

Association of Asthma Educators: Becoming an Asthma Educator and Care Manager

Produced by the Alabama Department of Public Health
Video Communications and Distance Learning Division

Medications

Faculty

Tim Op't Holt, EdD, RRT, AE-C, FAARC
Professor
Cardiorespiratory Care
University of South Alabama

William C. Pruitt, MBA, RRT, AE-C
Senior Instructor
Director of Clinical Education
Department of Cardiorespiratory Care
University of South Alabama

Medications

- Medications classifications
- Stepwise approach
- Inhalation devices

Medication Classification

- Quick relief medications
 - Medications used to treat acute symptoms and exacerbations
- Long term control medications
 - Medications used every day to achieve and maintain control of persistent asthma

Medication Classification

- Quick relief medications
 - Short acting β 2-Agonists (SABA)
 - Anticholinergics
 - Oral steroid “burst” therapy

Medication Classification

- Long term control medications
 - Inhaled corticosteroids (ics)
 - Long acting β 2-agonists (LABA)
 - Leukotriene modifiers
 - Non-steroidal anti-inflammatories
 - Theophylline
 - Immunomodulator
 - Daily oral steroids

Quick Relief Medications

- Short acting β 2-Agonists (SABA)
- Anticholinergics
- Oral steroid “burst” therapy

Short Acting β 2-Agonists (SABA)

- Albuterol
 - Proventil HFA®, Ventolin HFA®, ProAir®
 - Meter dose inhaler, solution for nebulization, tablets

Short Acting β 2-Agonists (SABA)

- Levalbuterol (Xopenex®)
 - Meter dose inhaler, solution for nebulization

Short Acting β 2-Agonists (SABA)

- Pirbuterol (Maxair®)
 - Autohaler
 - Meter dose inhaler

Short Acting β 2-Agonists (SABA)

- Affect the lungs by attaching to and relaxing the smooth muscles that wrap around the bronchi to improve asthma control
- Onset of action: rapid ~10 minutes
- Duration of action: ~ 4 hours

Short Acting β 2-Agonists (SABA)

- Dosing: 2 puffs q4-6hrs PRN for symptoms
 - May use 15 minutes before exercise to pre-treat
 - To be immediately available to the patient at all times

Short Acting β 2-Agonists (SABA)

- Clinically significant side effects associated with SABA are Skeletal Muscle Tremor and Tachycardia
- Increased use, greater than 1 canister per month, is an indicator of patient over reliance on short acting medication and may increase the risk for life-threatening exacerbations

Short Acting β 2-Agonists (SABA)

- Baylor's Rules of Two Questions™
 - Do your patients use their quick-relief inhaler more than TWO times a WEEK?
 - Do they awaken at night with asthma more than TWO times a MONTH?

Short Acting β 2-Agonists (SABA)

- Do they refill their quick-relief inhaler more than TWO times a YEAR?
- Has their peak flow dropped more than TWO times 10 (20%) from baseline when having asthma symptoms?

Short Acting β 2-Agonists (SABA)

- If the answer is “yes” to any of these questions, the health care professional should reevaluate patient's current treatment regimen

– Baylor Health Care System

Current Consensus on Short-Acting β 2s

- Data suggest regular use associated with asthma morbidity and mortality
- Causal link not yet established
- β 2-agonists should be prescribed for rescue or quick relief
- Prevention of exercised-induced asthma

Current Consensus on Short-Acting β 2s

- Increased use (>2 times/ week) signals deteriorating control and need for daily anti-inflammatory therapy

Short Acting β 2-Agonists (SABA)

- Patient to call if:
 - Needing more often than q4h for symptoms
 - Needing every 4 hours
 - Day and night
 - Not responding to treatment within 15 minutes
 - Getting worse

Anti-Cholinergics

- Ipratropium (Atrovent®)
- Tiotropin (Spiriva®)-FDA approved only in COPD
- Combination
 - Albuterol/Ipratropium (Combivent® or DuoNeb®)

Anti-Cholinergics

- Safe
- Approved for COPD and asthma exacerbations
- Synergistic effect with SABA
- Not FDA approved for children

Oral Corticosteroids

- Medrol
- Prednisone
- Prednisolone syrup
- Orapred®, Prelone®, Pediapred®

Oral Corticosteroids

- May be used for quick relief
 - Burst during an acute exacerbation for 3-10 days
- Long-term control in severe asthma
 - Daily dosing
 - Alternate day dosing
 - Combined with inhaled corticosteroid

Oral Corticosteroids

- Long term side effects:
 - Osteoporosis
 - Hypertension
 - Diabetes
 - HPA axis suppression
 - Obesity
 - Skin thinning
 - Easy bruising
 - Muscle weakness

Long Term Control Medications

- Inhaled corticosteroids (ICS)
- Long acting β 2-agonists (LABA)
- Leukotriene modifiers
- Non-steroidal anti-inflammatories
- Theophylline
- Immunomodulator
- Daily oral steroids

Inhaled Corticosteroids (ICS)

- “They are the most potent and effective anti-inflammatory medication currently available.”
- “ICSs are used in the long-term control of asthma.”
 - Expert Panel Report 3 (EPR-3)

Inhaled Steroids

Product	Generic Name	Color	Doses/Puff
Aerospan	Flunisolide HFA	Purple w/ gray spacer	80mcg
Asmanex	Mometasone	White w/ gray or pink	110mcg, 220 mcg
Azmacort (Last date for sale 12/31/2010)	Triamcinolone	White with spacer	100 mcg
Aerobid (Last date for sale 6/30/2011)	Flunisolide Flunisolide/menthol	Gray/Purple Gray/Green	250 mcg
Alvesco	Ciclesonide	Tan/Red	80mcg, 160mcg
Flovent	Fluticasone HFA Fluticasone Diskus	Orange/Peach Orange	44 mcg, 110 mcg, 220 mcg 50 mcg, 100mcg, 250mcg
QVAR	Beclomethasone	Tan/Pumpkin	40 mcg, 80 mcg
Pulmicort, also Respules	Budesonide Nebulizer suspension	White/Brown	180, 90 mcg .25, 0.5, 1 mg

Inhaled Steroids

Product	Generic Name	Color	Doses/Puff
Alvesco	Ciclesonide	Tan/Red	80mcg, 160mcg

- **Pro-Drug:** administered in an inactive (or significantly less active) form
 - Once administered, enzymatically activated by lung mucosal tissue to active form
 - Potential to reduce oral side effects seen with other inhaled corticosteroids

Inhaled Steroids

Product	Generic Name	Color	Doses/Puff
Pulmicort, also Respules	Budesonide Nebulizer suspension	White/Brown	180, 90 mcg .25, 0.5, 1mg

- Only inhaled corticosteroid with category B pregnancy rating
 - Pharmacotherapy outcomes in pregnancy:
 - Maximize lung function
 - Minimize drug side effect

Inhaled Steroids

Product	Generic Name	Color	Doses/Puff
Pulmicort, also Respules	Budesonide Nebulizer suspension	White/Brown	180, 90 mcg .25, 0.5, 1mg

– Pregnancy pearls:

- If well controlled on current therapy continue therapy
- When starting inhaled corticosteroid therapy consider Budesonide (Pulmicort®) since it is the most studied

Inhaled Steroids

Product	Generic Name	Color	Doses/Puff
Aerospan	Flunisolide	Purple w/ gray spacer	80mcg
Asmanex	Mometasone	White w/ gray or pink	110mcg, 220 mcg
Alvesco	Ciclesonide	Tan/Red	80mcg, 160mcg
Flovent	Fluticasone Fluticasone Diskus	Orange/Peach Orange	44 mcg, 110 mcg, 220 mcg 50 mcg, 100mcg, 250mcg
QVAR	Beclomethasone	Tan/Pumpkin	40 mcg, 80 mcg
Pulmicort	Budesonide	White/Brown	180, 90 mcg

Inhaled Steroids

- New generation inhaled corticosteroids
 - New parent drug: Mometasone, Ciclesonide
 - New formulation: HFA

Quiz– ICS Potency for a 5 Year Old Child with Asthma

- Assign low, medium, or high dose:
 - a) beclomethazone 80 mcg/puff
QVAR 2 puffs BID _____
 - b) budesonide 250 mcg neb.
Pulmicort 0.25 mg QID _____
 - c) fluticasone 220 mcg Flovent 220 mcg 1 puff BID _____

Method 1 – “I will count puffs...”

- Assign low, medium, or high dose to:
 - a) beclomethazone 80 mcg/puff
QVAR 2 puffs BID 4 High?
 - b) budesonide 250 mcg neb.
Pulmicort 0.25 mg QID ? No Puffs
 - c) fluticasone 220 mcg Flovent 220 mcg 1 puff BID 2 Low?

Method 2 – “I’ll Count MCG...”

- Assign low, medium, or high dose to:
 - a) beclomethazone 80 mcg/puff
QVAR 2 puffs BID 320 Low?
 - b) budesonide 250 mcg neb.
Pulmicort 0.25 mg QID 1000 High?
 - c) fluticasone 220 mcg Flovent 220 mcg 1 puff BID 440 Med?

Drug	Low Daily Dose			Medium Daily Dose			High Daily Dose		
	Child 0-4 Years of Age	Child 5-11 Years of Age	≥12 Years of Age and Adults	Child 0-4 Years of Age	Child 5-11 Years of Age	≥12 Years of Age and Adults	Child 0-4 Years of Age	Child 5-11 Years of Age	≥12 Years of Age and Adults
Budesonide Inhaler Inhalation suspension or nebulization	0.25-0.5 mg	0.5 mg	NA	>0.5-1.0 mg	1.0 mg	NA	>1.0 mg	2.0 mg	NA
Fluticasone HALOIN: 44, 110, or 220 mcg/puff	176 mcg	88-176 mcg	88-164 mcg	>176-352 mcg	>176-352 mcg	>164-440 mcg	>352 mcg	>352 mcg	>440 mcg
Beclometasone HFA 40 or 80 mcg/puff	NA	80-160 mcg	80-160 mcg	NA	>160-320 mcg	>160-320 mcg	NA	>320 mcg	>480 mcg

Modified from <http://www.nhlbi.nih.gov/guidelines/asthma/asthsumm.pdf>. Figure 18

Inhaled Corticosteroids (ICS)

- Inhaled corticosteroids can be dosed at low, medium, or high doses
- Most benefits of ICS occur at low to medium doses

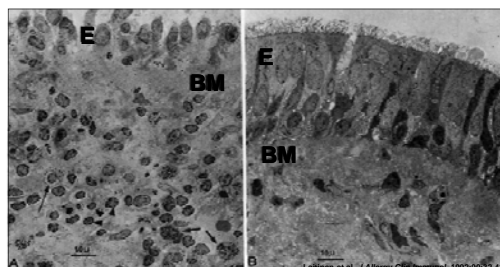
– Expert Panel Report 3 (EPR-3)

Inhaled Corticosteroids (ICS)

- Effects
 - Anti-inflammatory, decrease hyper-responsiveness, decrease secretions, and restore integrity
 - Improve function
 - Early intervention more effective

Inhaled Corticosteroids (ICS)

Pre- and post-3-month treatment with budesonide (BUD) 600 mcg b.i.d. n =14



E = Epithelium BM = Basement Membrane

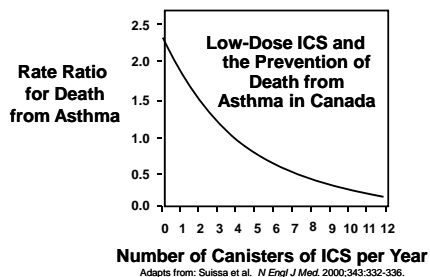
Inhaled Corticosteroids (ICS)

- Inadequately prescribed by providers
 - Inaccurate determination of persistent disease
 - Safety concerns

Inhaled Corticosteroids (ICS)

- Inadequately taken by patients
 - Reluctance to use daily therapy
 - Fear of “steroids” and confusion with anabolic steroids
 - Lack of perception of effect

Inhaled Corticosteroids (ICS)



Inhaled Corticosteroids (ICS)

- Local side effects
 - Throat irritation, irritative cough, candidiasis, hoarseness

Inhaled Corticosteroids (ICS)

- High dose inhaled side effects (rare and substantially less than with oral steroids)
 - May affect growth velocity in children if used long-term, but severe asthma that is uncontrolled also can cause growth suppression

Inhaled Corticosteroids (ICS)

- May affect serum osteocalcin levels and skin thickness in elderly
- Potential for systemic effects in children at 400 mcg of beclomethasone or budesonide

Inhaled Corticosteroids (ICS)

- High dose inhaled side effects (rare and substantially less than with oral steroids)
 - In adults with a family history of glaucoma and use of ICS has shown a slight increase in risk of glaucoma and cataract formation
 - Encourage periodic eye examination

Inhaled Corticosteroids (ICS)

- Rare adrenal gland suppression and elevated blood sugars with greatest risk at high doses
- Theoretical risk of disseminated varicella

Inhaled Corticosteroids (ICS)

- The provider/educator action is:
 - Teach patient about delay onset of action
 - Teach patient to take EVERY DAY
 - Demonstrate proper technique
 - Have patient demonstrate technique

Inhaled Corticosteroids (ICS)

- Instruct patient to use a spacer for MDI
- Instruct patient to rinse and spit after use
- Teach patient when to change canister

Long-acting β 2-Agonists (LABA)

- Formoterol (Foradil®)
- Salmeterol (Serevent®)
- Arformoterol (Brovana®) = for COPD only
- Performist (Formoterol®) = for COPD only

Long-Acting β 2-Agonists (LABA)

- Effects
 - Long-acting → 12 hours for prevention
 - Smooth muscle relaxation
 - Variable onset of action

Long-Acting β 2-Agonists (LABA)

- Black Box Warning:
 - LABAs should only be used long-term in patients with asthma not adequately controlled with inhaled steroids

Long-Acting β 2-Agonists (LABA)

- The agents should be used for the shortest time possible to achieve symptom control
 - Once patients are no longer experiencing symptoms, LABAs should be discontinued if possible

Long-Acting β 2-Agonists (LABA)

- Children and adolescents needing a LABA should use a combination product that also contains an inhaled steroid to ensure compliance with both medications

Long-Acting β 2-Agonist (LABA)

- The provider/educator action is:
 - Teach patient to take EVERY DAY
 - Use with an inhaled anti-inflammatory
 - Never use more than every 12 hours
 - Not to be used to treat acute symptoms

Combination Therapy

- ICS/LABA
 - Fluticasone/Salmeterol (Advair®) in mcg
 - Dry Powder: 100/50, 250/50, 500/50
 - MDI: 45/21, 115/21, 230/21

Combination Therapy

- Budsonide/Formoterol (Symbicort®) in mcg
 - MDI: 80/4.5, 160/4.5
- Mometasone/ Formoterol (Dulera®) in mcg
 - MDI: 100/5, 200/5

Combination Therapy

- “For patients not well controlled on low-dose inhaled corticosteroid (ICS), increasing the dose of ICSs to medium dose is recommended before adding adjunctive therapy in the 0–4 years age group.”

Combination Therapy

- “For other age groups (children 5–11 years of age and youths \geq 12 years of age and adults), increasing the dose of ICS to medium dose or adding adjunctive therapy to a low dose of ICS are considered as equal options.”
 - Expert Panel Report 3 (EPR-3)

Leukotriene Modifiers

- Montelukast (Singulair®)
- Zafirlukast (Accolate®)
- Zileuton (Zyflo CR®)

Leukotriene Modifiers

- Leukotrienes are inflammatory molecules that mediate airflow obstruction, hyperresponsiveness and inflammation through multiple channels
- Leukotriene D4 is a potent bronchoconstrictor at least 1000 times more potent than histamine

Leukotriene Modifiers

- Montelukast is available for patients >1 year of age
- Zafirlukast is available for patients ≥7 years of age
- Zileuton is available for patients ≥12 years of age

Leukotriene Modifiers

- Montelukast (Singulair®)
 - No known drug-drug interactions
- Zafirlukast (Accolate®)
 - Take on empty stomach
 - Inhibits metabolism of warfarin and increases prothrombin time
 - LFTs prior and during

Leukotriene Modifiers

- Zileuton (Zyflo CR®)
 - Take on empty stomach
 - LFTs prior and during

Leukotriene Modifiers

- “Leukotriene Receptor Antagonist (LTRAs) are alternative, but not preferred, therapy for the treatment of mild persistent asthma (Step 2 care).”

Leukotriene Modifiers

- “LTRAs can also be used as adjunctive therapy with ICSs, but for youths ≥ 12 years of age and adults they are not the preferred adjunctive therapy compared to the addition of LABAs.”
- “Zileuton can be used as alternative but not preferred adjunctive therapy in adults.”

– Expert Panel Report 3 (EPR-3)

Non-steroidal Anti-inflammatories

- Cromolyn
 - Blocks early and late phase reactions
 - Mast cell stabilizer
 - Inhibits acute response to exercise, cold dry air, and sulfur dioxide

Non-steroidal Anti-inflammatories

- 4-6 week trial
- Nebulizer form
 - Difficult to obtain product will eventually be removed from market
- Approved for 2 yrs and older

Non-steroidal Anti-inflammatories

- “They are used as alternative, but not preferred, medication for the treatment of mild persistent asthma.”
 - “They can also be used as preventive treatment prior to exercise or unavoidable exposure to known allergens.”
- Expert Panel Report 3 (EPR-3)

Methlyxanthine

- Theophylline
 - Theo-24®, Theochron®, Theolair®, Uniphyll®

Methlyxanthine

- Effects
 - Long-acting bronchodilator with possible anti-inflammatory properties
 - Narrow therapeutic range (5-15 mcg/ml)
 - Monitor blood level at least annually

Methlyxanthine

- **Side Effects**
 - Nausea, vomiting, reflux
 - Tachycardia, arrhythmias
 - Sleep disorders, seizures in toxic state
 - Interact with many medicines

Methlyxanthine

- **Theophylline levels are increased by:**
 - Cimetidine, Propranolol, Erythromycin, Clarithromycin, Zileuton
- **Theophylline increases effect of anticoagulants**
- **Theophylline decreases effect of:**
 - Lithium, Phenobarbital, Phenytoin, Carbamazepine

Methlyxanthines

- **The provider action is:**
 - Teach patient to take **EVERY DAY**
 - May cause GI irritation
 - Take with food
 - Annual blood level
 - 5-15 mcg/mL

Methlyxanthines

- Do not switch brands without monitoring level
- Once daily doses
 - Take at 6-7 PM
- Monitor for drug-drug interactions
- Side effect may occur at therapeutic doses

Methlyxanthines

- “Sustained-release theophylline is a mild to moderate bronchodilator used as alternative, not preferred, adjunctive therapy with ICS.”
 - Expert Panel Report 3 (EPR-3)

Immunomodulator

- **Omalizumab (Xolair®)**

Immunomodulator

- Recombinant humanized monoclonal antibody to IgE that may potentially serve as a long-term controller in patients:
 - 12 years of age or older
 - Moderate to severe persistent asthma

Immunomodulator

- Positive skin test or in vitro reactivity to a perennial aeroallergen
- Symptoms are inadequately controlled by ICS

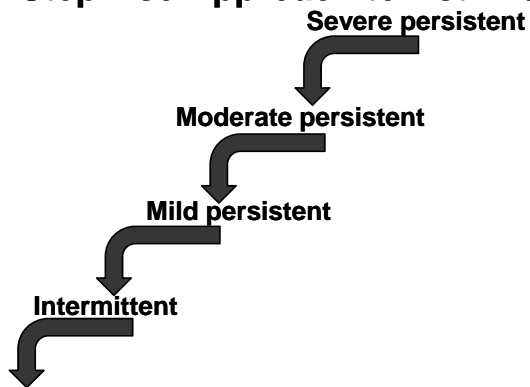
Immunomodulator

- “Used as adjunctive therapy for patients ≥ 12 years of age who have allergies and severe persistent asthma . Clinicians who administer omalizumab should be prepared and equipped to identify and treat anaphylaxis that may occur.”
 - Expert Panel Report 3 (EPR-3)

Stepwise Approach to Asthma

- Stepwise approach to Asthma
Therapy emphasizes initiating higher level therapy at the onset to establish prompt control and then stepping down

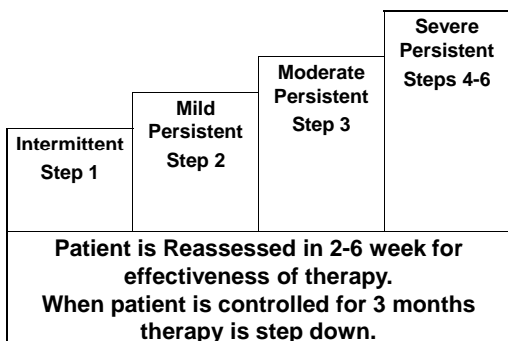
Stepwise Approach to Asthma



Stepwise Approach

- Treatment is initiated according to the patient’s highest component of severity

Stepwise Approach



Stepwise Approach

Age	Intermittent Step 1	Mild Persistent Step 2	Moderate Persistent Step 3	Severe Persistent Steps 4-6
0-4 yrs	SABA PRN	Low ICS	Consult Asthma Specialist	Consult Asthma Specialist
5-11 yrs	SABA PRN	Low ICS	Low ICS + LABA, LTRA, or Theophylline OR Medium ICS	Consult Asthma Specialist
12 + yrs	SABA PRN	Low ICS	Low ICS + LABA OR Medium ICS	Consult Asthma Specialist

Best Add-on Therapy Giving Effective Responses (BADGER)

- Asked the question, Which is the best when a child with asthma (5-11 yrs olds) is poorly controlled despite low dose corticosteroid use?
 - The best response was shown in:
 - Approximately 40% of the children by adding the LABA

Best Add-on Therapy Giving Effective Responses (BADGER)

- 30% by adding the LTRA
- 28% by increasing the dose of ICS

– NEJM. 2010;362:975-985

Allergen Immunotherapy

- May be considered for asthma patients steps 2-4 and/or 5 year to adult:
 - “When there is clear evidence of a relationship between symptoms and exposure to an allergen to which the patient is sensitive.”

Allergen Immunotherapy

- “If use of allergen immunotherapy is elected, it should be administered only in a physician’s office where facilities and trained personnel are available to treat any life-threatening reaction that can, but rarely does, occur.”
 - Expert Panel Report 3 (EPR-3)

Allergen Immunotherapy

- **Mechanisms of action:**
 - Decreases allergen specific IgE production
 - Inhibits seasonal rise in allergen-specific IgE
 - Produces allergen-specific IgG
 - Decreases organ-specific inflammatory cells

Allergen Immunotherapy

- **Demonstrated reduction in asthma symptoms caused by exposure to grass, cat, house-dust mite, ragweed, Cladosporium and Alternaria**
- **Course of allergy immunotherapy typically 3-5 years' duration**

Allergen Immunotherapy

- **Should be administered in a physician's office with trained personnel**

– Expert Panel Report 3 (EPR-3)

Drug Hypersensitivity

- **Patients with asthma may be more sensitive to the following medications:**
 - **Aspirin/NSAIDs**
 - **Anaphylaxis**
 - **Nonselective Beta-blockers**
 - **Bronchospasm**
 - **ACE inhibitors**
 - **Cough**

Key Education Messages Provided by Clinician