1. ***Definition of asthma:*** **Reversible obstruction** with normal lung function in between exacerbations, characterized by airway inflammation
2. Diagnosis is clinical, **PFTs are not a requirement** for the diagnosis
   *The **initial approach** to someone who may have asthma*

3. Are they short of breath? Are they wheezing? Do these symptoms come and go?
   - **Patients who are always short of breath probably don't have asthma!** Broaden your differential!
4. Cough: dry suggests asthma, productive suggests something else
5. Advising patients to **avoid triggers** is critical in disease management
   - Common triggers include: Dry air, cold air, exercise, cooking, chemicals, detergents. **These can all lead to bronchospasm**!
6. History of colds that persist 6-8 weeks?
   - **Typical of a URI followed by an asthma exacerbation!**
7. **Allergy history**: Hay fever? Sinus infections? History of sinus surgeries? Use of allergy medications? Pets?
   - May be the cause for the patient's symptoms or seen in association with underlying asthma
8. **Acid reflux** is very common and may be the cause of the patient's symptoms or an aggravating factor/trigger.
9. Note: there have been studies looking at PPIs in uncontrolled asthma without reflux symptoms. They don't help! **PPIs help asthmatics with reflux if they are actually experiencing reflux!**

10. ***Physical exam** in asthma*

    - General: Obesity? May suggest acid reflux disease
    - Evaluate neck and mouth (Mallampati Score). Does this person have risk factors for obstructive sleep apnea?
    - Nasal exam: look for polyps
    - Lung exam: Listen for cough, expiratory wheeze. Absence of end-expiratory wheezes but cough at the end of deep breaths may be present in **cough variant asthma**
    - Look for clubbing, peripheral edema, loud heart murmur. These are Important pertinent negatives
11. ***Pulmonary function testing** (PFTs):*
    - **Diffusion Capacity**: should be normal, if not, consider interstitial lung disease or other pathology
    - **Spirometry** recommended in guidelines for everyone, BUT in primary care, not always practical or necessary
      - Normal – asthma is more likely
      - Abnormal – more work up is necessary
      - 99% of the time, the patient's PFTs should be NORMAL
      - Obstruction (i.e. FEV1/FVC ratio below normal predicted value) should be seen during exacerbations, but NOT at baseline
      - If evidence of obstruction, give bronchodilator and look for improvement

    - **Why would there be obstruction if the patient has asthma but is not in an exacerbation?**Maybe they **are** in an exacerbation and don't realize it, or have chronic, poorly controlled disease at baseline.
    - If spirometry was abnormal upon initial evaluation, then treat and re-evaluate. If spirometry has not normalized, then consider an alternative diagnosis.
- **Methacholine Challenge Test**
    - Reserve for patients with intermediate pretest probability, or those who have failed first and second line therapies to reevaluate the diagnosis ***Peak expiratory flow (PEF)****:*Variability of values limits clinical utility, but helpful for some patients. Treating based on PEF is no better than tracking symptoms6***Chest X-Ray****:* If patient has high functional capacity without red-flag symptoms, then X-Ray low yield/unnecessary

12. ***Labs in Asthma***
    - **CBC** with diff: Rule out anemia; and look for eosinophilia which may suggest vasculitis or chronic eosinophilic pneumonia
    - **Serum IgE** and **allergen panel** if indicated based on a history suggestive of allergies
    - **Sputum samples**:
        - Chronic productive cough – always get one
        - Patient with history of mold exposure, on inhalers for asthma, now no longer exposed to mold but still has poorly controlled symptoms: sputum, PFTs, CBC with diff, allergen panel, chest X-Ray. Patient may have ABPA or hypersensitivity pneumonitis carrying over from prior exposure

Treatment

13. **Stepwise therapy**
    - As needed therapy – short acting bronchodilator (ex: albuterol, levalbuterol)
    - First line maintenance: inhaled steroid
    - Second line maintenance: long acting beta agonist (**never to be used alone in asthma!**)
    - Next steps: increase doses of inhaled therapies, add leukotriene inhibitor (ex: montelukast), add antihistamines if clinically indicated, consider omalizumab if elevated IgE is present
    - Anticholinergics: can help in recalcitrant asthma[1]
    - **Azithromycin:** useful if a patient has frequent exacerbations (as maintenance therapy) but **not useful** as empiric therapy for acute exacerbations [2,3]
14. **Skipping steps:** Therapies do not always have to be initiated in a stepwise manner.
    - A poorly controlled asthmatic may require multiple medications right away, there may be no time for stepwise implementation
    - …but you can always peel back therapies if a patient is improving! How do you know? No exacerbations, not needing albuterol, elimination of known triggers
15. **Short acting bronchodilator:** Use as often as needed! Don't let a patient think that because it is an "emergency inhaler" they should only use it if they feel they are moments away from a trip to the ED!
16. **Exercise induced-bronchospasm:** Use albuterol anytime within 30 minutes of exercise. It works within minutes!
17. **Myth busting:** No convincing evidence suggests any benefit to levalbuterol over albuterol (e.g. tolerability, side effects, etc.)
18. **Inhaler teaching:**
    - Encourage use of a spacer for inhaled therapies
    - For inhaled steroids: make sure patient's rinse after use – thrush is not good for maintaining patient adherence!

- Also, if a patient says they know how to use their inhaler – that is not enough! Make them show you in clinic

19. **Asthma action plans**[7]
    - Can empower patients by giving them specific instructions to prevent/reduce exacerbations.
    - Generally use the colors green, yellow and red to indicate baseline respiratory status, worsening of symptoms and significant worsening of symptoms
    - Therapeutic adjustments can be made by the patient based upon their personalized action plan and their symptoms at a particular time
    - Can give patients parameters to start short-course oral steroids as well as reasons to be evaluated in the clinic
    - Would NOT give an action plan to someone with multiple comorbidities (such as heart failure, chronic aspiration, etc.) because worsening symptoms in these patients would be more likely to warrant an in person evaluation
20. **Prevent asthma exacerbations:** Identify triggers, strategize to mitigate these triggers, ensure adherence to controller medications and promote symptom awareness
21. **Outpatient treatment of exacerbations:**
    - Encourage liberal use of short acting bronchodilators – use it as often as needed in exacerbation. In the ED patients get CONTINUOUS albuterol nebs!
    - **Steroids:** Start at home based on patient's action plan.
        - If no improvement after 48 to 72 hours, that patient should be seen ASAP
        - Dose: 40 mg for 5 days of prednisone, or could consider 10-14 day taper with a different dose depending on patient's history
22. **Inpatient treatment of exacerbations:**
    - **Nebulizers** (can use continuous beta agonist, anticholinergic nebulizers)
    - IV steroids
    - IV magnesium
    - Non-invasive positive pressure ventilation (such as Bi-Level) to decrease work of breathing
    - Consider benzodiazepines to reduce anxiety during an exacerbation
    - Consider alternative diagnoses if not improving
    - Note: **Hypoxemia** is a **late finding** in an exacerbation
23. Who to **refer to pulmonary:**
    - Anyone on maximum inhaled therapy (+/- anticholinergic) and still with symptoms/exacerbations.
    - Anyone on chronic steroids.
    - Anyone with frequent exacerbations
24. **Take home points**
    - Asthma is very common and it's a clinical diagnosis
    - 1st line is inhaled steroid, then work your way up…BUT **don't be reluctant to start multiple therapies immediately** in a patient with poorly controlled symptoms. You can always de-escalate care.
    - Consider broadening your differential and expanding the work up if the patient isn't improving despite usual treatment.
    - Difficult to control or severe asthma should be evaluated by pulmonary e.g. patients who need a lot of steroids, people who are intubated in the hospital