

# **1st WAO Allied Health Session - Asthma: Dia**

## **Exacerbations**

**Ronald Dahl,**

Aarhus University Hospital,  
Denmark

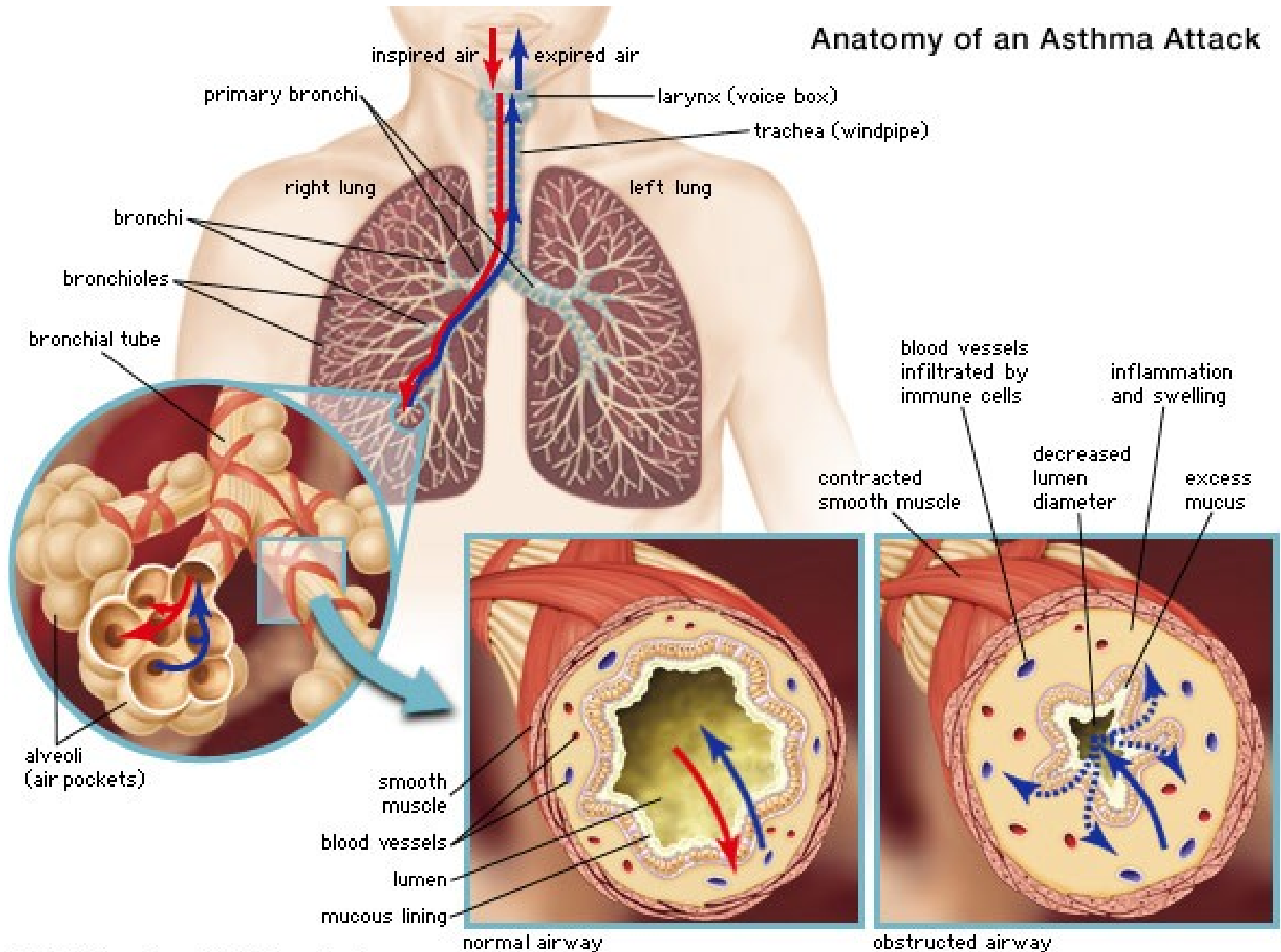
# **The health professional that care for patients with asthma exacerbation must be able to**

- Identify and diagnose asthma exacerbation
- Evaluate the severity of exacerbation
- Evaluate complications and co-morbidities
- Treat and monitor

# Agenda

- The abnormality in the airways, lungs and the clinical consequences
- Clinical evaluation and classification of the severity of asthma exacerbation
- Treatment and monitoring
- Prevention

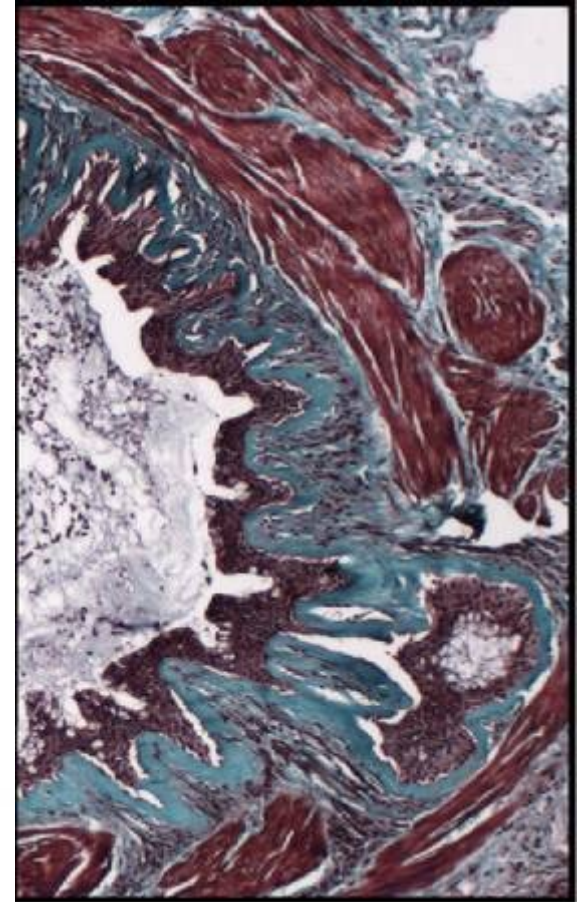
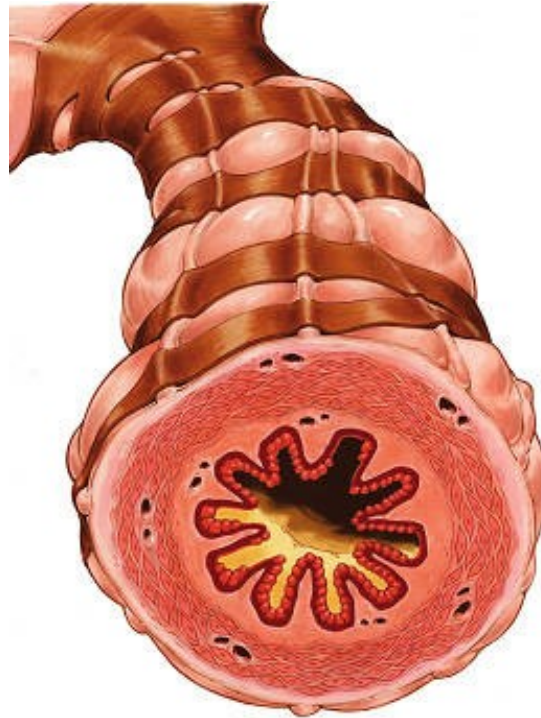
# Anatomy of an Asthma Attack



# Acute Severe Asthma Pathology

**Airway obstruction  
and symptoms by:**

- **Bronchoconstriction**
- **Mucus plugs**
- **Mucosal edema**
- **Inflammatory cell  
infiltration/activation**



## **Features of an asthma attack**

Appear rather sudden  
After exposure to an irritant  
Last from few min to few hours  
Respond immediately to bronchodilators  
No gradual worsening occur  
Seem not closely related to airway inflammation

## **Features of an asthma exacerbation**

Gradual progression over days  
Increasing symptoms and nocturnal asthma  
Respond partial or little to bronchodilators  
Related to increased airway inflammation  
Leads to hospital admission  
Responds to corticosteroids

# Exacerbation of bronchial asthma

Ventilation =  
Spirometric abnormalities

Respiration =  
Gas exchange abnormality

Central airway narrowing

Peripheral airway narrowing

**Bronchospasm**  
Airway wall inflammation

Bronchospasm  
**Airway wall inflammation**

# Exacerbation of bronchial asthma

Ventilation =  
Spirometric abnormalities

Respiration =  
Gas exchange abnormality

Central airway narrowing

Peripheral airway narrowing

**Bronchospasm**  
Airway wall inflammation

Bronchospasm  
**Airway wall inflammation**

**Treatments must be directed towards these two components**

**Smooth muscle spasm**

**Inflammation, edema, plugs**



# Pathology of Asthma: Ventilation Defects

**Normal**

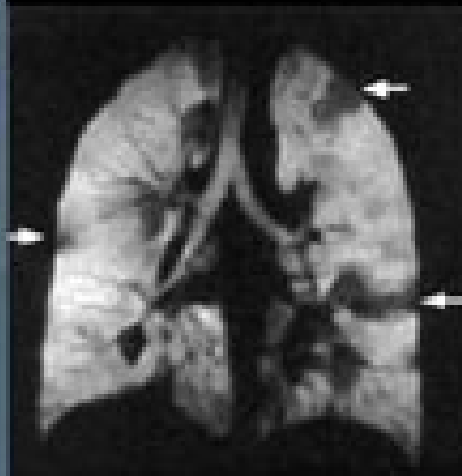


**Mild**

forced expiratory  
volume at 1 second  
(FEV<sub>1</sub>)  
132% predicted

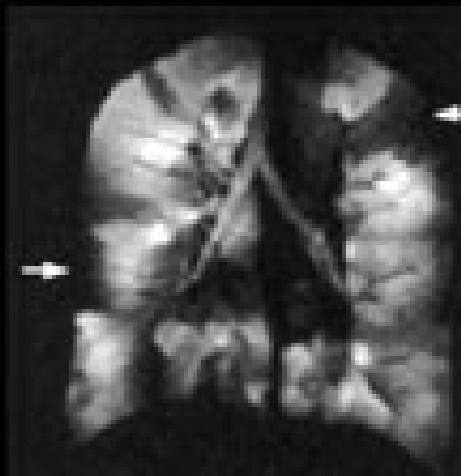


**Moderate**  
FEV<sub>1</sub>  
83% predicted

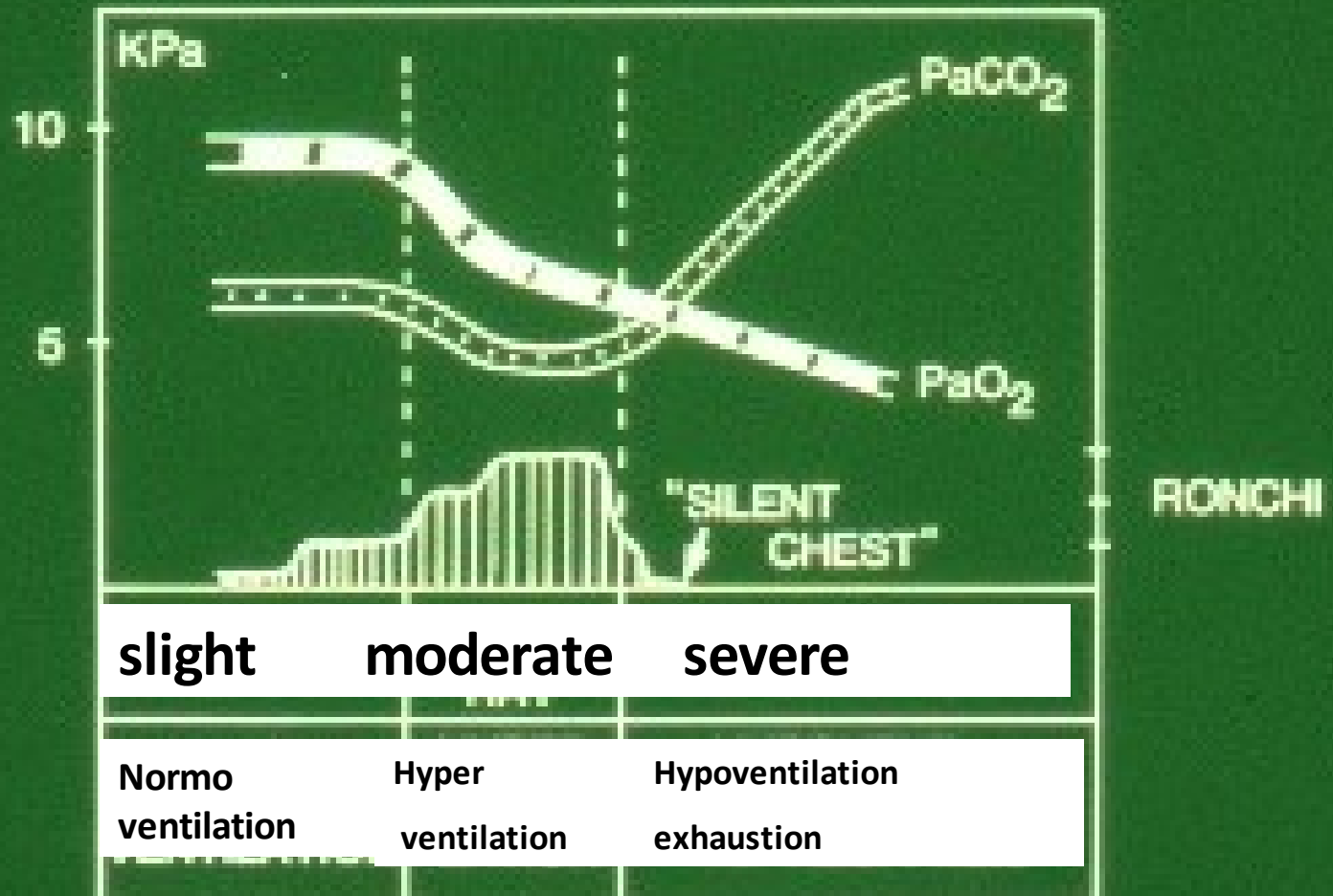


**Severe**

FEV<sub>1</sub>  
34% predicted

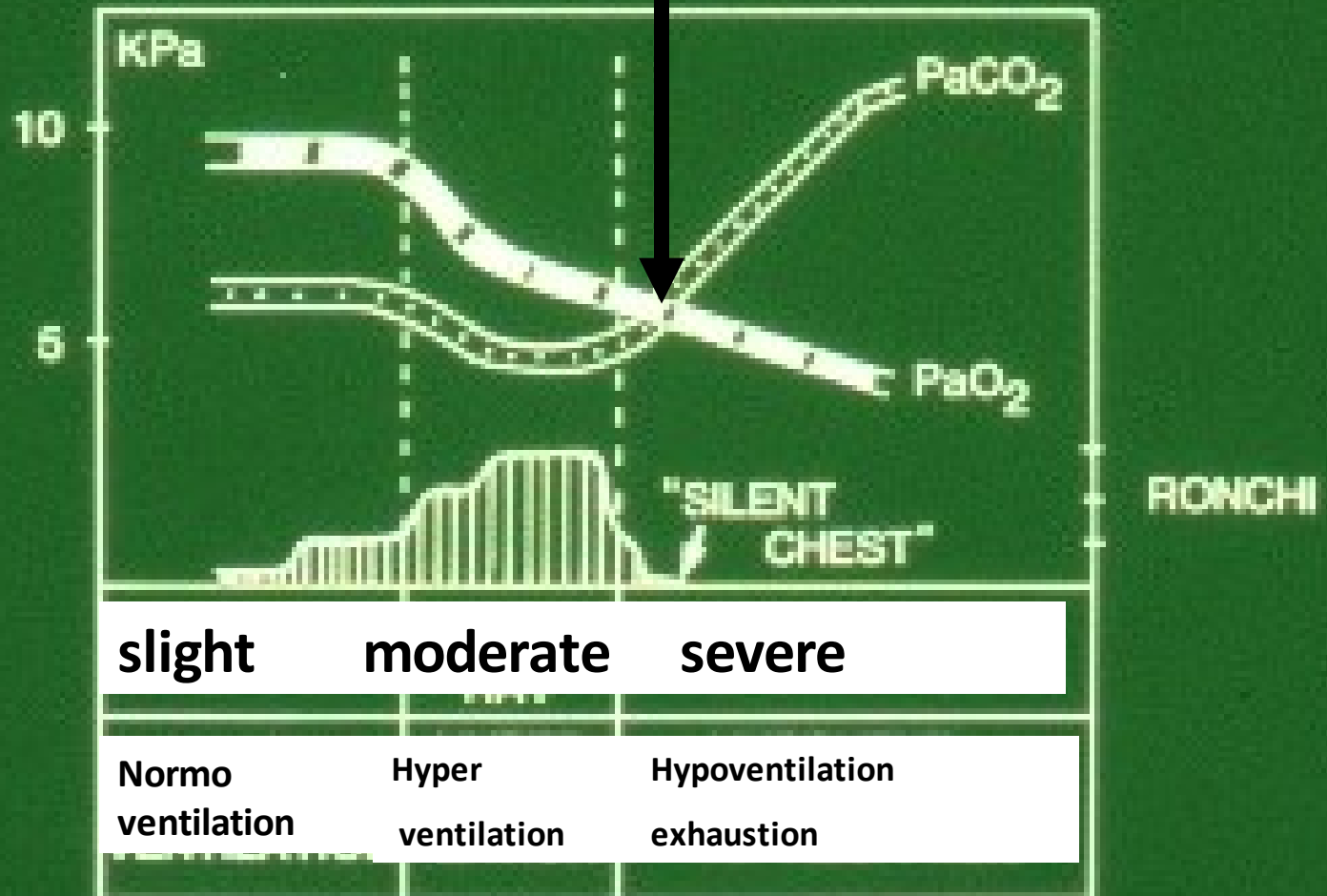


# Acute severe asthma monitoration



# Acute severe asthma monitoration

the cross-road of death



# Acute severe asthma monitoration

Clinical condition

PEF or  $FEV_1$

$P_aO_2$  and  $P_aCO_2$

<u>Asthma severity stage</u>	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4-5</u>
Respiratory rate	12	15	18	19	25
Pulse rate	89	103	111	115	127
Minute ventilation	11	12	14	13	16
PEF	327	237	124	113	97-219

# Acute severe asthma

## klinical evaluation

Respiratory rate: (number/min)

Speaking: short sentences, single word

Use of auxilary respiratory muscles

Position: prefer sitting, can lay down?

Airways obstruction: ronchi, silent chest (PEF)

Respiration: cyanoses, (SaO<sub>2</sub>, a-blood gasses)

General evaluation: degree of normal activities,  
pulse frequency

# Clinical staging of severity of acute asthma exacerbation

stage 0

Unaffected

Few ronchi

# Clinical staging of severity of acute asthma exacerbation

## stage 1

Breathlessness but unaffected physical activities

Can lie down

Ronchi during expiration



# Clinical staging of severity of acute asthma exacerbation

## stage 2

Some restriction in physical activity

Prefer to sit

Use of auxiliary resp. muscles (neck)

Ronchi during in- and expiration

# Clinical staging of severity of acute asthma exacerbation

## stage 3

Severe restriction in physical performance

Prefer not to lie down

Conversational dyspnoea

Use of auxiliary resp. muscles (neck, abdomen)

# Clinical staging of severity of acute asthma exacerbation

## stage 4

Sit quiet – bent forward

Answer with single word

Mental alert and orientated

Use of auxiliary resp. muscles

(neck, abdomen, arms)

Decreasing ronchi

# Clinical staging of severity of acute asthma exacerbation

## stage 5

Affected consciousness

Fast, superficial respiration

Silent chest

# Near fatal asthma acute severe asthma

- Respiratory arrest or
- PaCO<sub>2</sub> above 6.7 kPa and/or
- Altered conscious state or
- Inability to speak

Campbell et al. ERJ 1994; 7:490-7

# Near fatal asthma acute severe asthma

- Pretreatment SaO<sub>2</sub> below 90%
- Normal or high PaCO<sub>2</sub> after therapy
- Persistent metabolic acidosis
- Severe obstruction that improve less than 30% or worsen after beta-2-agonist

Mc Fadden ER Jr. Lancet 1995;345:1515-20

# Near fatal asthma acute severe asthma

<b>Asthma severity (before attack)</b>	<b>Death cases%</b>	<b>Near fatal attacks cases%</b>
mild	5	7
moderate	22	28
severe	73	65

**All asthma severities are at risk**

Campbell et al. ERJ 1994; 7:490-7

# Acute severe asthma

## Monitoring

Clinical condition

PEF or  $FEV_1$

$P_aO_2$  and  $P_aCO_2$



# The responsible staff must be able to:

- Assess asthma severity

- Assess improvement and worsening

- Treat properly

- Guidance

# Measurements for evaluation of severity and evolution improvement – worsening?

**Ventilatory capacity -  
Movement of air**

**Respiratory capacity -  
gas exchange in alveoli**

Spirometry

FEV1 etc.

Arterial blood

PaO<sub>2</sub>

PaCO<sub>2</sub>

SaO<sub>2</sub>

# Measurements for evaluation of severity and evolution

## improvement – worsening?

Cardiac function and  
Circulation

Heart frequency

Blood pressure

EKG

Chest x-ray

Pneumothorax

Pneumonia

Left ventricle failure

# ACUTE ASTHMA – MONITORING CHART

Name: \_\_\_\_\_  
 Birth date: \_\_\_\_\_  
 Date: \_\_\_\_\_  
 Time first seen: \_\_\_\_\_

History: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Time	Pulse rate	Respiratory rate	Use of accessory muscles	PEF	Pulse oximetry (SaO2)	Cyanosis	Exhaustion	Oxygen flow	Treatment
_____			Neck Abdomen Arms					_____ l/m	Salbutamol/Terbutaline Dose: _____ <b>Delivery:</b> Nebuliser/Spacer <b>Oral steroid:</b> _____ <b>Inhaled steroid:</b> _____
_____			Neck Abdomen Arms					_____ l/m	Salbutamol/Terbutaline Dose: _____ <b>Delivery:</b> Nebuliser/Spacer <b>Oral steroid:</b> _____ <b>Inhaled steroid:</b> _____
_____			Neck Abdomen Arms					_____ l/m	Salbutamol/Terbutaline Dose: _____ <b>Delivery:</b> Nebuliser/Spacer <b>Oral steroid:</b> _____ <b>Inhaled steroid:</b> _____

# Acute severe asthma

Admission and close monitoring in hospital unit:

- Clinical stage 4
- PEF or  $FEV_1 < 30\%$  of personal best  
(if unknown  $< 30\%$  predicted)
- $P_aCO_2 > 6$  kPa
- $P_aO_2 < 8$  kPa
- Poor response to initial treatment

# Acute severe asthma

## differential diagnosis - complications

- Hyperventilation syndrome
- Vocal cord dysfunction
- Vaso-vagal reaction
- Anaphylactic reaction (urticaria, BP-pulse, etc)
- Aspiration - foreign body – pneumonia
- Pneumothorax
- Cardiac failure
- COPD exacerbation

# Acute severe asthma treatment

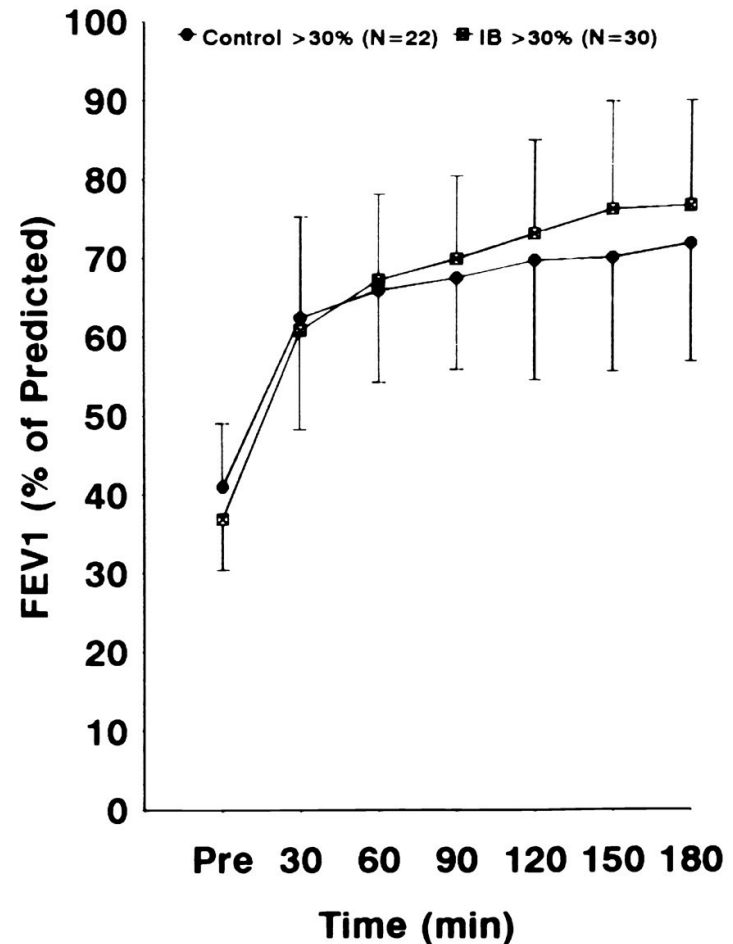
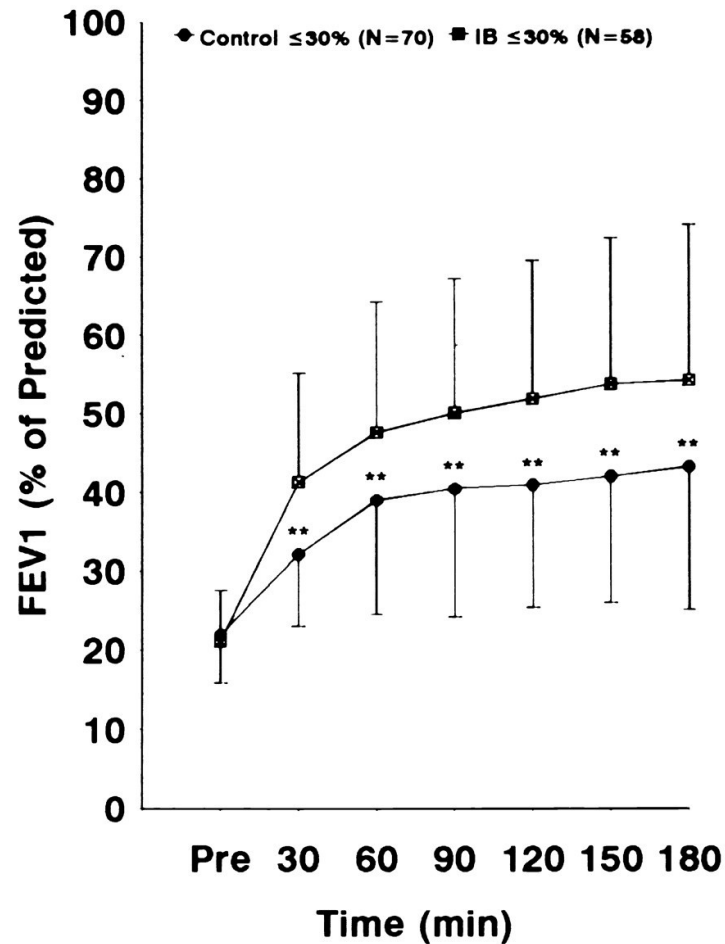
Oxygen

# Acute severe asthma treatment

Oxygen

Nebulised beta-2-agonist combined with anticholinergic, each 20 min first hour, then hourly as necessary





FEV<sub>1</sub> at presentation  
30% (*left panel*) or > 30% (*right panel*)

# Acute severe asthma treatment

Oxygen

Nebulised beta-2-agonist combined with anticholinergic  
each 20 min first hour, then hourly as necessary

Oral or i.v. corticosteroid

80 mg Methylprednisolon

repeat after 12 hours, following days usually

40 mg Methylprednisolon or equivalent

# Acute severe asthma treatment

Oxygen

nebulised beta-2-agonist combined with anticholinergic  
each 20 min first hour, then hourly as necessary

Oral or i.v. corticosteroid

80 mg Methylprednisolon

repeat after 12 hours, following days usually

40 mg Methylprednisolon or equivalent

Start inhaled high dose steroid as soon as possible

# Acute severe asthma treatment

Dangerous or at least without effect

Sedation

Mucolytic

Physiotherapy

Antihistamine

# Acute severe asthma treatment

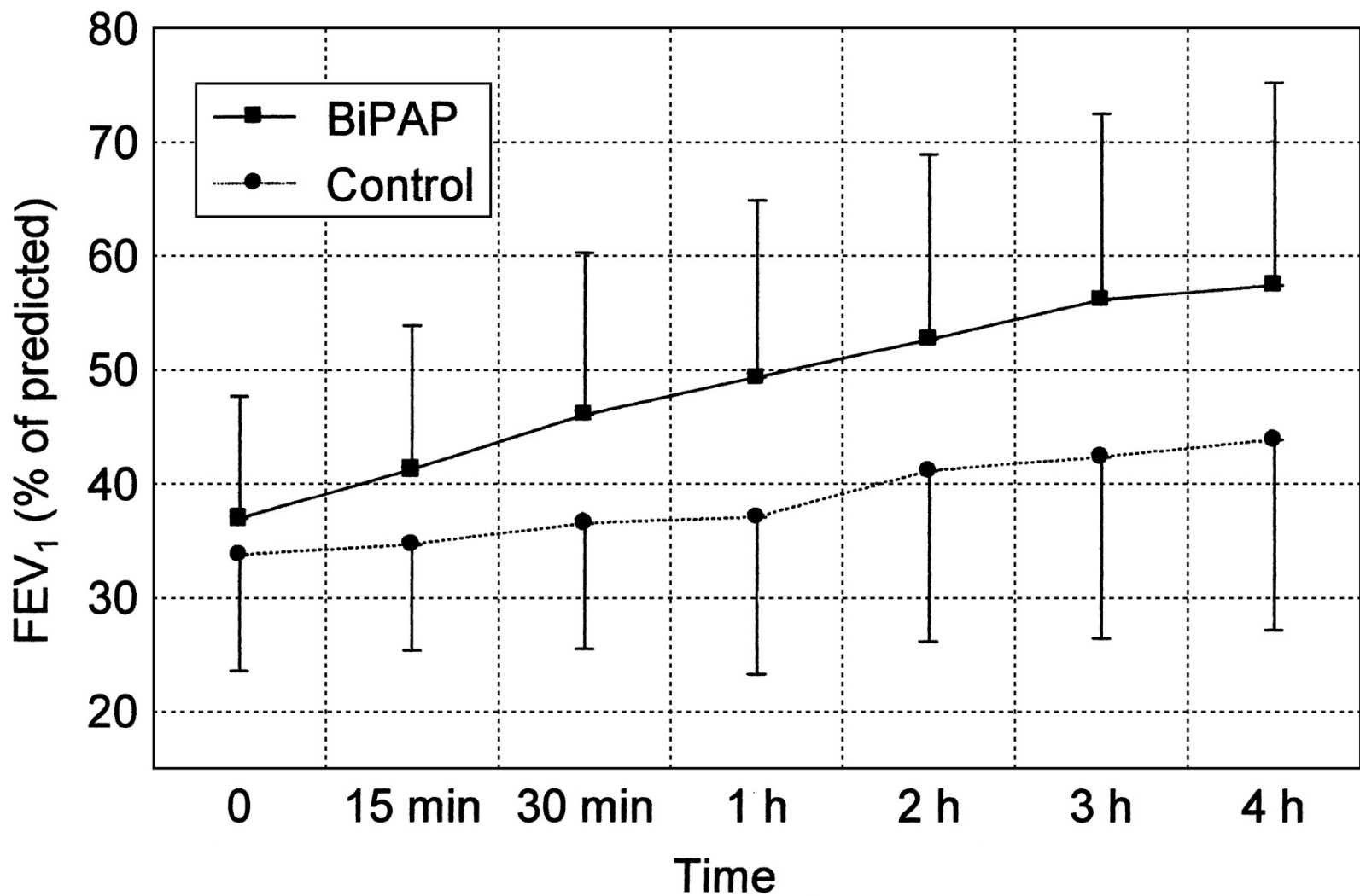
## Consider:

Infusion of  $\beta$ 2-agonist

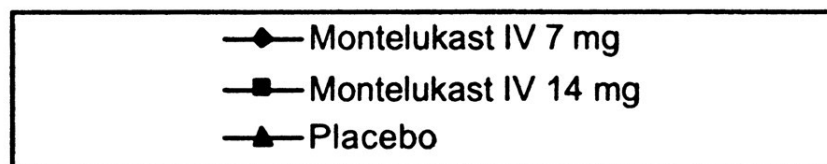
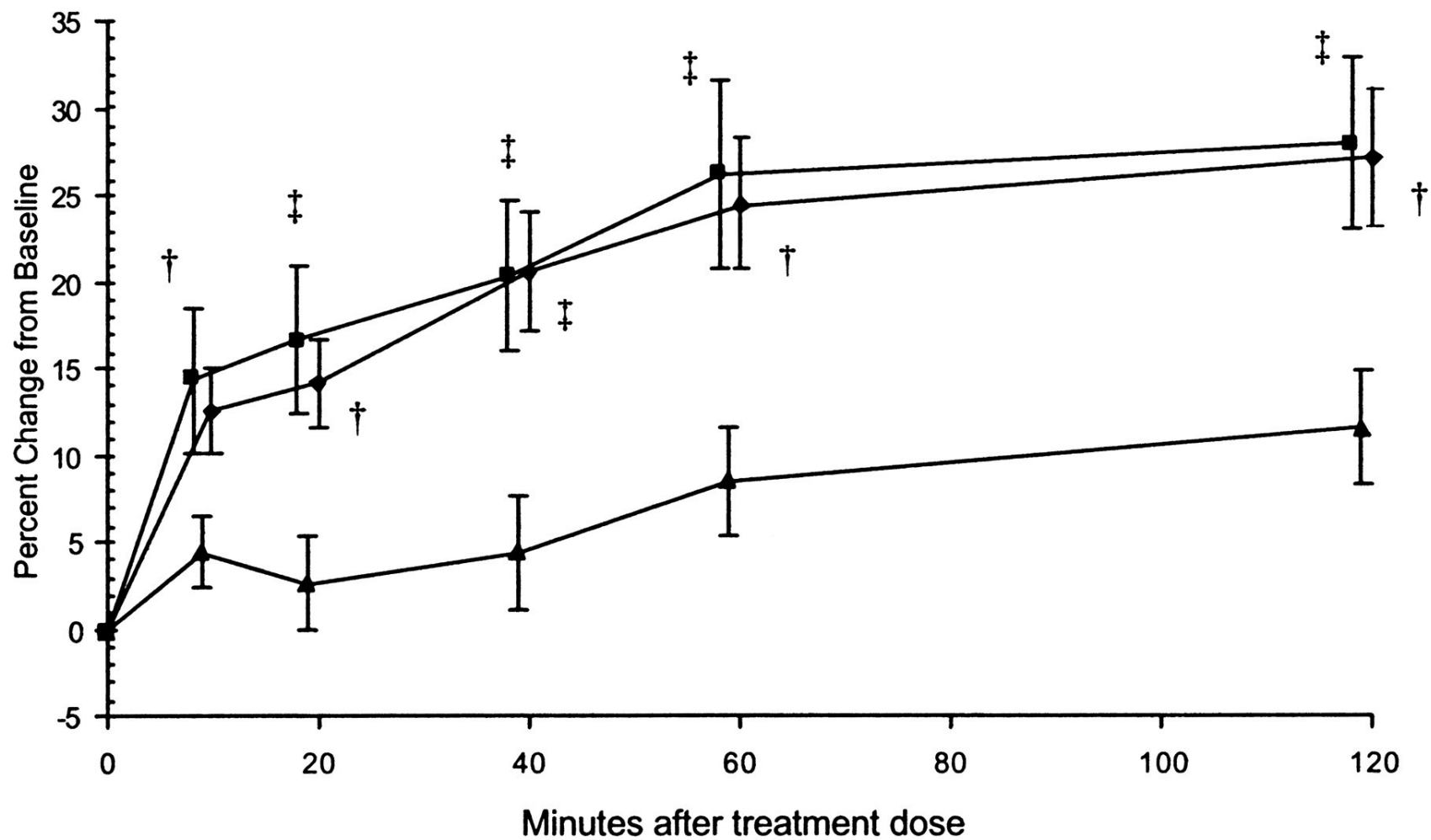
Infusion of theophylline

Antibiotic

Fluid

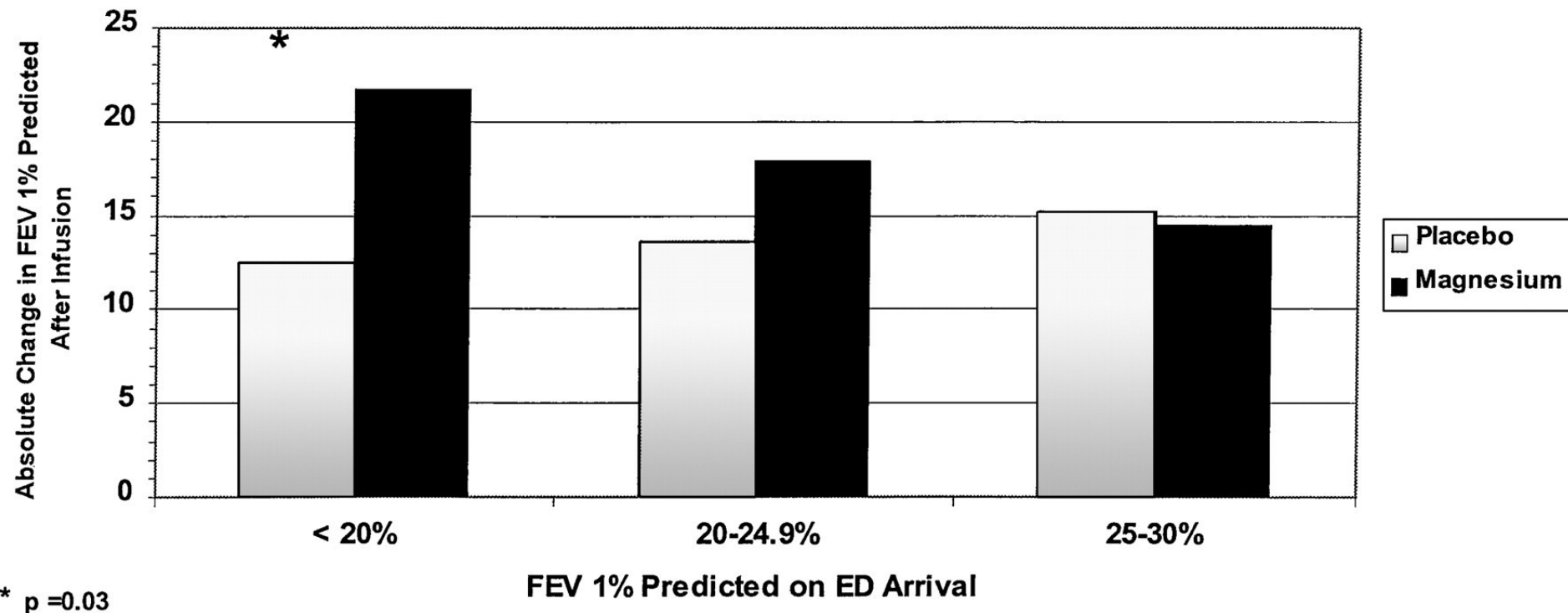


Change in FEV<sub>1</sub> in BPV group (BiPAP) and control group during 4 h



# Effect of Magnesium on Pulmonary Function

By Initial Illness Severity



Influence of illness severity on response to magnesium



# Acute severe asthma

- Treat the condition symptomatic
- Determine what caused the reaction

# Acute severe asthma

Determine what caused the reaction

- inhalant allergen
- food allergen
- drug reaction (ASA,vaccination,etc)
- infection
- worsening of a chronic condition  
compliance  
treatment need adjustment

# **The health professional that care for patients with asthma exacerbation must be able to**

- Identify and diagnose asthma exacerbation
- Evaluate the severity of exacerbation
- Evaluate complications and co-morbidities
- Treat and monitor

Thank you for your attention