously exposed to a grandaunt who was treated for tuberculosis in Korea and a grandfather with a chronic cough within the household. He has had a decreased oral intake and a two kilogram weight loss over the previous two weeks.
Exam: VS T39.2, P148, RR68, BP 104/89. Oxygen saturation 90% in room air (100% on 5 liters O2 by nasal cannula). He is alert with moderate respiratory distress. HEENT Normal. No lymphadenopathy. Neck supple. Heart regular without murmurs. Moderately severe chest retractions noted. Breath sounds are decreased on the right. There is good aeration over the left lung fields. No wheezing, rhonchi, or rales.

Laboratory studies: CBC WBC 9.2 with 41% lymphs, 43% segs, 14% monos, 1% eos, 1% basos. Hgb. 12.6, hct. 37.2. Chemistry panel is normal.
A PA view is shown here. His chest radiograph demonstrates a complete opacification of the right hemithorax with a shift of the mediastinal structures to the left. This patient presents with primary tuberculosis (TB) and a pleural effusion.

Teaching points
- All caregivers can be exposed to TB in the emergency room, even from pediatric patients.
- Pediatric patients may contract TB from family members, including extended family.

Membranous Croup
This is a 2-1/2 year old male who presents to an acute care clinic with a chief complaint of coughing and fever. He began coughing three days ago. His cough is now sounding worse. It sounds harsh and on further inquiry, it sounds like a barking seal. He was noted to be warm yesterday, but his temperature was not measured.

Membranous Croup
His past history is largely negative, but his immunization status is incomplete. He immigrated from Asia two weeks ago. He is known to have been immunized, at least partially, against typhoid and polio. He had a negative TB skin test at 12 months of age. He probably has not received any MMR or DPT immunizations.

Membranous Croup
Exam: T38.3 (rectal), P100, R24, BP 109/73, oxygen saturation 95% to 99% in room air. He is alert, but is noted to be drooling. He has stridor at rest with mild retractions. An occasional croupy cough is noted. He does not appear to be toxic. Head normocephalic. Eyes clear and moist. No pallor. Nose clear mucus. Oral mucosa pink and moist.
Membranous Croup  
Volume 5, Case 20  Loren G. Yamamoto, MD, MPH  
Thick yellow and white exudates are noted on the tonsils, the uvula, and the posterior pharynx. The epiglottis is not visualized. Neck supple, with several 1 cm nodes.  
Heart regular, no murmurs or gallops. Lungs with inspiratory stridor at rest. Aeration is good. No wheezes or rales. Abdomen negative. Normal genitalia. Color, perfusion, pulses and turgor are good. Strength and movement good. Sensation intact. He is able to ambulate.

Membranous Croup  
Volume 5, Case 20  Loren G. Yamamoto, MD, MPH  
Because of his lack of DPT immunization, diphtheria is suspected. He is hospitalized in an intensive care unit. He is treated with IV penicillin and diphtheria anti-toxin. A cardiac work-up is negative. During hospitalization, his stridor worsens and he requires intubation. During intubation, his larynx and epiglottis are noted to be edematous. Following intubation, his condition improves. He is eventually extubated and is subsequently discharged in good condition. Throat cultures for diphtheria are positive.

Teaching points  
- Although diphtheria immunization exists, some are never immunized:  
  ◆ vaccines given at specific ages  
  ◆ immigration  
  ◆ religion  
  ◆ other objections  
- Diphtheria resembles epiglottitis.

Hemoptysis Identifies An Esophageal Coin  
Volume 2, Case 1  Loren G. Yamamoto, MD, MPH  
This is a two-year old Chinese female with a chief complaint of coughing up some blood. There has been a one-month history of coughing and wheezing. She has seen her pediatrician three times in the past month. The child has been treated with albuterol syrup and amoxicillin. Some improvement had been noted. She is currently taking amoxicillin-clavulanic acid since her symptoms did not resolve after 10 days of amoxicillin. Up until this time, the wheezing and coughing have been mild, but tonight, her parents were alarmed because she coughed up some blood for the first time.

Hemoptysis Identifies An Esophageal Coin  
Volume 2, Case 1  Loren G. Yamamoto, MD, MPH  
Her parents are concerned about tuberculosis since an elderly relative suffered from this in Hong Kong. Prior to this, there was no history of wheezing or prolonged respiratory illness. There is no family history of wheezing.  
Examination: VS T37.7R, P130, R44, BP 95/60, oxygen saturation in room air 99%. She is active and alert in no acute distress. She does not appear toxic or irritable.
Eyes normal. Ears normal. Oral mucosa moist. Normal pharynx and tonsils. No hemorrhaging in the mouth noted. Neck supple. No adenopathy. Heart regular without murmurs. Lungs good aeration, mild wheezing. No retractions. She is coughing occasionally, but the cough does not sound moist. She does not expectorate any secretions while being examined. Abdomen benign. Good color and perfusion. No bruising or petechiae noted.

The child is taken to the operating room where the coin is removed under general anesthesia. At the time of removal, some hemorrhaging within the esophagus is noted. This was followed by extensive hemorrhaging and hypovolemic shock refractory to fluid and blood resuscitation. Before a vascular team could be called in, the child arrested and could not be resuscitated. Post-mortem studies identified an esophageal perforation overlying an ulcerating aortic perforation.

Teaching points
- Objects in the esophagus can obstruct the trachea, causing coughing, wheezing, stridor, etc.
- Objects in esophagus can also cause vascular injury and hemorrhage.