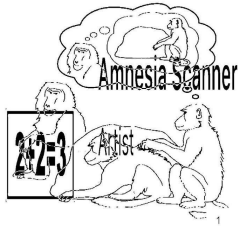
Session objectives

1. Identify differential diagnosis for shortness of breath.
2. Differentiate different phases of bronchial asthma.
3. Discuss briefly about bronchial asthma in adult.
4. Discuss briefly about bronchial asthma in children.
5. Enumerate and discuss the importance signs & symptoms.
6. Investigate appropriately a patient with bronchial asthma.
7. Advice initial management plan according to (SINA 2021).
8. Identify long term complications.



- A 22-year-old man presents to your office for assessment of a chronic cough. He has just moved to your city and will be attending the university there. He has moved into an apartment in the basement of a house.
- As soon as he moved in, he began to notice a chronic, nonproductive cough associated with shortness of breath. He has never had these symptoms before, and he has no known allergies. When he leaves for school for the day, the symptoms disappear. The symptoms are definitely worse at night.
- His landlady has three cats. He did not think he was allergic to cats, but now he thinks that might be the cause of the problem.

Chronic cough: >3 months

N RR: 12-16

- On examination, his respiratory rate is 16 breaths per minute and regular. He is in no distress at the present time. There are a few expiratory rhonchi heard in all lobes. His blood pressure is 120/70 mm Hg, and his pulse is 72 beats per minute and regular.

- What is the most likely diagnosis in this patient?

a. paroxysmal nocturnal cough syndrome

b. hyporesponsive airways disease

c. cough variant asthma

d. allergic bronchitis

Cough comes in elderly - pregnancy

Asthma is an inflammatory response (asthma is both allergic + Inflammatory) in ttt: we need reliever + controller
- If unilateral wheezes - rhonci in children —> FB
- bilateral wheeze - rhonchi —> Asthma

Happens at the moment then disappear after the allergen goes

There's difference between atopic dermatitis and contact/ allergic dermatitis
- Atopic —> genetically present
- Contact/allergic —> after exposure of allergen it present

DD. of shortness of breath.

lung diseases

- Asthma
- Bronchitis
- Chronic obstructive pulmonary disease
- Cystic fibrosis
- Emphysema

Disorders affecting breathing nerves and muscles

- Amyotrophic lateral sclerosis — Autoimmune
- Guillain-Barré syndrome — Infection gastroenteritis due to specific micro organism; ascending paralysis يجي لمدة اسبوعين إلى ثلاثة ويبعده يصير (diaphragm + respiratory muscles)
- Multiple sclerosis
- Myasthenia gravis — Autoimmune - destruction of neuromuscular junction then there's accumulation of Acetylcholine
- Eaton-Lambert syndrome — Autoimmune - affect the proximal muscles + central muscle e.g. diaphragm

Disorders of the blood and metabolism

- Anemia
- Hypothyroidism
- Adrenal insufficiency
- Metabolic acidosis
- Sepsis
- Leukemia

Psychological conditions

- Anxiety disorders and panic attacks

Cardiac

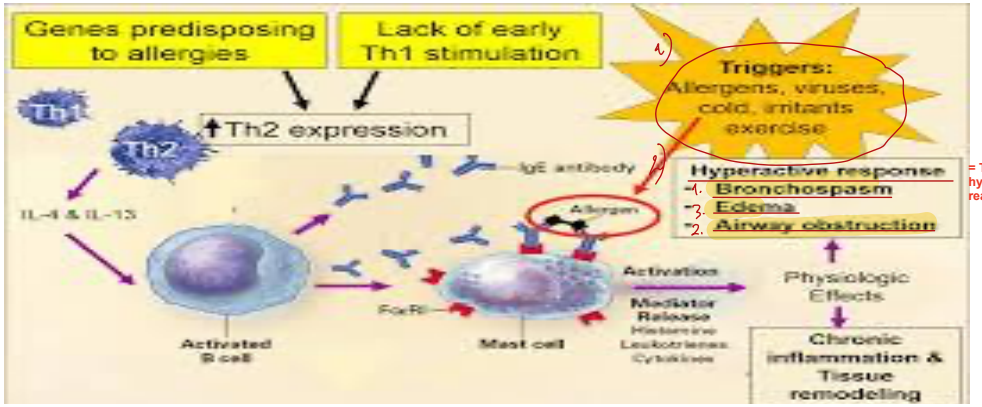
- acute myocardial infarction
- congestive heart failure
- **Cor pulmonale**

Definition

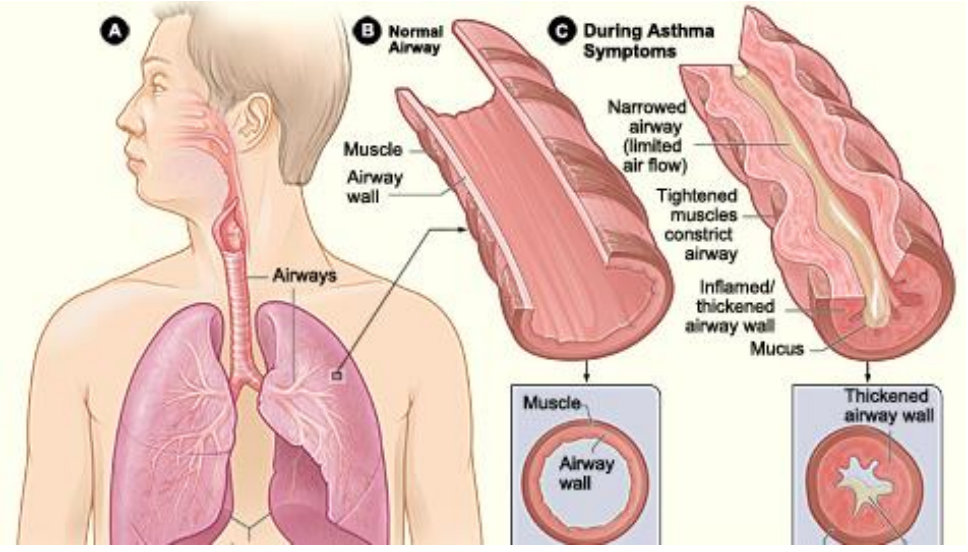
Famous causes of chronic cough
1. ACEI
2. GERD
3. TB
4. ASTHMA

- Asthma is a chronic inflammatory disease of the lung associated with reversible hyper-responsive airways.
- Asthma causes symptoms such as wheezing, shortness of breath, chest tightness and cough that vary over time in their occurrence, frequency and intensity.

Pathophysiology



= Type 1 hypersensitivity reaction



Predisposing factors and triggers

If a father smokes in another room he said it won't effect the family! Cause he is smoking in another room!
- WRONG!! Tobacco stick in the ceilings/walls for 6 months!!!!!!

List of Possible Triggers	Presence
Viral respiratory infections	☐ Yes ☐ No
Pollens	☐ Yes ☐ No
Dust mite, Molds	☐ Yes ☐ No
Animal dander, Secretions	☐ Yes ☐ No
Cold weather, Raining	☐ Yes ☐ No
Food (egg, peanut, sea food, others:.....) Strawberry	☐ Yes ☐ No
Smoking	☐ Yes ☐ No
Asthma symptoms related to exercise	☐ Yes ☐ No
Asthma symptoms related to exposure to work environment	☐ Yes ☐ No

- Occupational asthma
- Perfume
-
- stress

ATOPY
- Allergic rhinitis (atopic rhinitis) or allergic sinusitis
- Atopic dermatitis e.g eczema
- Conjunctivitis
- Asthma

Rhinitis
Does the patient have constant or seasonal nasal congestion, runny nose, and/or postnasal drip?
Gastroesophageal reflux disease (GERD)
Does the patient have heartburn?
Does food sometimes come up into the patient's throat?
Has the patient had coughing, wheezing, or shortness of breath at night in the past four weeks?
Does the infant vomit, followed by cough or have wheezy cough at night? Are symptoms worse after feeding?
Sulfite sensitivity Sea food, canned food ,
Does the patient have wheezing, coughing, or shortness of breath after eating shrimp, dried fruit, or processed potatoes or after drinking beer or wine?
Medication sensitivities and contraindications
What medications does the patient use now (prescription and nonprescription)?
Does the patient use eye drops? What type?
Does the patient use any medications that contain beta-blockers or angiotensin-converting enzyme (ACE) inhibitors? ARBs نبدله ب
Does the patient ever take aspirin or other nonsteroidal anti-inflammatory drugs (NSAIDs)?
Has the patient ever had symptoms of asthma after starting or taking any of these medications?

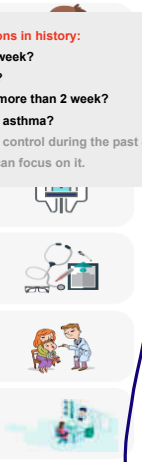
Drugs causing B. Asthma

- Aspirin
- Nonsteroidal anti-inflammatory drug (NSAID)
- Sulfite sensitivity
- Use of beta-adrenergic receptor blockers (including ophthalmic preparations)
- Oral contraceptive pill Combined OCP (HTN, headache, DM)
- Cholinergic agents
- dry cough ???? ACEi

Drugs contain sulfite:
- sulfonylureas
- trimethoprim
- mebendazole

Assessment

1. Ascertain diagnosis of Asthma
2. Assessment of Asthma Control
3. Set up a management plan
4. Prescribe appropriate medication
5. Conduct patient /parents education
6. Give a follow up appointment



To know the control we ask 4 questions in history:

1. Daytime symptoms more than 2 week?
2. Any night waking due to asthma?
3. Reliever used for the symptoms more than 2 week?
4. Any limitation of activities due to asthma?
5. How would you rate your asthma control during the past 4 weeks? (ACT score) i added to so you can focus on it.

Clinical Presentation

DIAGNOSTIC FEATURE	CRITERIA FOR MAKING THE DIAGNOSIS OF ASTHMA
1. History of variable respiratory symptoms	
Wheeze, shortness of breath, chest tightness and cough Descriptors may vary between cultures and by age, e.g. children may be described as having heavy breathing	• Generally more than one type of respiratory symptom (in adults, isolated cough is seldom due to asthma) • Symptoms occur variably over time and vary in intensity • Symptoms are often worse at night or on waking • Symptoms are often triggered by exercise, laughter, allergens, cold air • Symptoms often appear or worsen with viral infections

Histrionic laugh
those who take cannabis they laugh historically

Physical examination

- Bilateral expiratory wheezing
- Examination of the upper airways
- Other allergic manifestations: e.g., atopic dermatitis/eczema
- Consider alternative diagnosis when there is localized wheeze, crackles, stridor, clubbing

Grade of dyspnea	Symptoms
Grade 0	Not troubled by breathlessness except on strenuous exercise
Grade 1	Short of breath when hurrying or walking up a slight hill
Grade 2	Walks slower than contemporaries on the level because of breathlessness or has to stop for breath when walking at own pace
Grade 3	Stops for breath after walking 100 m or after a few minutes on the level
Grade 4	Too breathless to leave the house or breathless when dressing or undressing

- Dyspnea with exercise
- Dyspnea at rest
- Dyspnea use of accessory muscle (subcostal refraction) sign of respiratory distress
- Granting?

Variable expiratory airflow limitation

- Asses the severity depending on age and height
- Asses the response of the treatment

2. Confirmed variable expiratory airflow limitation ≥12% improvement	
Documented excessive variability in lung function* (one or more of the tests below) AND documented airflow limitation*	The greater the variations, or the more occasions excess variation is seen, the more confident the diagnosis At least once during diagnostic process when FEV_1 is low, confirm that FEV_1/FVC is reduced (normally >0.75–0.80 in adults, >0.90 in children)

- FEV1: forced expiratory volume in 1 second أقوى وأسرع نفس بالثانية الوحدة
- FVC: forced vital capacity أقوى وأسرع نفس كله على بعض
- normally >80%

Investigations

- These tests confirm the diagnosis
- It's diagnosed clinically

• Pulmonary function tests

- ➢Spirometry
  - Done in the clinic
  - Diagnostic if there's obstructive disease
  - We diagnose asthma with spirometry if its lower than 80%
- ➢Bronchodilator response: improve ≥ 12%.
- ➢Broncho provocation testing — done in hospital for cough variant asthma — استفز الجهاز التنفسي عشان يجيبه ربو
- ➢Peak expiratory flow
- ➢Exhaled nitric oxide
  - Not used anymore (we rely more on clinical diagnosis)
  - Chemical reaction

بعد ما خليناه يسوي PEF or spirometry نعطيه بخاخ PEF or spirometry وأرجع اسوي له bronchodilator وأشوف واقارن قبل وبعد المفترض يكون فيه تحسن 12%< فمن هذا الاختبار نتأكد انه ربو لو تحسن :)

• Others

- ➢CBC: eosinophilia — Common cause for eosinophilia in blood: worms (parasitic)
- ➢Test for allergy — Skin desensitization
- ➢Imaging — When we do imaging? If I suspect anything other than asthma

Asthma assessment

1. **Symptom control**
2. **Assess treatment issues**
3. **Assess comorbidities**

So i can know if i step up of treatment or step down the drugs حسب هالاسمنت نحدد نزيد خطوة او خطوتين بالعلاج او أحوله لعيادة ثانية

MCQ:

1. Assess asthma control = symptom control and future risk of adverse outcomes

- Assess symptom control over the last 4 weeks (Box 2-2A)
- Identify any other risk factors for exacerbations, fixed airflow limitation or side-effects (Box 2-2B)
- Measure lung function at diagnosis/start of treatment, 3–6 months after starting controller treatment, then periodically

2. Assess treatment issues

- Document the patient's current treatment step (Box 3-5, p.43)
- Watch inhaler technique, assess adherence and side-effects
- Check that the patient has a written asthma action plan
- Ask about the patient's attitudes and goals for their asthma and medications

3. Assess comorbidities هدفنا نصلحهم عشان تتصلح الأزما

allergic

- Rhinitis, rhinosinusitis, gastroesophageal reflux, obesity, obstructive sleep apnea, depression and anxiety can contribute to symptoms and poor quality of life, and sometimes to poor asthma control

مهم جدًا نخلي المريض يستخدم الinhaler قدامنا!!

Assessment of asthma symptoms

Asthma symptoms control	Asthma control level based on symptoms		
In the past 4 weeks has the patient had:	Controlled	Partly controlled	Uncontrolled
	Number of questions answered «Yes»		
• Daytime symptoms more than twice/ week? قبه خلال هذا الاسبوع جاك attack اكثر من مرتين في النهار؟ ☐ Yes ☐ No	None	have 1 or 2 positive أزود خطوة بالعلاج 1-2	have 3 or 4 positive أزود خطوتين بالعلاج 3-4
• Any night waking due to asthma? هل انت خلال الشهر اللي فات جاك كم attack بالليل؟ ☐ Yes ☐ No			
• Reliever used for symptoms more than twice /week? بناءً عليه استخدمت البخاخ اكثر من مرتين هالاسبوع في النهار؟ ☐ Yes ☐ No			
• Any limitation in activities due to Asthma? هل الطفل معد يقدر يلعب بسببه؟ هل الشخص ماعاد يقدر يمارس حياته زي قبل؟ ☐ Yes ☐ No			

الفرق عن الجدول اللي قبل الخطوة الخامسة

ACT Score (for adults and children >5y)	Controlled	Partially (أزود خطوة بالعلاج)	Uncontrolled (أزود خطوتين بالعلاج)
	≥ 20	16-19	≤15 Out of 25

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?
   1 All of the time | 2 Most of the time | 3 Some of the time | 4 A little of the time | 5 None of the time
2. During the past 4 weeks, how often have you had shortness of breath?
   1 More than once a day | 2 Once a day | 3 to 6 times a week | 4 Once or twice a week | 5 Not at all the week
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?
   1 4 or more nights a week | 2 2 or 3 nights a week | 3 Once a week | 4 Once or twice | 5 Not at all the week
4. During the past 4 weeks, how often have you used your rescue inhaler or nebulizer medication (such as albuterol)?
   1 3 or more times per day | 2 1 or 2 times per day | 3 2 or 3 times per week | 4 Once a week or less | 5 Not at all the week
5. How would you rate your asthma control during the past 4 weeks?
   1 Not controlled at all | 2 Poorly controlled | 3 Somewhat controlled | 4 Well controlled | 5 Completely

TOTAL ☐

Management plan قرتها

1. Inform patient /parents about the diagnosis.
2. Education about asthma possible triggers.
3. Available options of medications.
4. Proper technique of using inhaler devise
5. How can the patient/parent minimize exacerbations?
6. How do patient/parent deal with worsening symptoms (action plan)?
7. How would the patient/parent communicate with the treating physician?
8. How frequent is the patient going to be seen in the clinic?

Drugs used in treatment of asthma

مهم نعرف الاختصارات :)

- SABA: short acting bronchodilator
- LABA: Long-acting bronchodilator
- ICS: inhaled corticosteroids bronchodilator + anti-inflammatory (work both ways)
- OCS: oral corticosteroids Used in emergnecy something?
- LTRA: leukotriene receptor antagonist Used for control the inflammtion
  - mast cell stabilizer
- Theophylline

β2-Agonists

- Are the most effective bronchodilators available.
- This results in smooth muscle relaxation, mast cell membrane stabilization, and skeletal muscle stimulation.
- Short acting agents: Albuterol, levalbuterol or pirbuterol
- Long-acting agents: Salmeterol, formoterol

Anticholinergics:

Ipratropium bromide and tiotropium bromide are competitive inhibitors of muscarinic receptors; they produce bronchodilation only in cholinergic mediated bronchoconstriction.

Anticholinergic agent overview

Drug	Indications	Possible Side effects	Some Potential Interactions	Precautions and Contraindications
Ipratropium	• Bronchospasm	• URI/ bronchitis • Sinusitis • Chest pain • Palpitation • Headache • Dizziness • Dry mouth/ throat • Blurred vision	• AChEIs • Anticholinergics	Precautions: • Bladder neck obstruction • Prostatic hyperplasia • Narrow-angle glaucoma • Myasthenia gravis • Pregnancy/ lactation Contraindications: • Hypersensitivity

AChEIs: Acetylcholinesterase Inhibitors; **URI:** Upper respiratory tract infection

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INNOVATE RESEARCH & DEVELOPMENT™

Corticosteroids

- Anti inflammatory + bronchodilator
- Inhaled may cause oral candidas to avoid it we use mouth wash

- Corticosteroids increase the number of β2-adrenergic receptors and improve receptor responsiveness to β2 -adrenergic stimulation, thereby reducing mucus production and hyper-secretion, reducing BHR, and reducing airway edema and exudation.

- Systemic toxicity of inhaled corticosteroids is minimal with low to moderate inhaled doses, but the risk of systemic effects increases with high doses.
- Local adverse effects include oropharyngeal candidiasis and hoarseness of voice.

هنا بس نعرف ان فيه جرعات low , medium , high
فنزود الجرعة حقت الICS

Adults and adolescents inhaled corticosteroid	Total daily ICS dose (mcg)		
	Low	Medium	High
Beclomethasone dipropionate (MDI, standard particles, HFA)	200-500	>500-1000	>1000
Beclomethasone dipropionate (MDI, extrafine particle, HFA)	100-200	>200-400	>400
Budesonide (DPI)	200-400	>400-800	>800
Ciclesonide (MDI, HFA)	80-160	>160-320	>320
Fluticasone furoate (DPI)	100		200
Fluticasone propionate (MDI, HFA) and (DPI)	100-250	>250-500	>500
Mometasone furoate (DPI)	200		400
Mometasone furoate (MDI,HFA)	200-400		400

low , medium , high هنا بس تعرف ان فيه جرعات
فنزود الجرعة حقت الICS

Children 6-11 years inhaled corticosteroid	Total daily ICS dose (mcg)		
	Low	Medium	High
Beclomethasone dipropionate (pMDI, standard particles HFA)	100-200	>200-400	>400
Beclomethasone dipropionate (pMDI, extrafine particle, HFA)	50-100	>100-200	>200
Budesonide (DPI)	100-200	>200-400	>400
Budesonide (Nebules)	250-500	>500-1000	>1000
Ciclesonide (MDI, HFA)	80	>80-160	>160
Fluticasone furoate (DPI)	50		Not Applicable
Fluticasone propionate (MDI, HFA) and (DPI)	50-100	>100-200	>200
Mometasone furoate (MDI,HFA)	100		200

Leukotriene Modifiers

Mast cell stabilizer
- oral or inhaled

- Zafirlukast (Accolate) and montelukast (Singulair) are oral leukotriene receptor antagonists that reduce the proinflammatory (increased microvascular permeability and airway edema) and bronchoconstriction effects of leukotriene D4.

- In adults and children with persistent asthma, they improve pulmonary function tests, decrease nocturnal awakenings and β2-agonist use, and improve asthma symptoms.

- Space meter
- For children
- MCQ: child partially controlled what to use?
  Space meter :D
عشان ياخذ الجرعة كويس

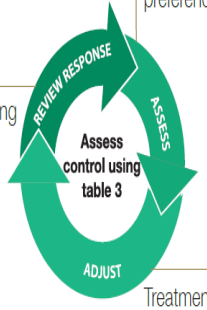
How to use MDI

- We have 2 things controller + reliever
- Reliever: used time of attack (SABA + low dose ICS)
- STEP1: only reliever at the time of attack (SABA + low dose ICS)
- STEP2: my inhaler are controller twice daily (**fixed even without attack**) if attack happens we use reliever other than the controller doses (SABA + low dose ICS) other option (LTRA + low dose ICS) reliever same thing fixed in all steps.
- STEP3: controller twice daily fixed (LABA + low dose ICS) other option (medium dose ICS alone or low dose ICS + LTRA) reliever fixed in all steps.
- STEP4: controller (LABA + medium dose ICS) other option (high dose ICS only or medium dose ICS + tiotropium or medium dose ICS + LTRA) reliever fixed.
- STEP5: ريحوا مخكم وحولوهم، بس هم بيونا تضيف أدوية بدون ما توصل لل maximum dose.

Adults & Children ≥ 6 years

Confirmation of diagnosis if necessary, symptom control & modifiable risk factors, comorbidities, inhaler technique & adherence, Patient preference & goals

Symptoms, Exacerbations, Side-effects, Lung function, Patient satisfaction



Treatment of modifiable risk factors & comorbidities, Non-pharmacological strategies, Education & skills training, Asthma medications adjustment

Uncontrolled

Step 3-4-5

Asthma severity steps	Controlled	Partially			
	STEP 1	STEP 2	STEP 3	STEP 4	STEP 5
PREFERED CONTROLLER To prevent exacerbations and control symptoms	As-needed low dose ICS-formoterol (for Adults & Adolescents ≥12 years)	Daily low dose ICS, or as-needed low dose ICS-formoterol (for Adults & Adolescents ≥12 years)	Low dose ICS-LABA	Medium dose ICS-LABA	• High dose ICS-LABA, or • Medium dose ICS-LABA + tiotropium, or • Medium dose ICS-LABA + LTRA
OTHER CONTROLLER OPTIONS	As-needed SABA with low dose ICS taken whenever is SABA taken	Leukotriene receptor antagonist (LTRA)	• Medium dose ICS, or • Low dose ICS+LTRA	• High dose ICS • Medium dose ICS+tiotropium • Medium dose ICS+LTRA	and Refer to a Specialist :D
Reliever Options Any reliever must have ICS + SABA (fixed in all steps)	As-needed low dose ICS-formoterol* only if ICS-formoterol is used as maintenance therapy As-needed short-acting B_2 - agonist (SABA)				
Action based on control (refer to the steps Page 13)*		Continue the same or one step down	One step up	One or two steps up	

How to step down ICS?

لما بناخذ الستيرويد بفترة طويلة وانتظم صعب نتركه فجاة فنقله بنسبة ٢٥٪ كل ٣-٦ شهور فلو كان ١٠٠٠ جرعته يصير ٧٥٠ ولو بناخذ ٥٠٠ يصير ٣٥٠ ونشيك عليه كل شهر

If controlled, reduce 25% of ICS dose every 3-6 months to the lowest possible dose.

- Asthma diagnosed in children above 2 years

Asthma management in Children ≤ 5 years

1. If asthma is uncontrolled or partly controlled start with low dose ICS such as fluticasone propionate 50-100 mcg/day or budesonide nebuliziation 250-500 mcg/day. Alternatively, LTRA 4 mg/day (granules in ≥6 months or chewable tablets in ≥2 years) may be used in partly controlled children.
2. If still not well controlled after 3 months, double the ICS dose or add LTRA.
   - exercise induced asthma —> ttt: SABA before the exercise بربع ساعة خذ بخاخ
3. If still not well controlled after 3 months refer to a specialist, or earlier if necessary.

Indication of referral:
- Uncontrolled exercise induced asthma with SABA

Patient education

1. Environmental allergens, indoor: e.g., mold, house-dust mite, cockroach, animal dander
2. For dust mite sensitizations (in humid climate): Wash bed linen and blankets weekly with hot water (≥ 60 C).
3. Exercise: Take bronchodilator inhaler before exercise.
4. Irritants: tobacco smoke. Avoid both active and passive smoking.
5. Drugs e.g., Aspirin and other NSAIDs, beta-blockers including eye drops...etc.
6. Food, food additives. Avoid if known to cause asthma in the patient.
7. Changes in weather, exposure to cold air or rain.

Referral criteria

1. Exercise induced symptoms that are atypical or not responding to pretreatment with bronchodilators.
2. Persistent uncontrolled asthma (Asthma severity step 5).
3. Any risk factors for asthma related death (e.g.: ICU admission or mechanical ventilation for asthma).
4. Suspected asthma is not confirmed especially with normal pulmonary function tests.
5. Evaluation of inhalant (pollens or animal dander) sensitization to confirm the triggers and provide education regarding avoidance measures or possible immunotherapy.
6. Patient with major co-morbidity that need management by specialist.

Pt came with severe attack + severe exacerbation

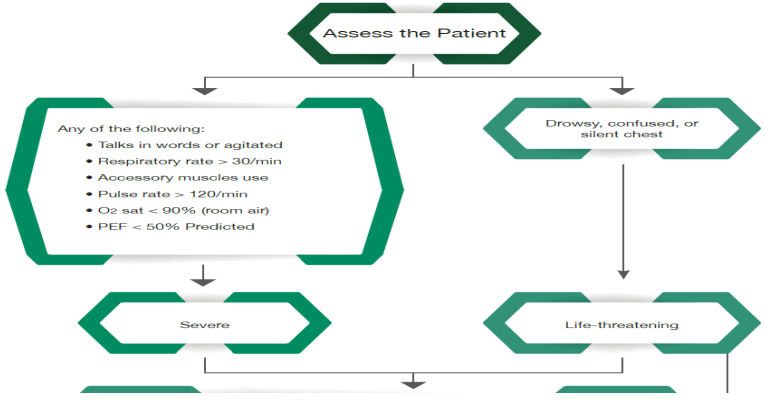
E.g. pt with HF need BB or aspirin the problem is bigger than family med so REFER!

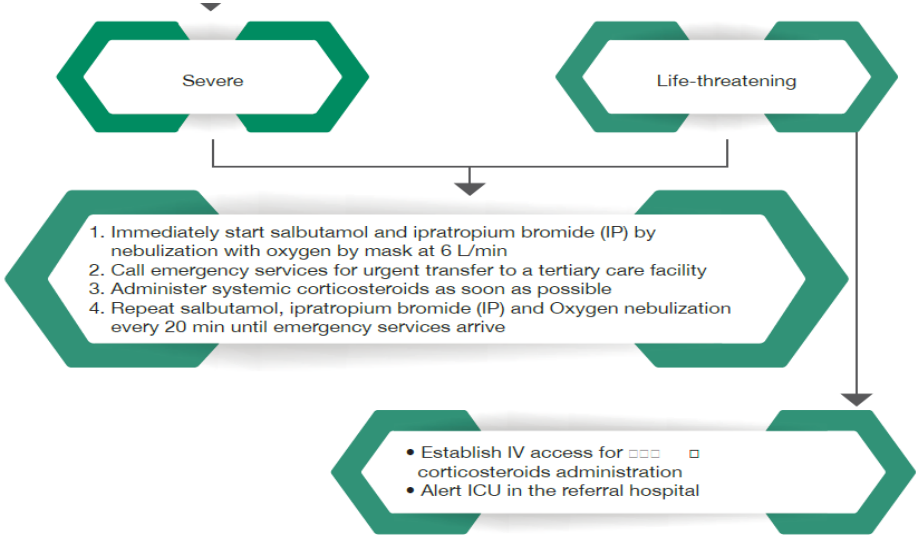
MCQ

Acute Exacerbation of asthma

	Symptoms and Signs	Initial PEF (or FEV1)	Clinical Course
Mild	- Dyspnea only with activity (assess tachypnea in young children) - No accessory muscle use - End expiratory wheezing - O_2 sat>95% N	- PEF≥ 75% predicted or personal best Normal PEF >80%	- Administer inhaled or nebulized SABA Repeat if necessary
Moderate Intercostal + subcostal muscle retraction العضلات تدخل بدال ما تطلع	- Dyspnea interferes with or limits usual activity - Accessory muscle use - Expiratory wheezing - O_2 sat 90%-95%	- PEF 50-74% predicted or personal best	- May require ED referral - Administer inhaled or nebulized SABA, repeat every 20 min for 1 hour In clinic - Oral systemic corticosteroids In clinic
Severe Intercostal + subcostal muscle retraction العضلات تدخل بدال ما تطلع	- Dyspnea at rest; interferes with conversation يس راح الحمام ما منوا مجهود بالبيت - Accessory muscle use - Inspiratory/Expiratory Wheezing - O_2 sat<90%	- PEF <50% predicted or personal best	- Requires ED referral and likely hospitalization - Please refer to next section for management
Life-threatening	- Too dyspneic to speak: perspiring يا الله يتنفس بجاهد نفسه - Drowsy or confused - Silent chest No inspiration or expiration	- PEF < 25% predicted or personal best	- Requires ED/ hospitalization and likely ICU - Please refer to next section for management

Management





- You are caring for a 35-year-old man with a long history of allergies and asthma. His asthma has been in good control, but his blood pressure has been elevated on more than two occasions despite weight loss, exercise and appropriate dietary intervention. Which of the following blood pressure medications should be avoided in this case?

a. Hydrochlorothiazide

b. Lisinopril (Zestril, Prinivil)

c. Nifedipine (Procardia)

d. Propranolol (Inderal)

e. Losartin (Cozaar)

- You are caring for a young woman who has had mild intermittent asthma for years. She uses a short-acting bronchodilator as needed, but in the past has only needed therapy once or twice a month. Over the past 2 months, she has noted that she is using her inhaler more. In fact, she uses it at least three times a week, and on occasion has had to wake up in the middle of the night to use her inhaler. Of the following, which is the most appropriate treatment option at this point?

a. Change her short-acting beta-agonist from albuterol (Proventil, Ventolin) to pirbuterol (Maxair)

b. Add a long-acting beta-agonist

c. Add an inhaled corticosteroid

d. Add a leukotriene receptor antagonist

e. Add cromolyn (Intal)