

# PBL – Clinical Cases – RS



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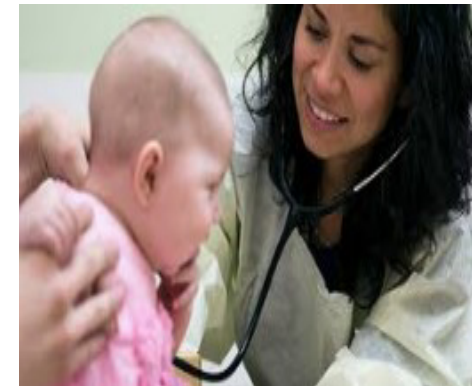




# Pediatric Respiratory cases 1



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- Respiratory diseases or respiratory pathology is subdivided into 5 categories:
  1. **Acquired diseases:** when an **infective agent or aspiration** of a toxin invade our body. (Note the source of aspiration is gastric content)
  2. **Congenital diseases:** when the disease is present **since birth.** (lung fistulas and lung anomalies)
  3. **Hereditary diseases:** when the disease is related to **genetics**, and inherited from the parents (like Cystic fibrosis)
  4. **Lung neoplasms:** which is also subdivided into Malignant and benign and unfortunately lung cancer is the most common cancer in adults, however it's very rare among pediatrics, and among those rare cancers they are commonly arising from the mediastinum.
  5. **Connective tissue diseases:** the pathologies are related to unknown immunological reactions (Like SLE)
- In this lecture we will focus on the most common causes of lung pathology like infections and inflammatory diseases like **asthma**.
- Also. You have to know the respiratory tract pathologies are divided into URT (from the nose to the upper part of the trachea) diseases and LRT diseases, divided in location by the sternal notch.
- Most dangerous diseases among children in the URT is obstruction due to complete loss of main airway and suffocation, and it's subdivided into mechanical (foreign body) and inflammatory (by a viral agent that we will discuss later in the lecture)

- **Most common respiratory symptoms are:**
  1. **Cough (in both URTD & LRTD)**
  2. **Abnormal auscultation sound during Expiration (obstruction/ the sound is called a wheeze when it's an obstruction in the LRT and a strider when there's an obstruction in the URT) Inspiratory (restrictive)**
  3. **Dyspnea**
  4. **Nasal discharge**
  5. **Fever (in infection)**
  6. **Sore Throat.**
  7. **Chest pain (not seen always in pediatric)**
  8. **hemoptysis**
  9. **Coughing sputum.**



**Hx**

# Case 1

Mohammad ,

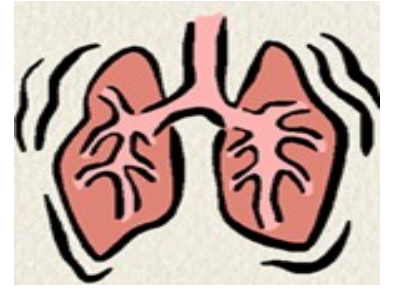
4month old infant ,presented with cough, wheeze for 3 days, low grade of fever .

Hx of URTI 2 days prior to onset of symptoms .

1 month – 12 months >> Means he's an infant

- Cough indicates a respiratory illness, wheezes indicates an obstruction in the lower respiratory tract.
- A history of the URTI could indicate that the infection has spread to the LRT.,
- Since he's still an infant congenital diseases can be part of the DDx.
- From those hints we conclude that it's an infection that has invaded both the URT & LRT but we mainly care about the lower cause its symptoms are more sever, but now we need to investigate what is the infective agent to choose the proper treatment.
- The absence of high fever, the nasal symptoms indicate a viral infection. But the question here is how does a virus cause wheezing??
- Our hypothesis is that the virus has invaded the smallest airways (bronchioles), and the name of the condition is **Acute Viral Bronchiolitis**.

# Question 1



1-What are important questions you should ask in history?

Assess the severity of the symptoms in the case of an infant you ask the mom how did he sleep the day before and did he eat well ?

- Mention anything relevant in :H/OI,ROS,Past medical ,Birth ,Social , Vaccination, drug hx

**DO NOT PANIC:** The next 2 slides are some notes about history taking from the Dr's Slides, she said you can just read them or IGNORE them..

# Q 1: Answer and discussion

1-Hx of Present Illness : should include:

1- Assessing cough :

-Onset : sudden, gradual in this child it was progressing over the past 3 days ,

-Course progression : it was intermittent ,getting worse over past 24 hours

-Nature :Dry or wet: often dry but sound of secretions in his nose and throat noted sometimes .

-Severity : cough got worse over past 24 hours causing sleep disturbances , interrupted feeds , irritability and associated with post- tussive vomiting two times

-Relieving and aggravating factors : no obvious relieving or aggravating factors but often worse after feeds or when asleep .

2-Associated Symptoms :

-URTI : nasal blocked and snoring sounds preceded onset of cough and still active ,with sneezing.

-Wheeze : mother noted rattling (wheezing )sound as he takes his breath out during last 2 d

-Apnea : No apnea noted ,nor he stopped breathing

-SOB : shortness of breath noted after a bout of cough especially during the past 24 hours ,rapid breathing noted

-Fever : child felt warm to touch since two days ,not documented

-Cyanosis : not noted

3-Hx of sick contact : his sibling had URTI 5 days ago

4-Activity – Feeding : baby was generally active and had good sucking but his cough and dyspnea interrupted his feed today and was less active than usual.

5-Other relevant :

No hx of choking while feeding , No hx of travel, No hx of diarrhea , No Hx of rash, No Previous similar

# Q 1: Answer and discussion

2- ROS :

GI : no diarrhea , has post tussive vomiting , usually good appetite , adding weight , No GERD symptoms

Heart : No cyanosis , no lethargy or hypoactivity or sweating or pallor after feeds

CNS : no abnormal movements , baby alert no change in LOC

ENT : URT sx noted

Skin : no atopic dermatitis or eczema

3-Birth : born term at JUH , vaginal delivery , Birth weight 3.4 kg , No NICU admission

4-Anti natal , Post natal : -----no jaundice , was well until this present illness

5-Vaccination : received BCG , and first dose of DTaP , Hib , HBV , IPV , Rota no complications post vaccine

6-Social : father smoker , education and career for parent :-----

7-Nutrition : breast fed for first 2 months only then shifted to Formula , Baylac:fortified with iron , usually receives 120 ml every 3 hours until this illness

Supplementation : Vitamin D 1 drop a day : 400 IU

8- Growth : should plot on chart Head cx, weight, length

9-Development : acceptable ( should ask questions relevant to his age )

10-Family hx : should draw the pedigree ( child has one older sister 3 years of age, parents not relatives)

No family hx of asthma , atopy

11- Drug hx : no medications used



# Question 2

-What are important findings you should look for in Physical Examination?

Please observe the findings in video

below [https://www.youtube.com/watch?v=QNrsjDzD0\\_QM-](https://www.youtube.com/watch?v=QNrsjDzD0_QM-)

Examination :

Should comment on :

- **-General look** , vital signs ,LOC (alert ,agitation if hypoxic , late : CO<sub>2</sub> narcosis causes drowsiness and narcosis) any supplementation with O<sub>2</sub>
- **-Audible breathing sound if present** (wheeze /stridor /whoop)
- **-SPO<sub>2</sub> % (If less than 92, then admit the infant to the hospital)**
- **-Comment on Signs of respiratory distress if present** : tachypnea , grunting ,flaring of nostrils ,retractions (supra sternal ,intercostal and sub costal ) head bobbing can be noted in younger infants with bad respiratory distress
- **-Comment on increased work of breathing** , use of accessory muscles
- -Signs of dehydration : from decreased oral intake
- -Fingers : for clubbing (older children ) ,cyanosis
- -ENT exam
- -Skin : for eczema ,rash
- -Chest exam : complete exam :inspection, palpation , auscultation ,percussion ,
- -Relevant organs :
- Heart for CHF or CHD
- Liver for hepatomegaly

In the Video :

- **This child looks in respiratory distress has : increase work of breathing ,tachypnea ,subcostal intercostal retractions , audible expiratory wheeze**
- **Although he is alert , interested in surroundings ( not septic ,or hemodynamically unstable)**

# Question 3

➤ What important investigations should be performed for this child?

- Priority always in ER or clinic to stabilize the child before doing investigations .
- If not in respiratory distress ,if well no high grade fever , usually this condition is diagnosed clinically with no investigations needed .
- However ,a sick child ,with high grade fever and /or respiratory distress will need the following :
- CXR : to confirm dx ,exclude complications or other DDx
- CBC : for WBC ,Diff if febrile
- KFT ,electrolytes : if persistent vomiting ,or dehydrated on Examination from decreased feeding
- CRP : if sepsis or pneumonia suspected
- Blood culture :if sepsis or pneumonia suspected
- Nasal swab or nasopharyngeal aspirate : for viral detection ,if admitted . (RSV ,Influenza,parainfl,adeno,rhino ,HMNP ,

# Q 4 :what is your interpretation ?



- Here the X-Ray show almost normal findings which rule out pneumonia.
- CXR shows hyperinflation (there's trapping of air) with increase broncho vascular markings and bronchial inflammatory changes. We can assess the hyperventilation by counting the ribs the more ribs the more severe hyperventilation.
- more than 6 anterior ribs or 8 posterior ribs.. Hyperinflation
- Normally the right dome of diaphragm higher than the left (because of the liver), in hyperinflation the 2 domes of diaphragm are parallel.
- in general the X-ray helps a lot to rule out most of the DDx.

# What is your DDX likely diagnosis

- Acute viral bronchiolitis
- Viral bronchopneumonia
- Bacterial pneumonia
- Reactive airway disease
- Aspiration Pneumonia

## DDX:

- **Acute viral bronchiolitis** ( hx of URTI ,presence of wheeze , non-toxic )/ **this disease is a disease of infants, very common among them.**
- **Viral bronchopneumonia** ( usually wheeze are not prominent)
- **Bacterial pneumonia** ( why not : no high grade fever ,no severe hypoactivity or decreased sucking)
- **Reactive airway disease** (early **asthma**) why not ; **young age (should be at least 5 years old)** ,no previous episodes ,no atopy or family history
- **Aspiration pneumonia** ( no hx of choking ,no neuromuscular problems )
- **Congestive Heart failure** ( no symptoms of CHF ,adding weight , no hepatomegaly on P/E or CXR)

Likely diagnosis ; acute viral bronchiolitis

# What is your diagnosis?

**Acute viral bronchiolitis**



# ACUTE Viral BRONCHIOLITIS

- Common disease of the lower respiratory tract in infants.  
usually most cases < 2 years.
- Inflammatory obstruction of small airways.
- Severe disease more in infants 1-3 months of age.
- Seasonal peak in winter-early spring.
- **Most common virus; RSV**

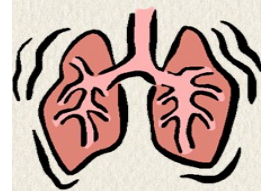
# Treatment

- Primarily supportive
- Hospitalization ,for children with respiratory distress
- If hypoxic ( cool humidified oxygen).child sitting with head and chest elevated 30 degree angle with neck extended .
- Hydration : IVF ,NG feeds
- Symptomatic Tx : nebulization with(**mucoytic nebulizar**)Normal saline/Hypertonic saline (**By osmosis it will drive more water to the airways and will make the sputum less thick**)
- **If worsening respiratory distress**,persistent hypoxemia ;consider positive pressure ventilation CPAP (**Noninvasive**)
- For pending respiratory failure, respiratory failure with acidosis m apnea : consider intubation (**invasive**) and assisted ventilation

**Extra info>>** A nebulizer is a small machine that turns liquid medicine into a mist.



# Case 2



## Hx :

- 6 years old, previously healthy , presented to clinic with **fever** for 5 days, reaching **39.5 C**. Associated with cough intermittent.
- His mother noted **rapid breathing** and dyspnea worsening with time .Had hx of URTI 1 week ago.
- His appetite and activity decreased, and Vomited twice

High grade fever for more than 3 days indicates a bacterial infection, also dyspnea indicates a LRTI, these symptoms all go with pneumonia.  
Signs of respiratory distress: Tachypnea, shortness of breath and cyanosis.



### Work of breathing

## P/E :

- General : looks unwell, has increased WOB .(RR 40 b/m, PR 110 temp 39).
- subcostal and intercostal retractions .

## Chest :

- Auscultation : decreased air entry on Rt lower side, Bronchial breathing ,increased tactile vocal fremitus ,few inspiratory crackles Rt side.
- Percussion : dull to percussion

Resonant sounds heard over normal lung tissue, while dullness replaces resonance when fluid or solid tissue replaces air-containing lung tissues.

**Tactile vocal fremitus:** you put your hand to the chest and you ask the patient to say words, if it normal lung the conduction of sound is poor, however if its consolidated lung the tactile vocal fremitus will be increased



Subcostal Retraction SCR

# What are Clinical Investigations needed ?

Hint: the answer is in the next slide.

# CXR

CBC ,Blood culture ,inflammatory  
markers ,...etc



Here we can see that lung X-ray is not black so infiltrated by pneumonia, we call the whitish appearance (obfuscation) in the lower and middle part and it's a homogenous infiltration. Here we can see the costophrenic angle filled by a fluid which is called pleural effusion if you want to confirm the effusion you do an Ultrasound( in children we prefer use it ) or CT scan.

# What is your diagnosis?

**Pneumonia**

specific : ( lobar ,bacterial)



# Pneumonia

## Definition

Inflammation of the parenchyma of the lungs.  
(alveoli and terminal airspaces in response to invasion by an infectious agent introduced into the lungs through hematogenous spread or inhalation )

## Causes :

Infectious ,mostly (Strept Pneumonia ,staph aureus ,Mycoplasma p. Noninfectious :  
aspiration of food or gastric juice  
hypersensitivity reactions foreign bodies  
Hydrocarbons and lipoid substances radiation induced  
pneumonitis

Notes from the Doctor,  
She said we don't focus on  
diagnostic test for infective agents  
cause it's not cost effective  
however if it's a sever condition  
you have to do those diagnostic  
test like PCR or blood cultures or  
AB titers.

# COMPLICATIONS

- **Pleural effusion**
- **Direct invasion: Empyema ( absesse in the lungs which is one of the worst complications of pneumonia) ,pericarditis**
- **Hematogenous spread: Meningitis ,supporative arthritis and osteomyelitis (rare ).**

# Complicated pneumonia

Pleural effusion



Necrotizing pneumonia :  
cavitation



Usually caused by Staph.  
Aureus

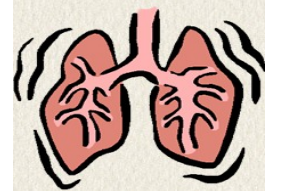


# TREATMENT

- **Bacterial pneumonia** ;mild ,out-patient Mx :oral amoxicillin ,cefuroxime, amoxicillin/clav.
- **School-aged children** (*Mycoplasma pneumoniae*) macrolide like azithromycin.
- **Sick ,hospitalised patients** ;parenteral cefuroxime .if staph. aureus suspected (pneumatocele ,empyema) clindamycin or vancomycin .
- **Viral pneumonia** ,if mild no respiratory distress no need for AB therapy , 30% of cases have co-existing bacterial infx. Clinical status to decide use of AB for superimposed bacterial infx,

The doctor didn't say anything about this slide (she's not gonna ask about a pharma question I guess

# Case 3



- **Hx:**
- 12 year old child ,presented to the clinic with hx of cough for 7 days duration .Cough (dry ,**worse at night** and post exercise ,ass with whistling sound) ,symptoms started following a recent URTI ).it worsened over last 2 days with dyspnea at times.
- Past Hx : **previous episodes** occurring mostly during winter , has hay fever ,**had eczema (which is an allergic condition)** during early childhood. Positive family hx of similar condition.

- You have to differentiate between dry cough and wet cough, by which we mean if the cough is related to sputum formation or not, and if the patient has dry cough (no sputum formation) that means he probably doesn't have an infection or that he has a viral infection, other cause might be Asthma.
- however wet cough or productive cough is related to infections specially bacterial infection.
- All symptoms indicates Asthma is and reactive allergic reaction related to Allergens like tobacco smoke or cats or dogs, pollens (like olives).
- The patient of asthma usually present with other allergic conditions.

## P/E :

- Afebrile ,RR 35 (20-30) , Pulse rate 100 .
- SPO2 89%.
- ENT :Hyperemic throat.
- Intercostal and subcostal retractions .
- **Chest :**
- **diffuse Expiratory wheeze**,prolonged expiratory phase with decreased air entry. ( **when the condition is very sever the patient can develop biphasic sounds which means both expiratory and inspiratory sounds**)
- CVS :normal ,liver not palpable , hands : no fingera clubbing .

# Question 1

1-What are important questions you should ask in history ?

Mention anything relevant in

:HOI,ROS,Past medical ,Birth ,Social , Vaccination, drug  
hx

You can check The doctor's notes on history taking in the next slide.. It's not important for our level tho .

**General condition** :alert ,responsive ,can complete a sentence or not ,comment if on nebulizer or supplemented with O<sub>2</sub> therapy

**-Comment if audible wheeze or stridor noted** -Observe for signs of respiratory distress (tachypnea,tachycardia ,cyanosis,retractions ,use of accessory muscles ,flaring of nostrils, increased work of breathing .....

**-LOC** : alert (agitated irritable which occurs with Hypoxemia (occurs early in an attack ) or drowsy (narcois : CO<sub>2</sub> retention ,late severe stage of distress)

**-Vital signs and SPO<sub>2</sub>** : RR ,PR,Temp ,Blood pressure (pulsus paraparadoxi-pulm SPO<sub>2</sub>% his sat is 87% Room air (normal > 93%)

**-Skin** : eczema-Fingers : no clubbing-comment on growth parameters or dysmorphism--ENT : positive PND (post nasal drip ) hyperemic throat ,clear tympanic membranes -Chest :-Inspection ,Palpation ,percussion ,auscultation : findings :Child has some signs of respiratory distress Hyperresonant chest Bilateral diffuse expiratory wheeze Diminished air entry Prolonged expiratory phase Relevant Organs :

**-Liver** :Palpable 1 finger below costal margin But liver span performed by percussion found to be normal Why is this ? Due to hyper inflation of lungs which pushes the liver downward -Hear :Comment on S<sub>1</sub> S<sub>2</sub> no S<sub>3</sub>, no gallop, no murmur... Why important ( e.g 1- Left sided CHF can cause respiratory symptoms (pulmonary edema), 2-chronic respiratory illness (fibrosis ,bronchiectasis ) can cause Rt sided heart failure :cor -pulmonale)

# Question 2

-What are important findings you should look for in Physical Examination ?

**Here we listen to both expiratory and inspiratory sounds but in asthmatic patients expiratory sound is more prolonged cause it's an obstruction disease that cause air trapping and hyperinflation.**

<https://www.bing.com/videos/search?q=video+physical+examination+for+a+child+with+a+sthma&&view=detail&mid=1716B617D91DA36B8E271716B617D91DA36B8E27&rsvmid=25C76EB9BD41A07D6EE925C76EB9BD41A07D6EE9&FORM=VDRVRV>

# The following are signs found in this child can you comment?



Those signs are not symptoms of asthma they are signs associated with asthma which means they are usually present in asthmatic patients but not cause by it.

## Signs :

- 1-ENT : signs of allergic rhinitis ,common in asthma (allergy)  
Nasal polyposis : rare in children .usually present in adults with asthma triad (aspirin sensitivity,asthma,nasal polyposis)But rare in younger children with asthma, if present at an early age ;suspect CF ,ciliary dysfunction.
- 2-sniffing signs for children with allergic rhinitis
- 3-Allergic shiners : dark halos around the eyes for allergic rhinitis (+/\_ allergic conjunctivitis)
- 4- Eczema on extensor surfaces

# Q 3 : what is you DDX

What is your DDX

What is the most likely Dx Explain ,discuss

*See notes ,discussion below*

When we want to suggest DDx we think of a disease that is related to obstruction in the lower respiratory tract, so might by an obstruction by a forgein body or asthma.



# DDX

1. Bronchial asthma
2. Cystic Fibrosis
3. Primary ciliary dyskinesia
4. GERD
5. Foreign body aspiration

Cystic fibrosis: wet cough  
Asthma: dry cough

Most likely dx is bronchial asthma, but why?

Typical signs and symptoms of: repeated previous episodes, seasonal variation, presence of atopy and family history, spirometry, chest xray findings.

Less likely DDX:

**1-Cystic Fibrosis**: it's not CF because there's no GI manifestations, child growing well, normal chest film, no clubbing and so on (all these symptoms related to asthma)

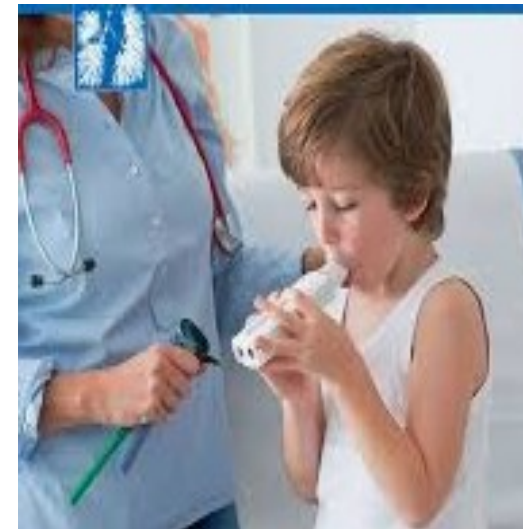
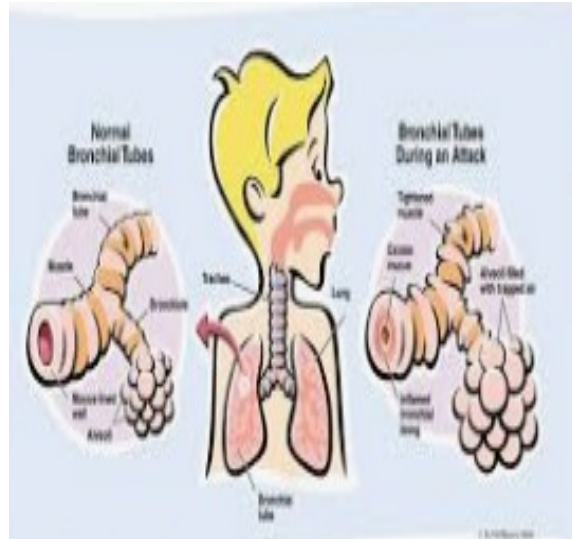
**2-Primary ciliary dyskinesia**: (A disease similar to Cystic fibrosis but the problem is in the cilia) present with nasal polyposis (not present in this child), recurrent draining ears with tubes in place, may have dextrocardia, clubbing, bronchiectasis.

**3-GERD**: No GI symptoms

**4-FB aspiration**: hx not suggestive as no choking, wheeze and hyperinflation often localized, though not necessary

# What is your diagnosis ?

## Bronchial Asthma



# Why Asthma

Typical signs and symptoms, repeated previous episodes ,  
seasonal variation, presence of atopy and family history  
spiromerty ,chest xray findings...etc

## Question 3

What important investigation should be performed for this child ?

**The answer is  
X-ray**

# CXR

Usually non is needed , to review old

- chart and previous imaging if available .

If child in severe distress, suspect

- complication or other DDx needs to be excluded .

# This is the child's CXR ,what is your interpretation ?



## Signs of Hyperinflation:

1. More than 6 and 8 ribs ant and post respectively
2. Flattening of diaphragm
3. Both domes are parallel to each other
4. right is pushed downward by hyper inflated lungs
5. Narrow mediastinum
6. Increased lucency of lung fields

# SPT to common inhaled allergens



Asthma is diagnosed clinically or physically but sometimes we do test that help us identify the allergens that trigger asthmatic attacks: We do those 2 either through the skin or through the blood.

- SPT (skin prick test) positive when a weal is more than 3 – 4 mm
- Anti histamine medications should be stopped 5 days prior to test



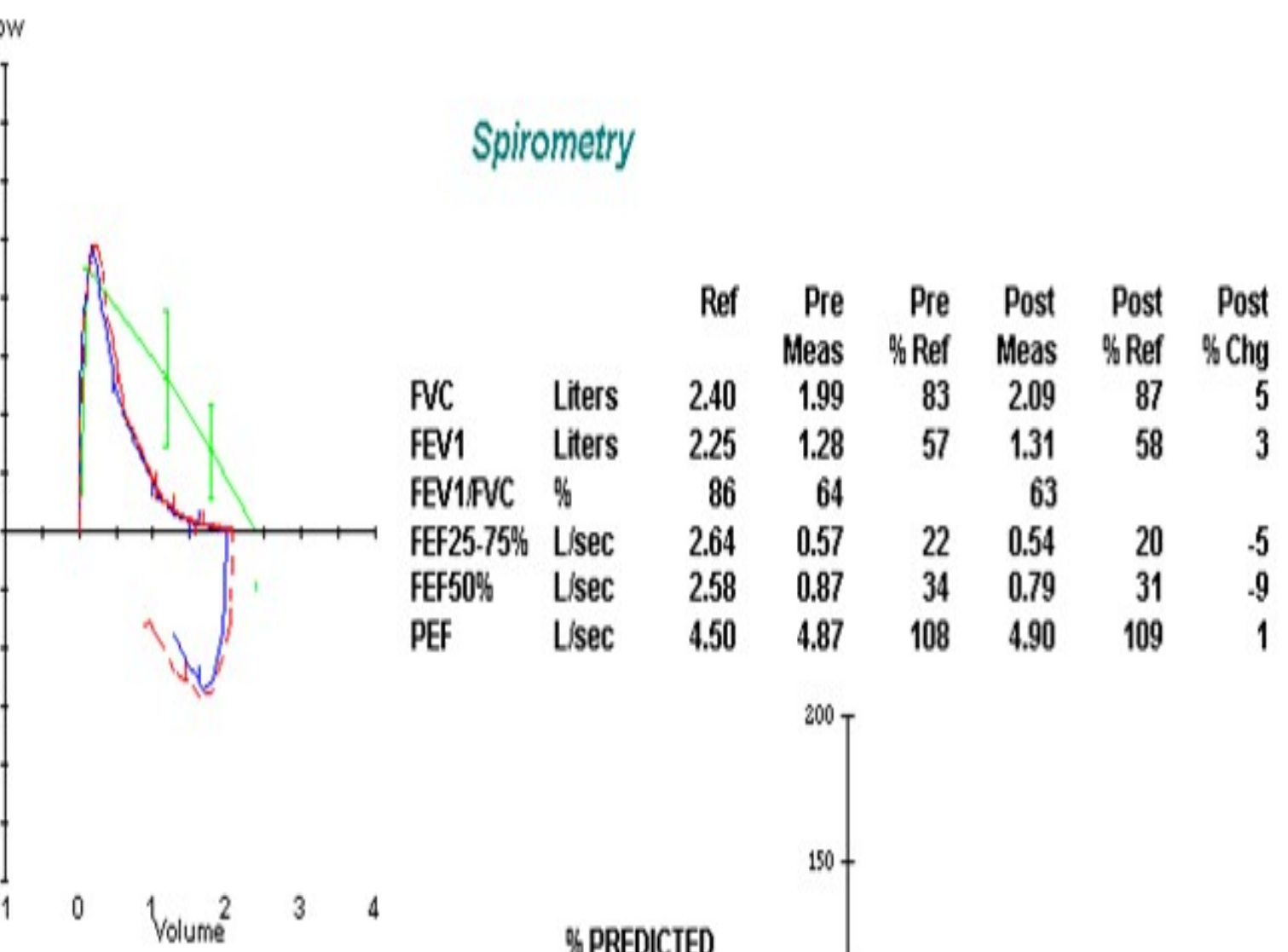
# Spirometry

Spirometer is used to diagnose lung disease and one of them is Asthma, and remember from physiology that obstruction disease will have decreased FEV1 cause they have difficulty in letting the air out (expiration)





*This is a flow volume loop for this child ,what is your interpretation ?*



- Asthmatic patients have:**
- low FEV1 and consequently low FEV1/FVC.
  - normal FVC intra thoracic obstruction, with no response to ventolin

# Question 4

What treatment should this child receive ? Discuss

The treatment of asthma has 2 categories: Rescue treatment to treat the symptoms ( we supply him with oxygen and give him bronchodilators)  
Then you start to control the episodes ( controll medications) mentioned in details in slide 43

# Treatment

1-Acute settings :

O<sub>2</sub> 100 %for hypoxemia and respiratory distress

Rapid-acting beta<sub>2</sub>-agonists as needed for symptoms

Short course of systemic steroids Ipratropium Bromide  
nebulized

# Treatment

2-For control ,and prevention of future episodes :

- 1.ICS inhaled corticosteroids: first choice in children
- 2.LTRA leukotriene receptor antagonists
- 3.Combination LABA/ICS Long -acting b agonists
- 4.Cromolyn/Nedocromil
- 5.Methylxanthines:Theophylline
- 6.Sytemic steroids

When we stop steroids  
If we use it more than 10  
days, we have to  
gradually reduce the  
dose

# Methods of inhaled medications delivery options



**1-Metered dose inhaler and a spacer**( metered dose means the doses are measured very carefully and it's not particularly for children cause they won't forcefully inhale from the inhaler, and remember MDI is the name for the technique not the equipment // (**extra info :** **A metered-dose inhaler (MDI) is a device that delivers a specific amount of medication to the lungs, in the form of a short burst of aerosolized medicine that is usually self-administered by the patient via inhalation)**)

**2-Dry powder inhalers** // **extra info:** **A dry-powder inhaler (DPI) is a device that delivers medication to the lungs in the form of a dry powder.**

**3- Nebulizer machines**>> also called a spacer



THANK YOU

