# Guideline-directed Asthma Care

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August 1, 2017 – 11 AM – 12:30 PM

# Objectives

- Review asthma prevalence, morbidity and mortality trends
- Describe the four components of the Expert Panel Report-3 (EPR-3)
  - Discuss current standards for determining the diagnosis of asthma, as well as severity and control classifications
  - Highlight asthma triggers (allergens vs. irritants)
  - Compare and contrast the pharmacologic agents recommended by age and severity/control indices
  - Examine the role of patient-provider partnerships in asthma self-management
- Assess the evidence for new therapeutic agents/interventions for asthma from 2017 Global Initiative for Asthma (GINA) and 2018 EPR-4 guidelines
- Identify new risks for asthma related to climate change
- Appraise the current state of asthma adherence

# Asthma prevalence, morbidity and mortality trends

# Asthma prevalence: globally

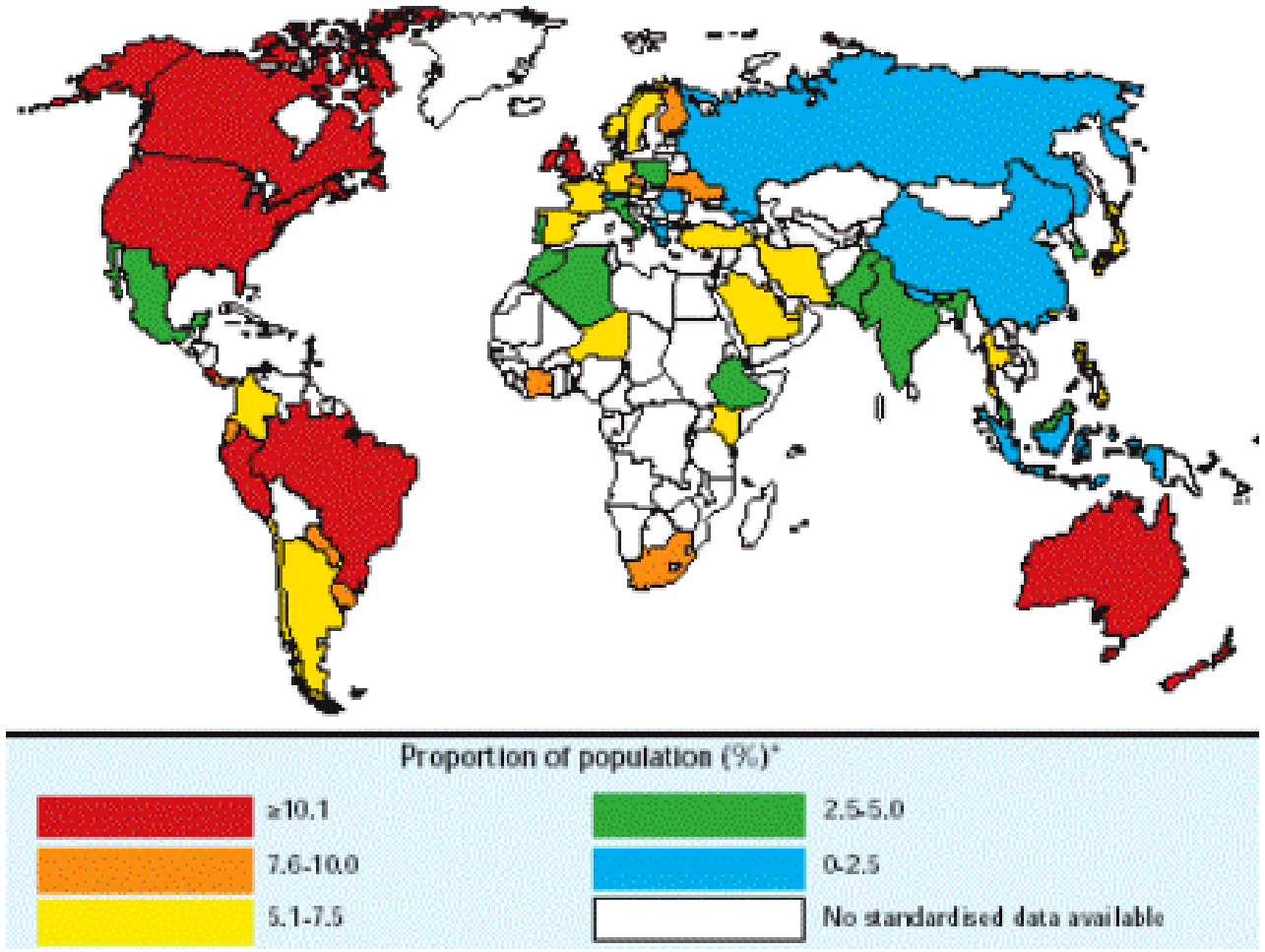
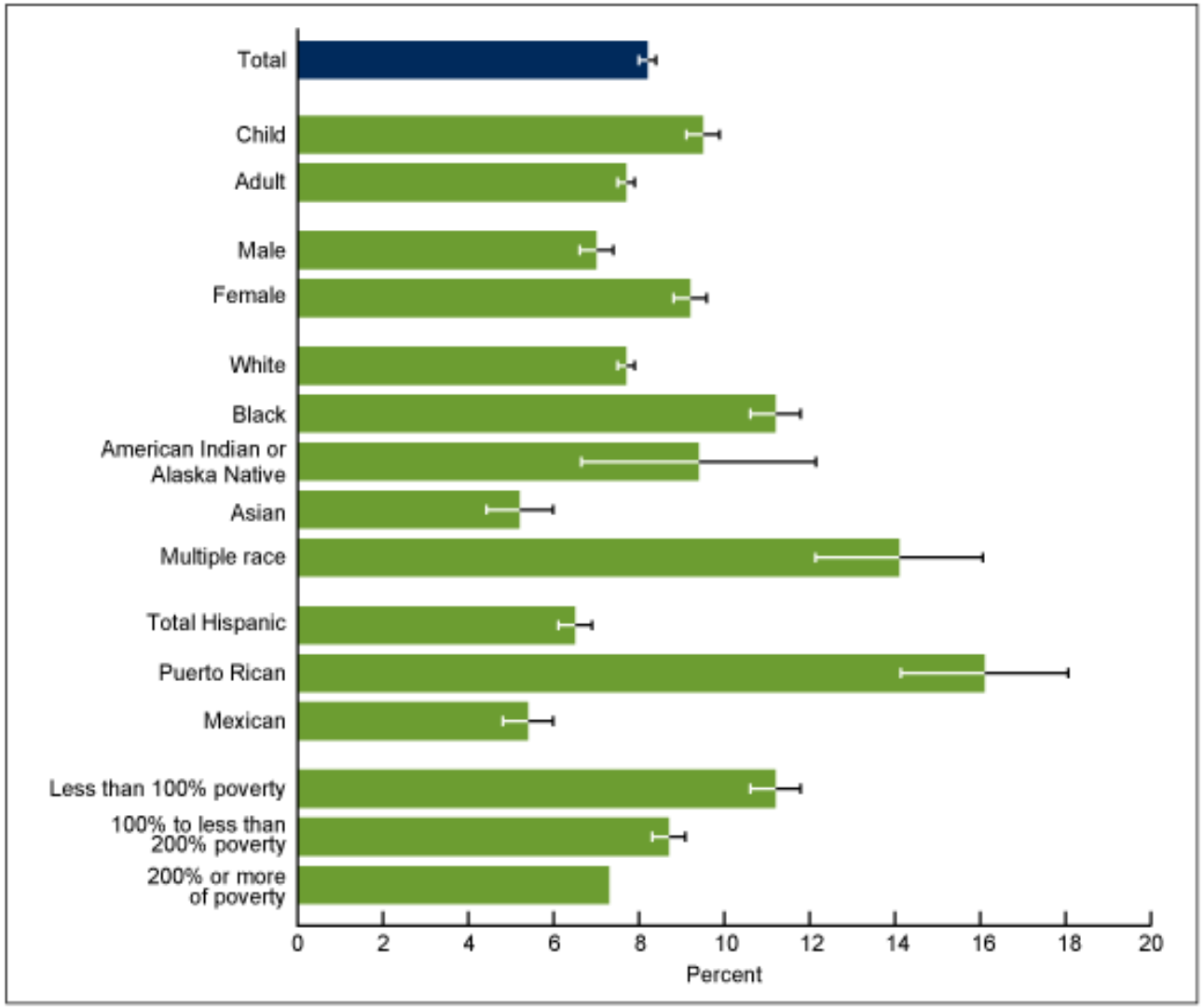


**Figure 2. Asthma prevalence, by selected demographic characteristics: United States, average annual 2008–2010**



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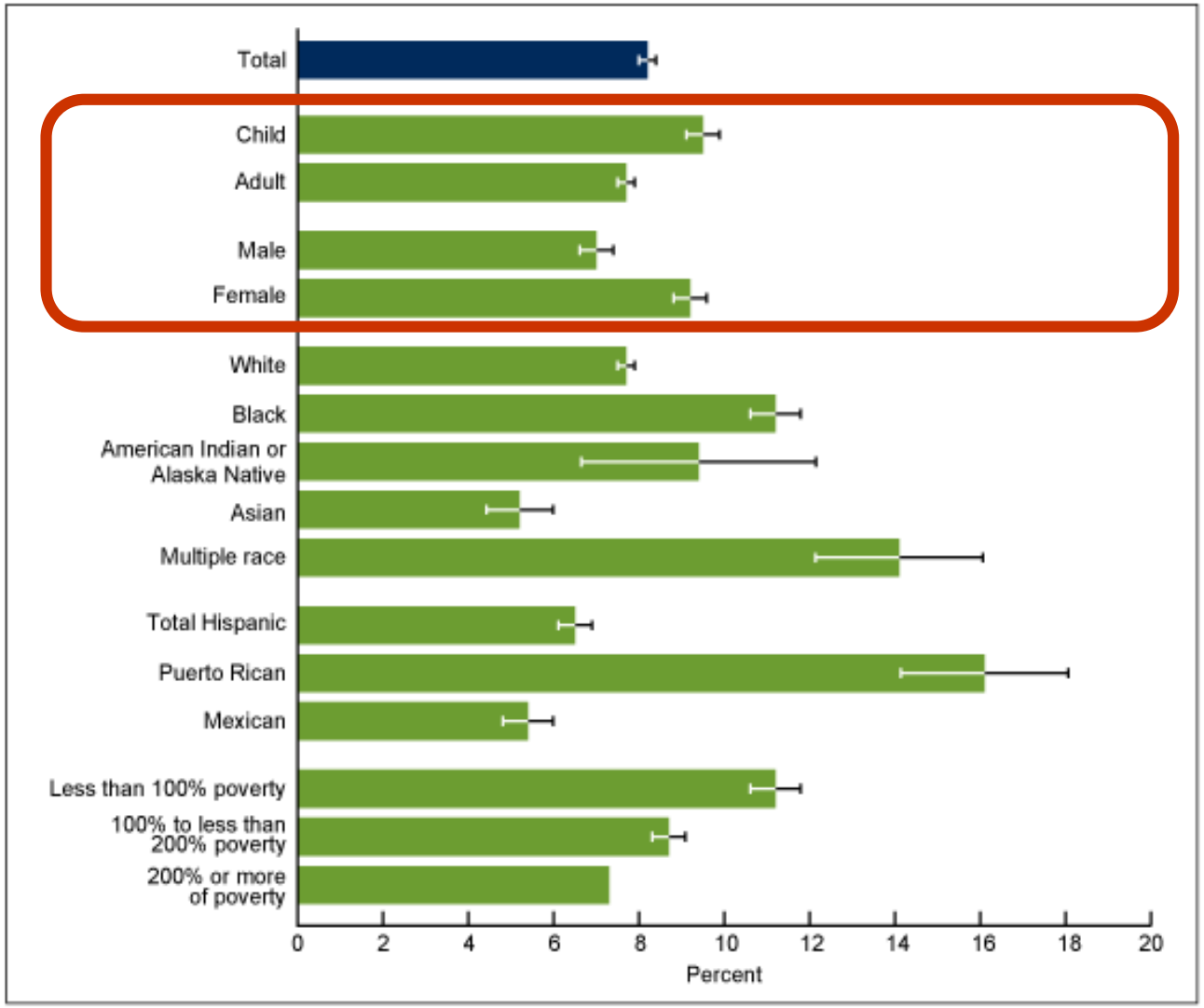

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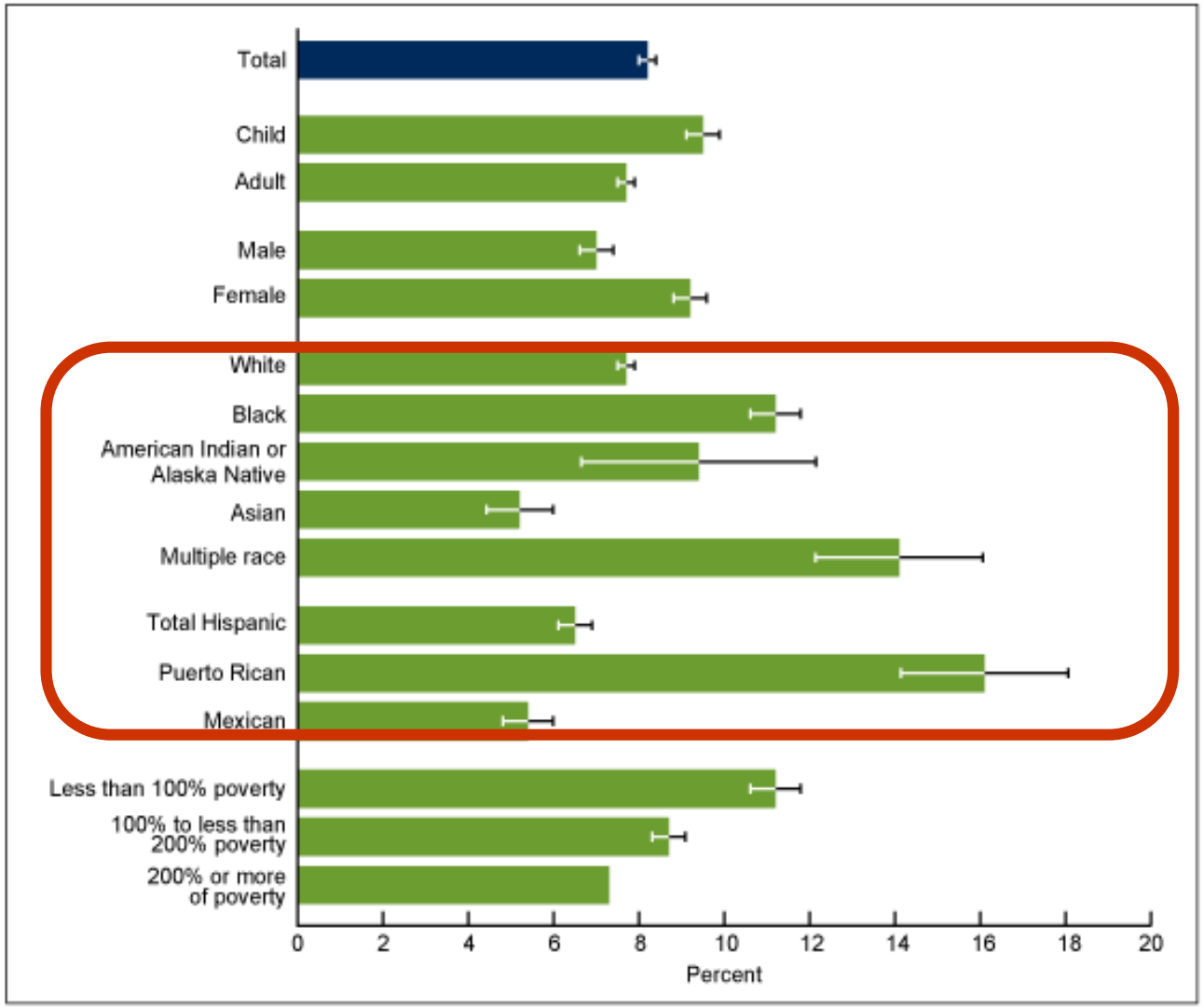

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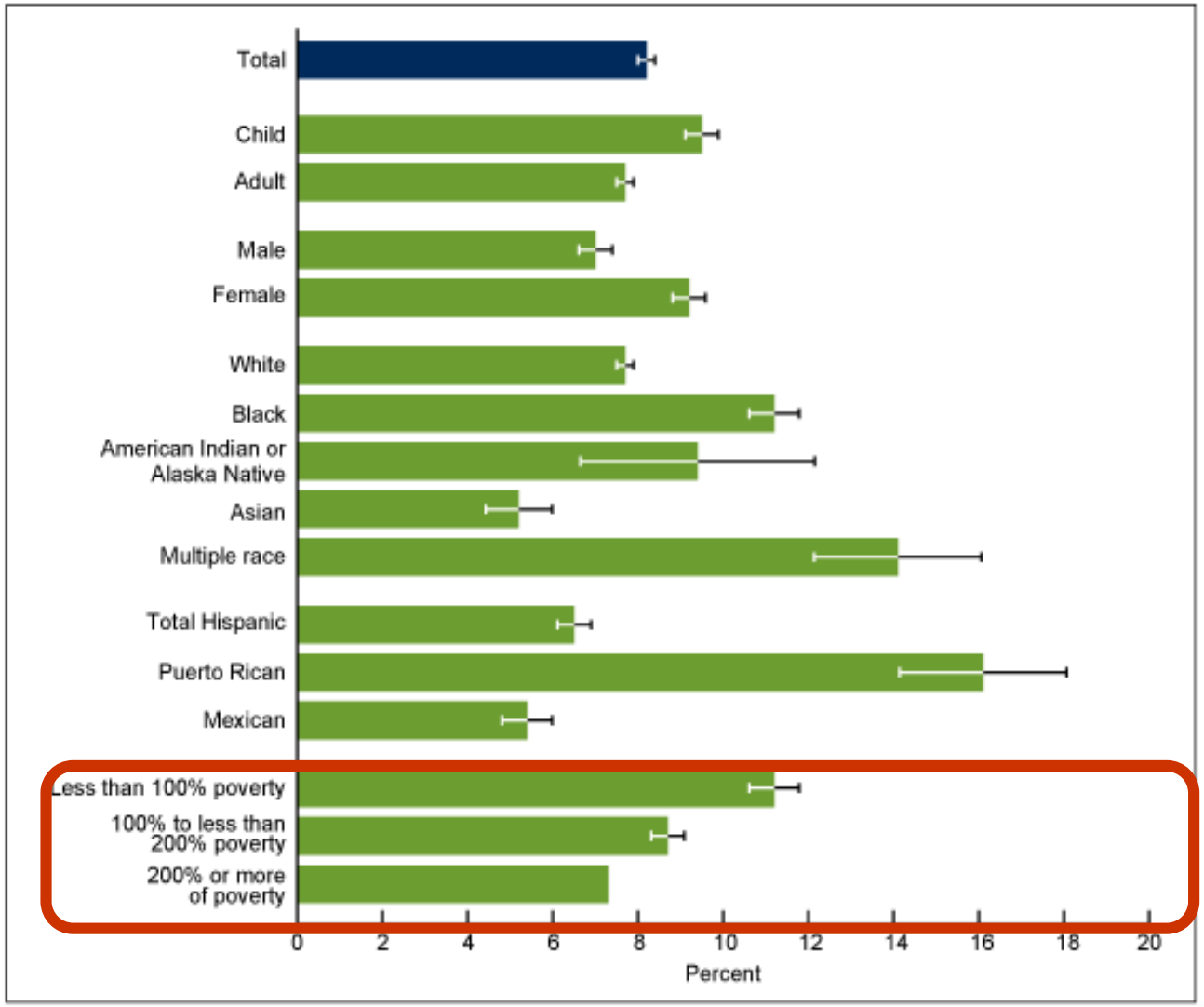

# NCHS Data Brief Number 94, May 2012
# Trends in Asthma Mortality in the United States, 2001–2010

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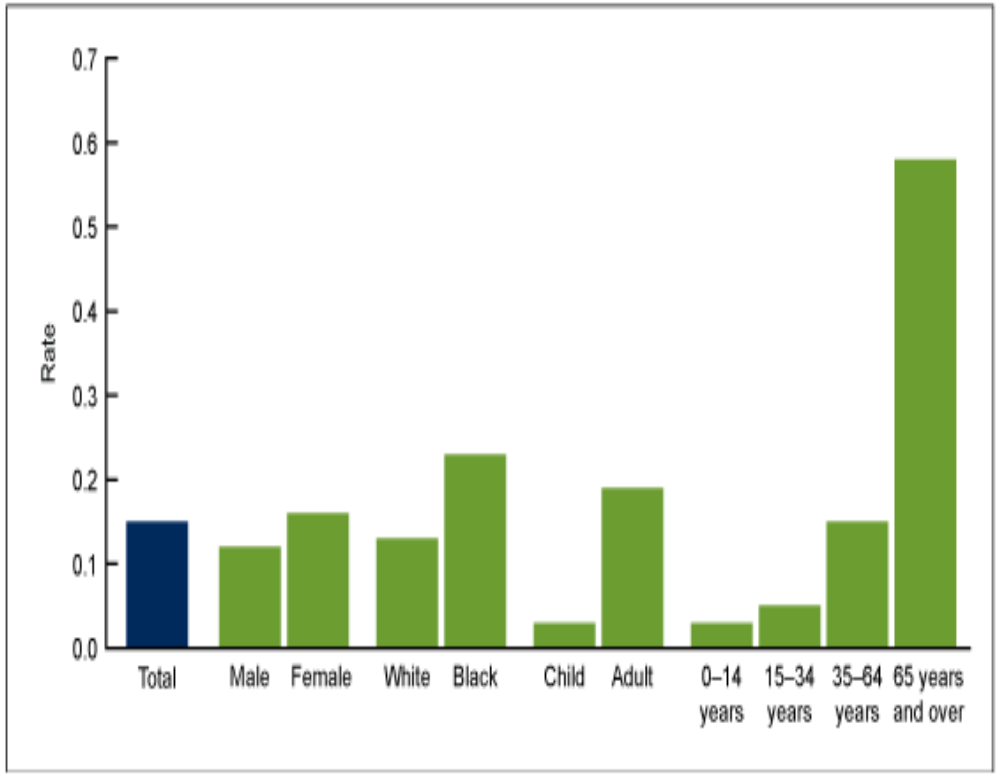

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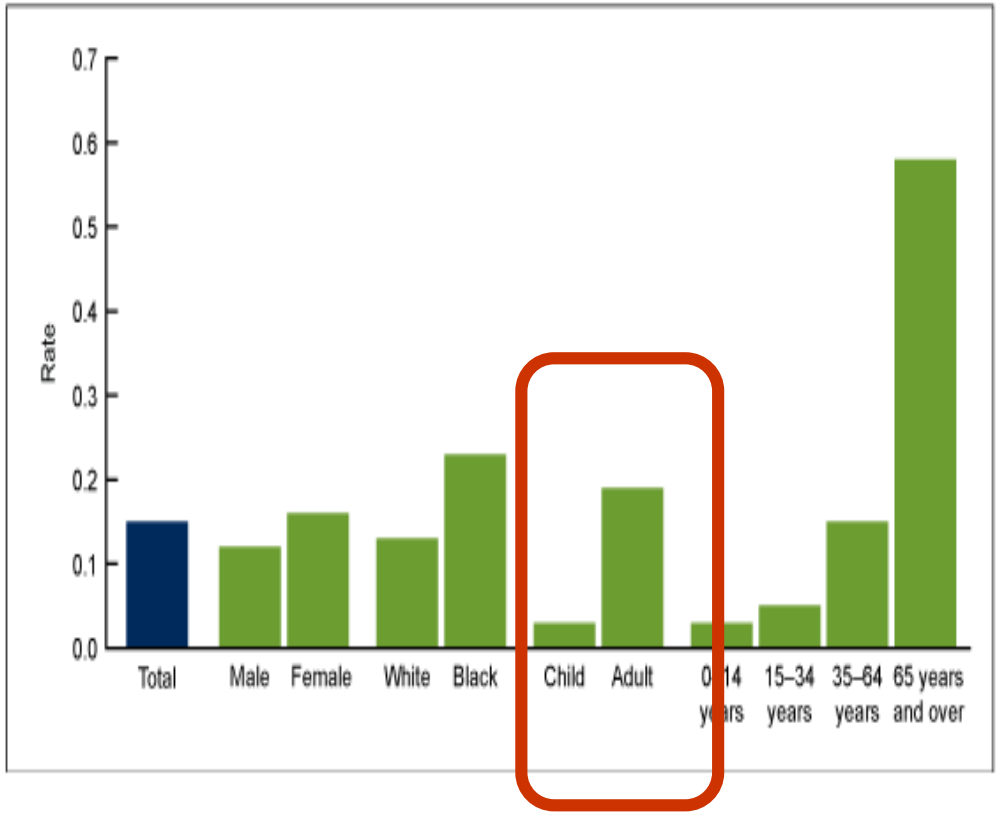

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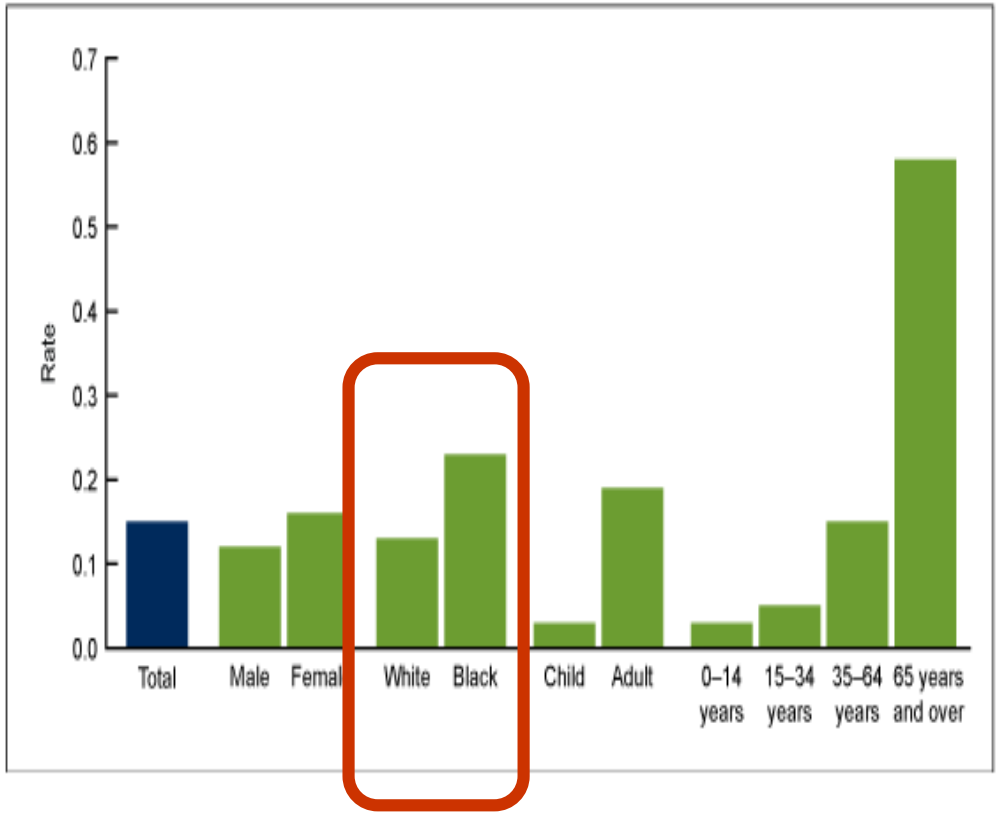


# Describe the four components of the Expert Panel Report-3 (EPR-3)

**Component 1- Measures of Asthma Assessment and Monitoring**

**Component 2-Environmental factors**

**Component 3-Treatment**

**Component 4-Education for a partnership**

# Component 1- Measures of Asthma Assessment and Monitoring

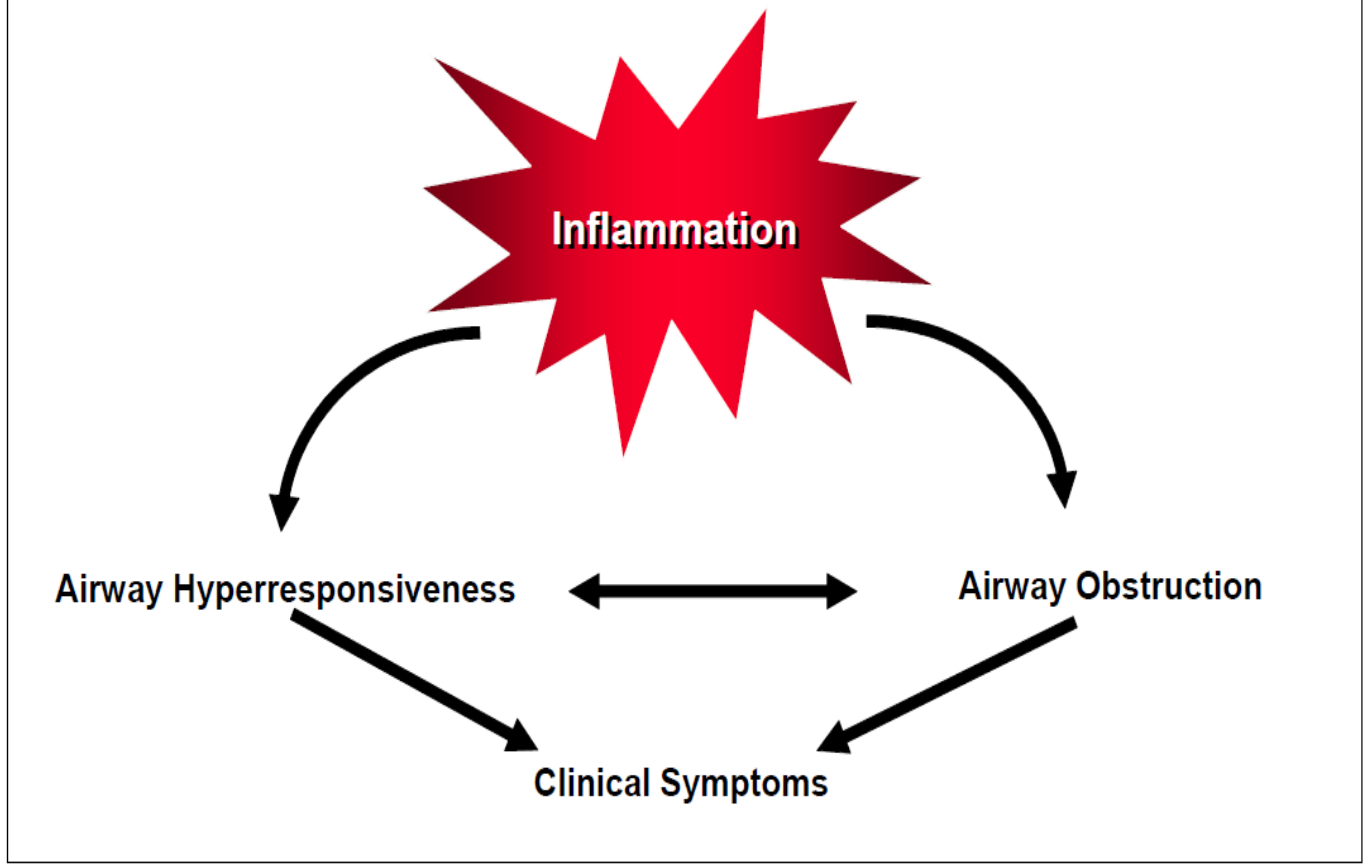
# Defining Asthma

Asthma is a heterogeneous disease, usually characterized by chronic airway inflammation.

It is defined by the history of respiratory symptoms such as wheeze, shortness of breath, chest tightness and cough that vary over time and in intensity, together with variable expiratory airflow limitation.

GINA 2017

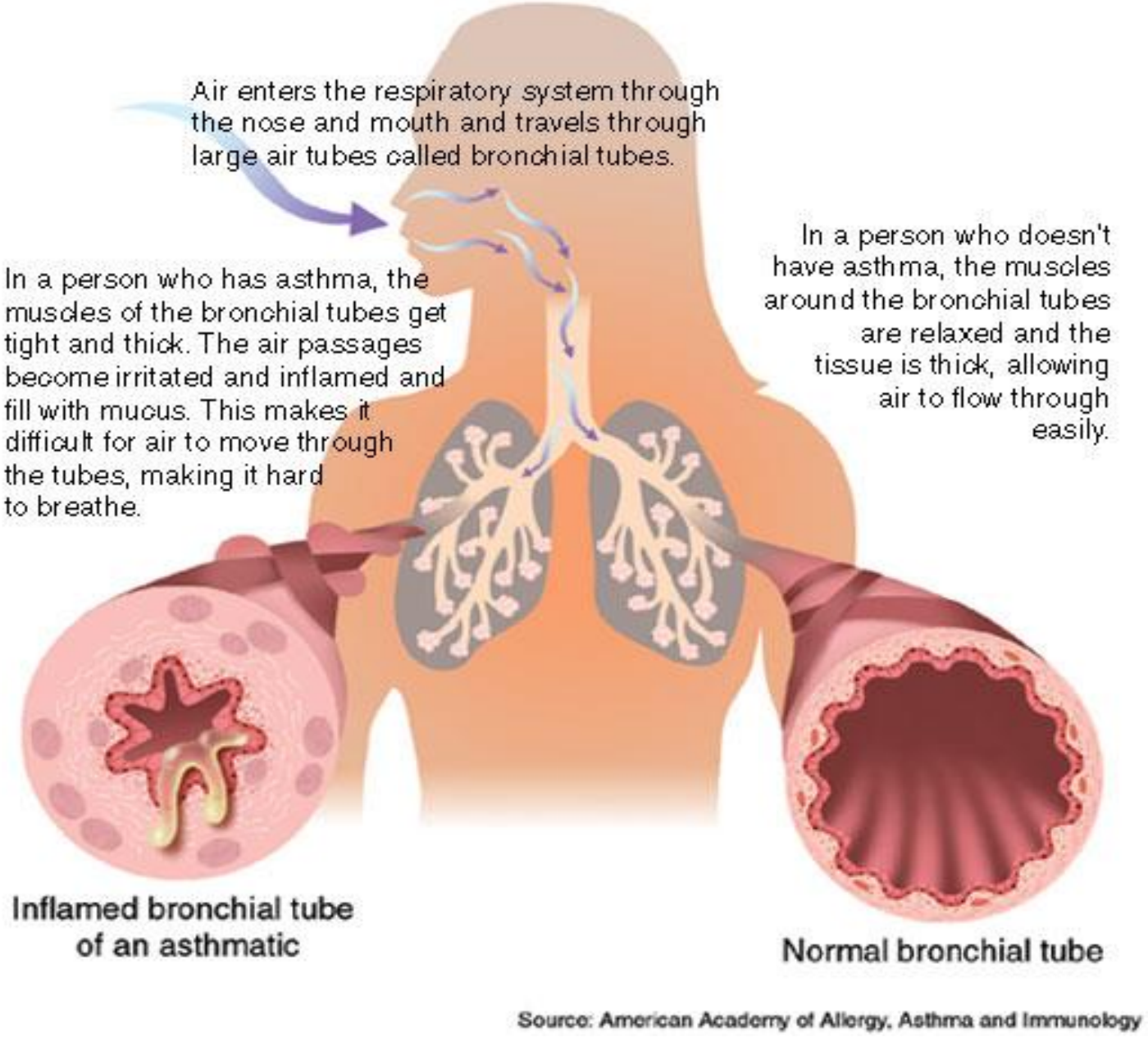
FIGURE 2–1. THE INTERPLAY AND INTERACTION BETWEEN AIRWAY INFLAMMATION AND THE CLINICAL SYMPTOMS AND PATHOPHYSIOLOGY OF ASTHMA

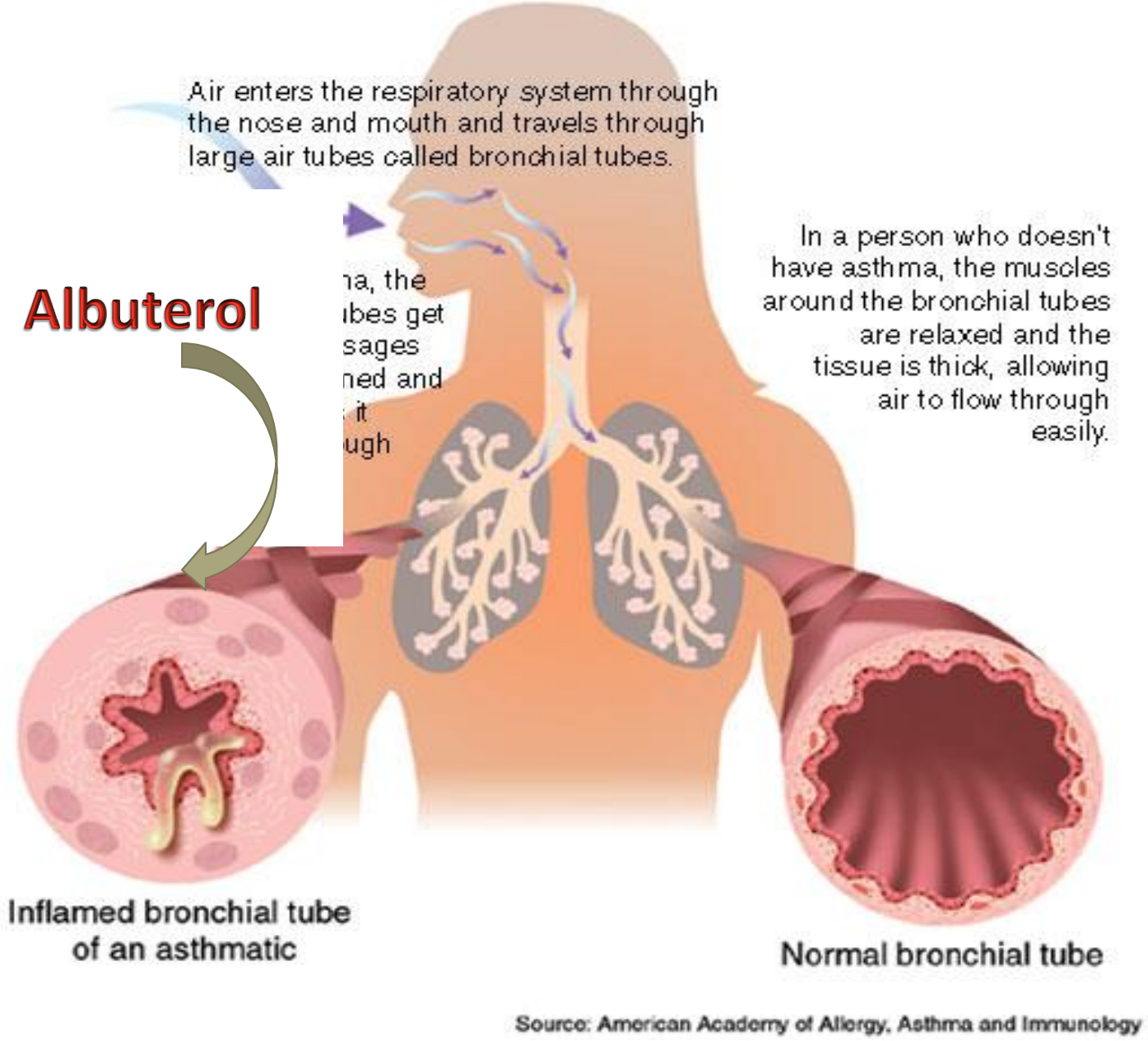



Adapted from: National Heart, Lung, and Blood Institute. *NAEPP Expert Panel Report 3*. Bethesda, MD: National Institutes of Health; 2007.

# Asthma is not Reactive Airways Disease

- "Reactive Airway Disease" and "Asthma" are used interchangeably
  - RAD isn't a specific diagnosis
  - The diagnosis of asthma can-and should be confirmed beginning at age of 5


Air enters the respiratory system through the nose and mouth and travels through large air tubes called bronchial tubes.
In a person who has asthma, the muscles of the bronchial tubes get tight and thick. The air passages become irritated and inflamed and fill with mucus. This makes it difficult for air to move through the tubes, making it hard to breathe.
In a person who doesn't have asthma, the muscles around the bronchial tubes are relaxed and the tissue is thick, allowing air to flow through easily.
Inflamed bronchial tube of an asthmatic
Normal bronchial tube
Source: American Academy of Allergy, Asthma and Immunology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Albuterol
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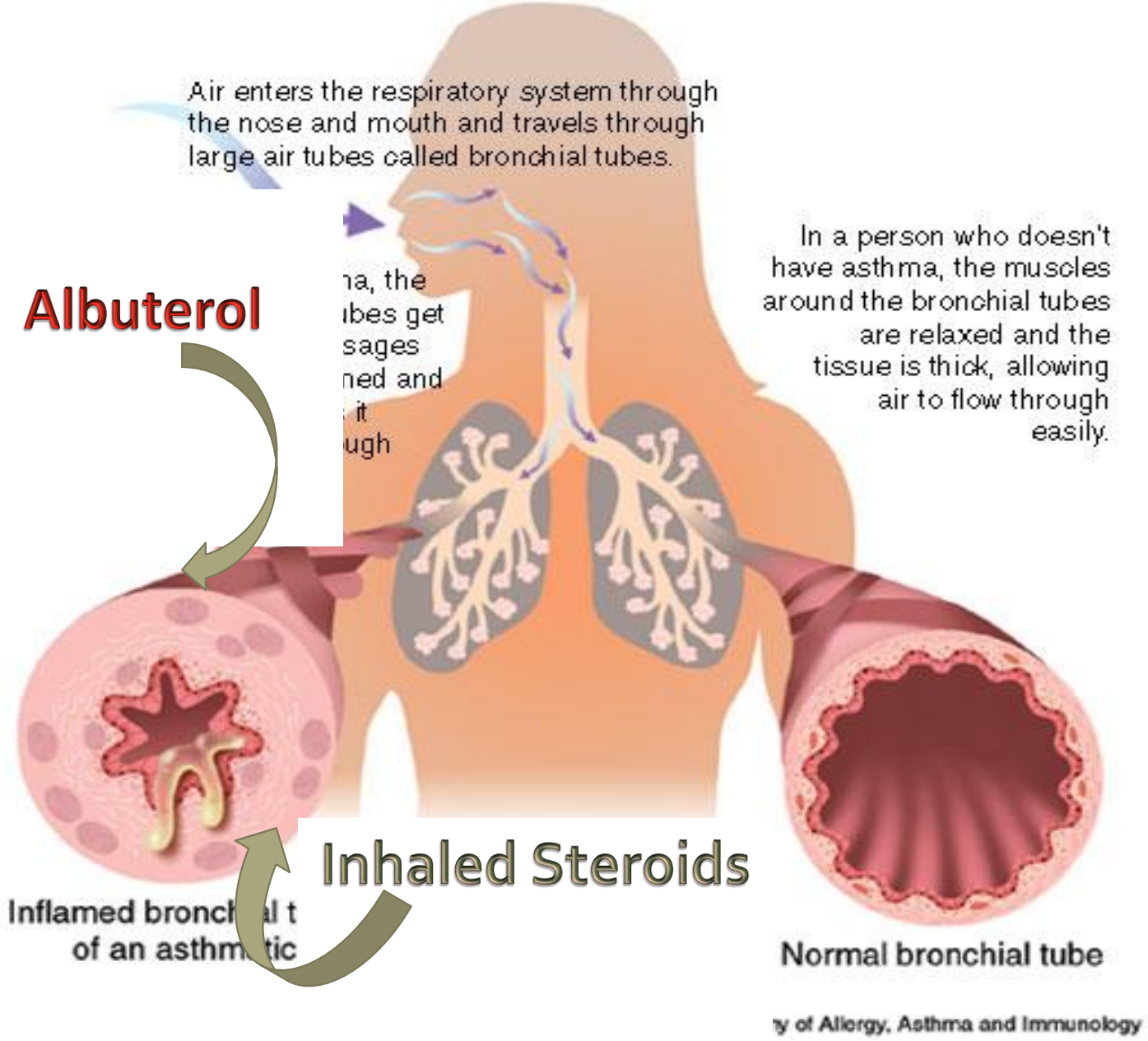
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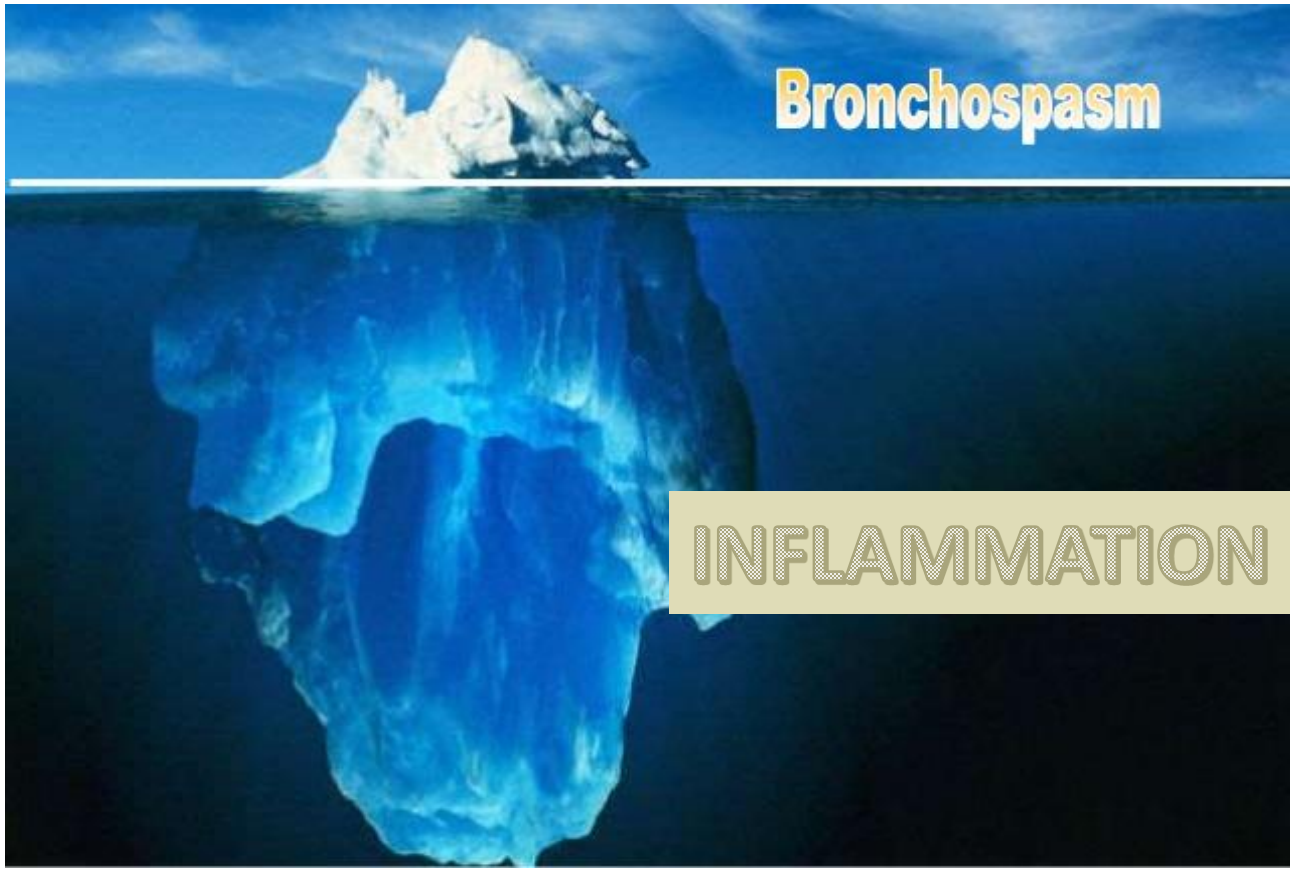
# Asthma symptoms are the tip of the iceberg



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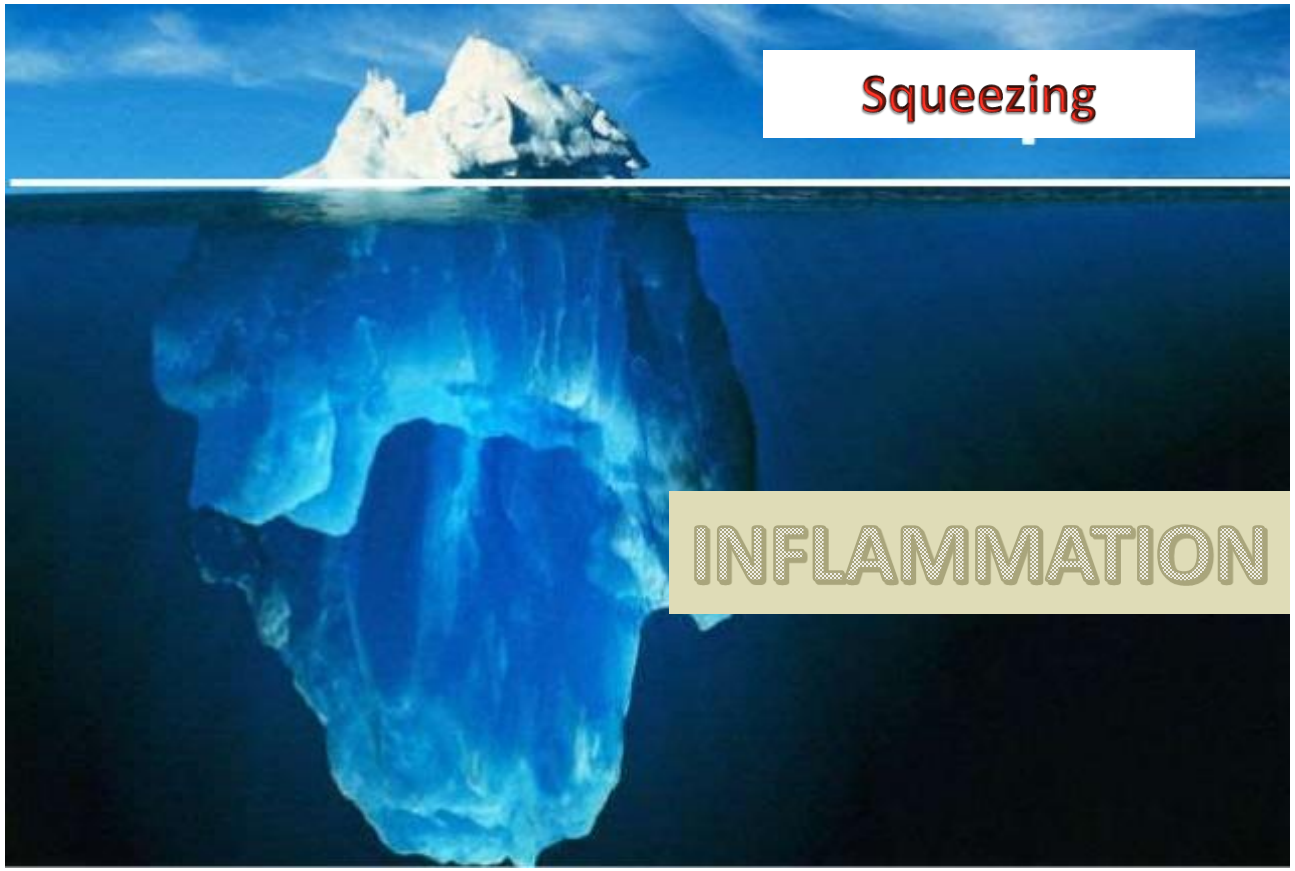

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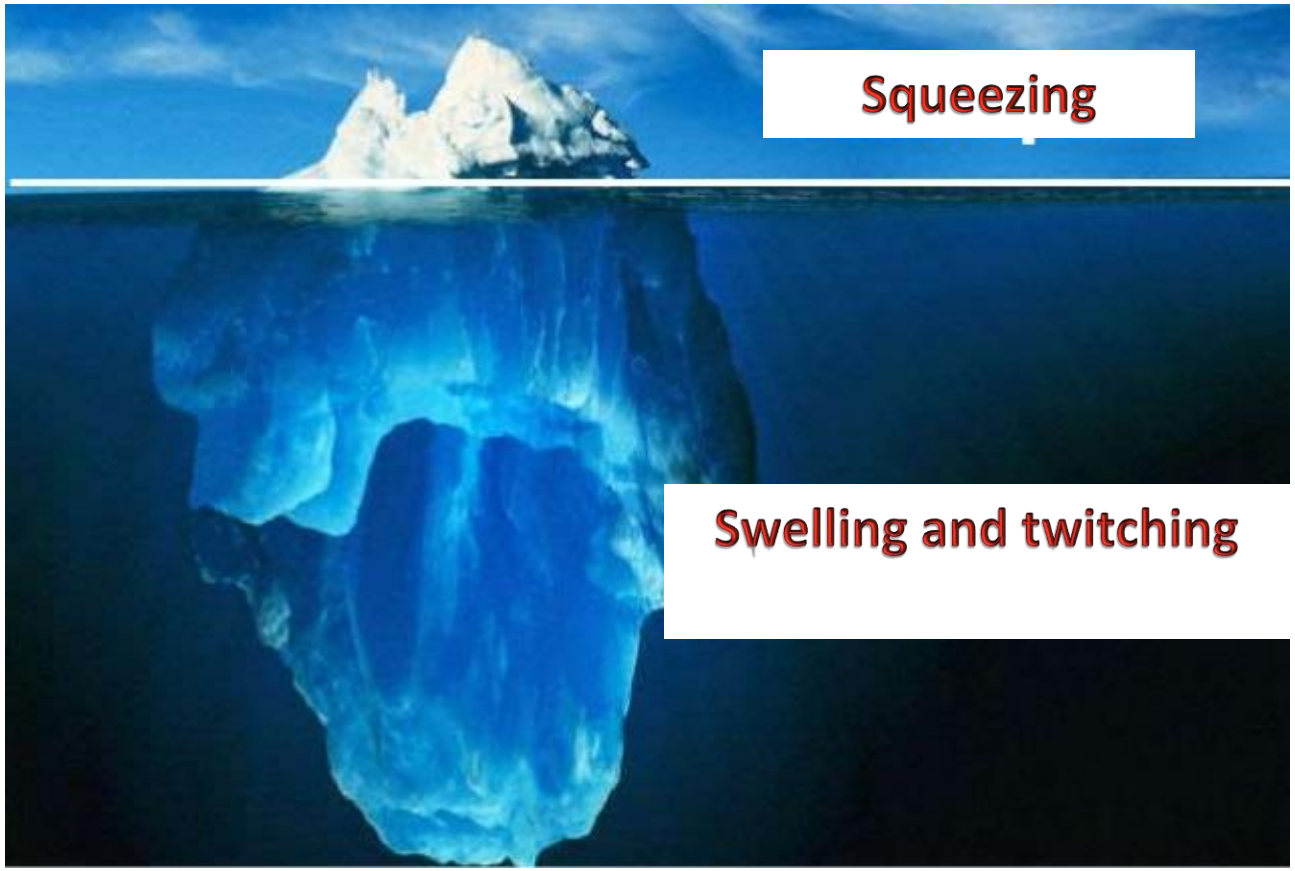
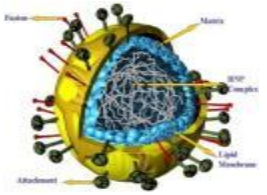


# How do you get asthma?

## Family (genes)

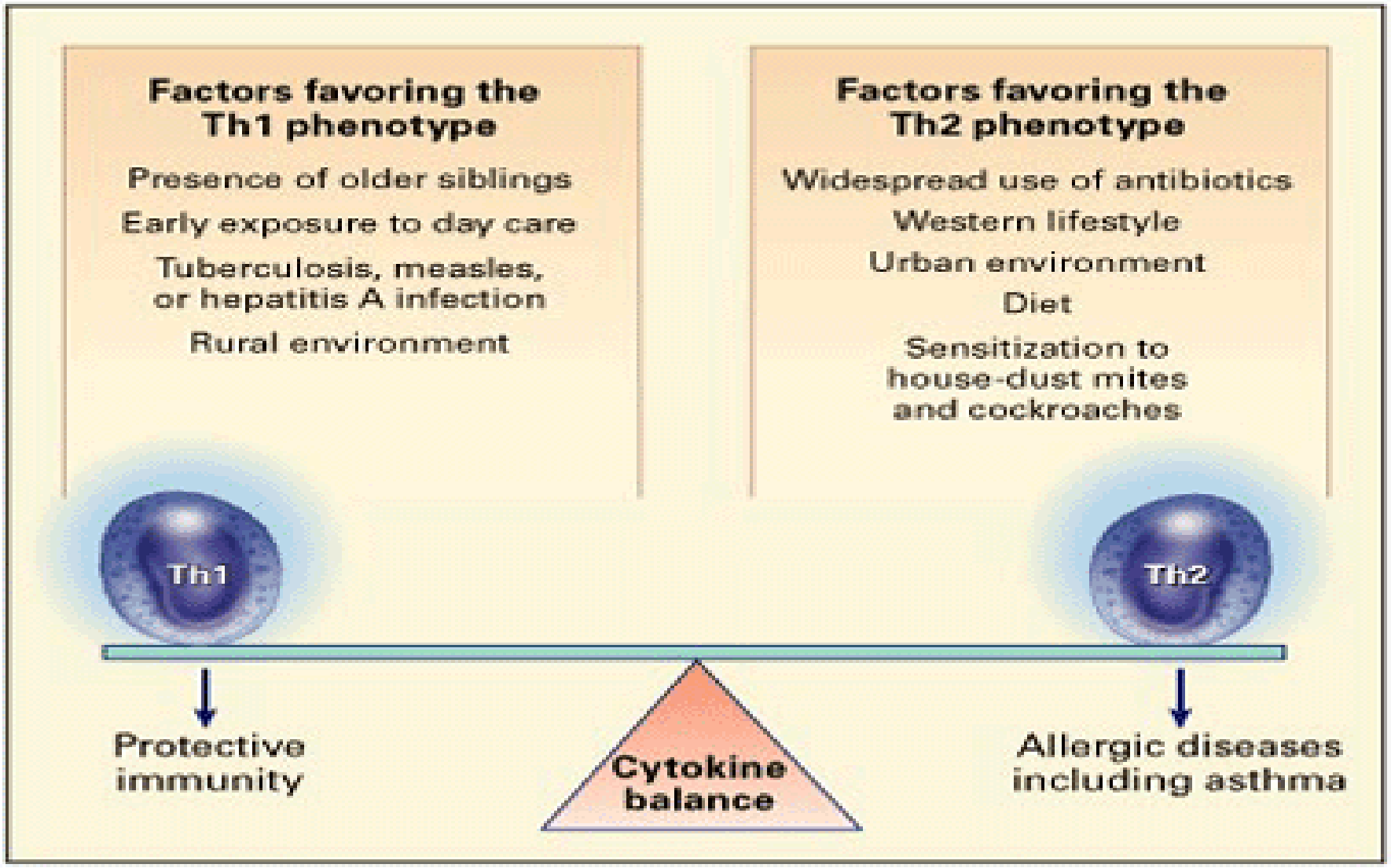
## Triggers



Swelling inside breathing tubes (silent)

Squeezing of muscle around breathing tubes (noisy)

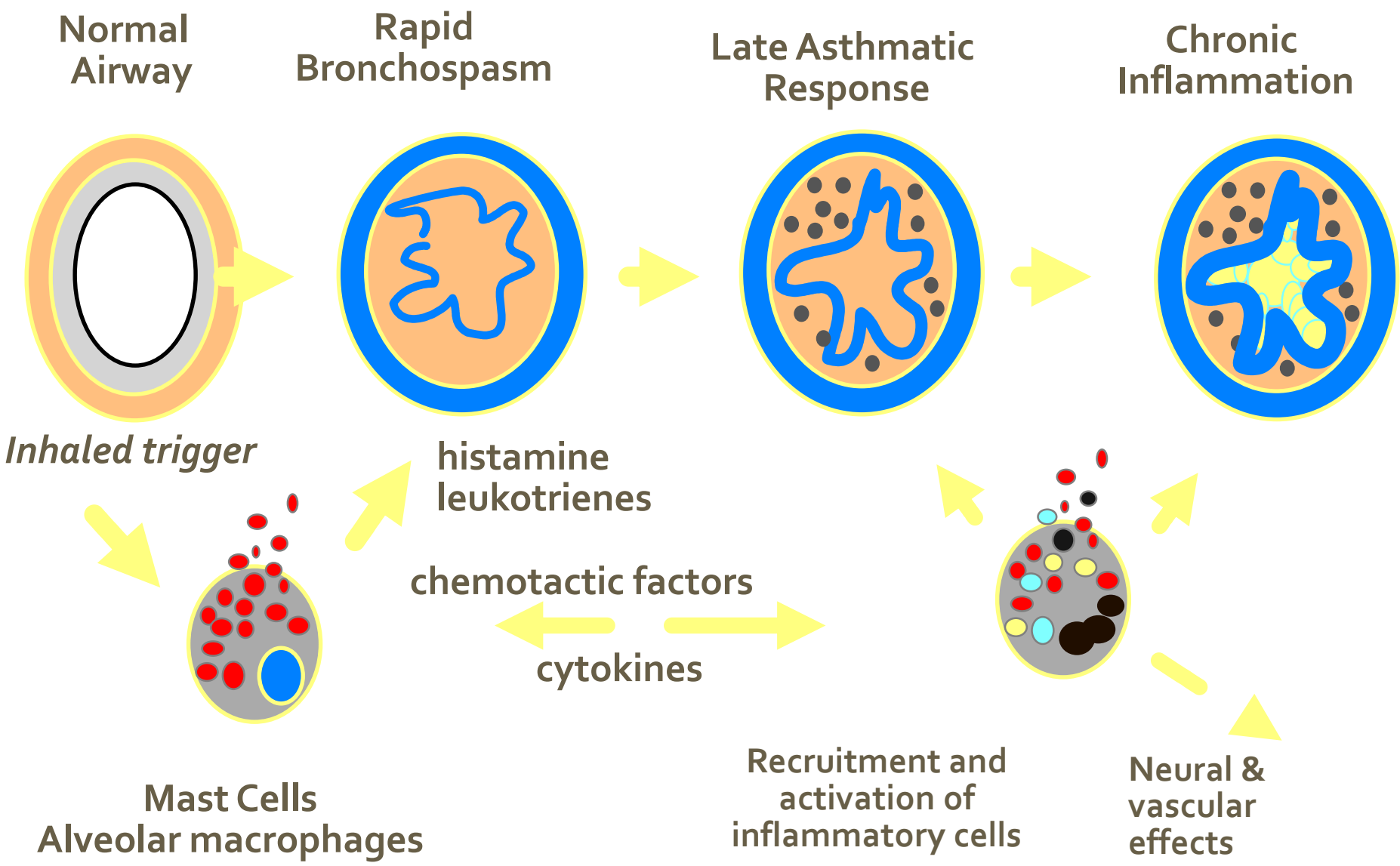
Wheeze, chest tightness, cough, shortness of breath




Hygiene Hypothesis

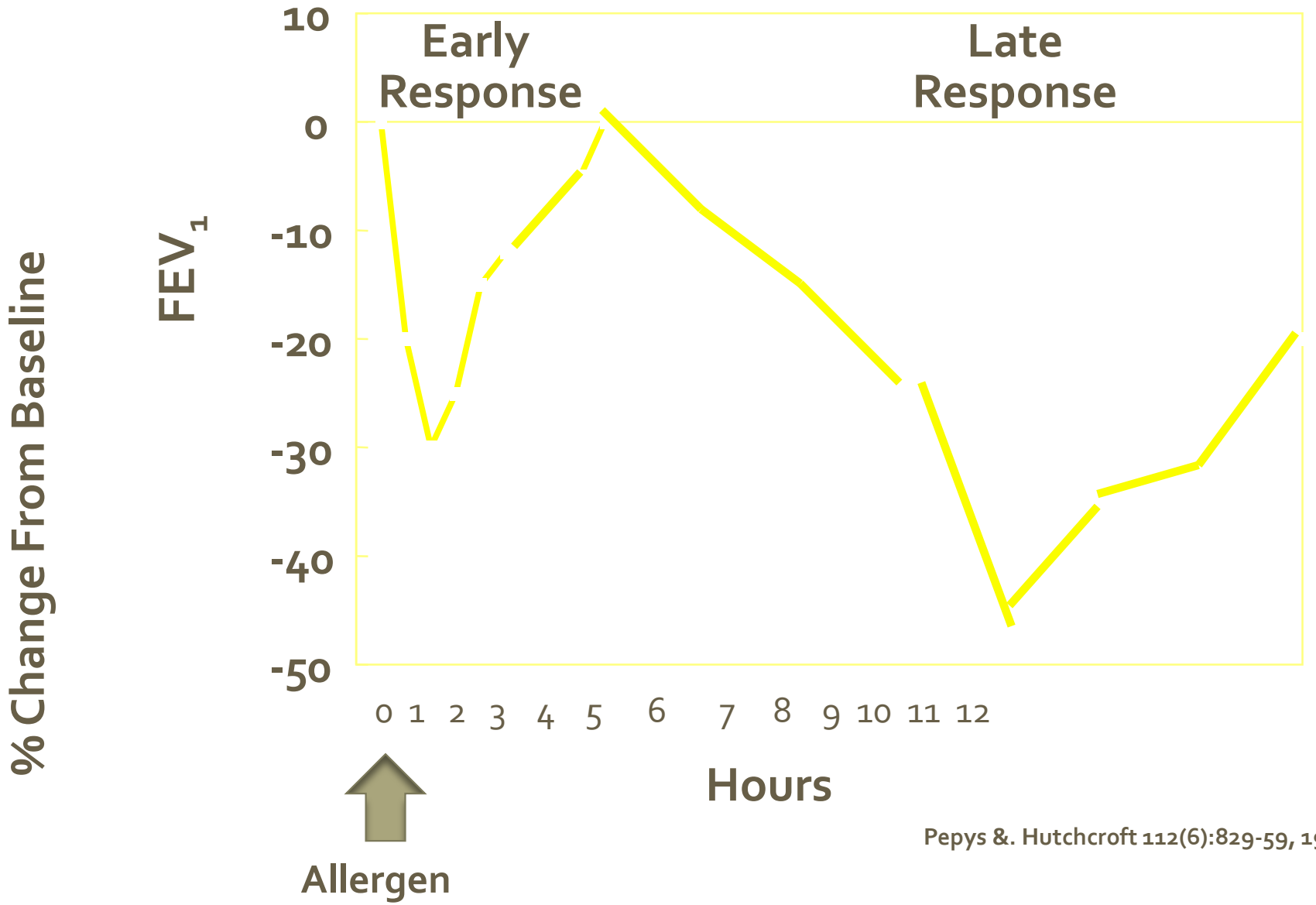
# Allergic and non-allergic asthma

- Allergic asthma, or allergy-induced asthma, is the most common form of the disease
  - Most children have allergic asthma
- Most adults have non-allergic asthma
- Many of the symptoms of allergic and non-allergic asthma are the same but the triggers may differ




Pepys &. Hutchcroft 112(6):829-59, 1975

# Early and Late Asthmatic Response

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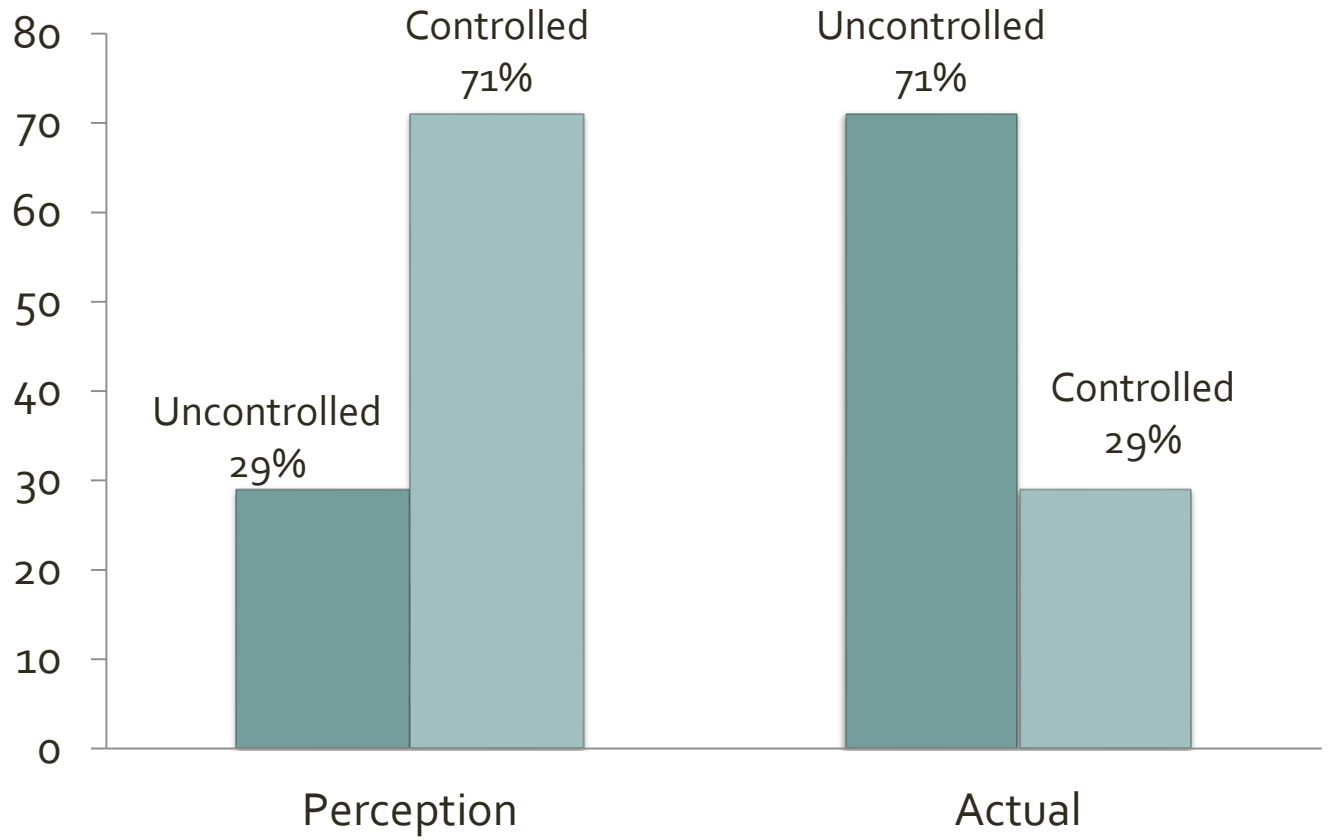
# Asthma control: Perceived and actual



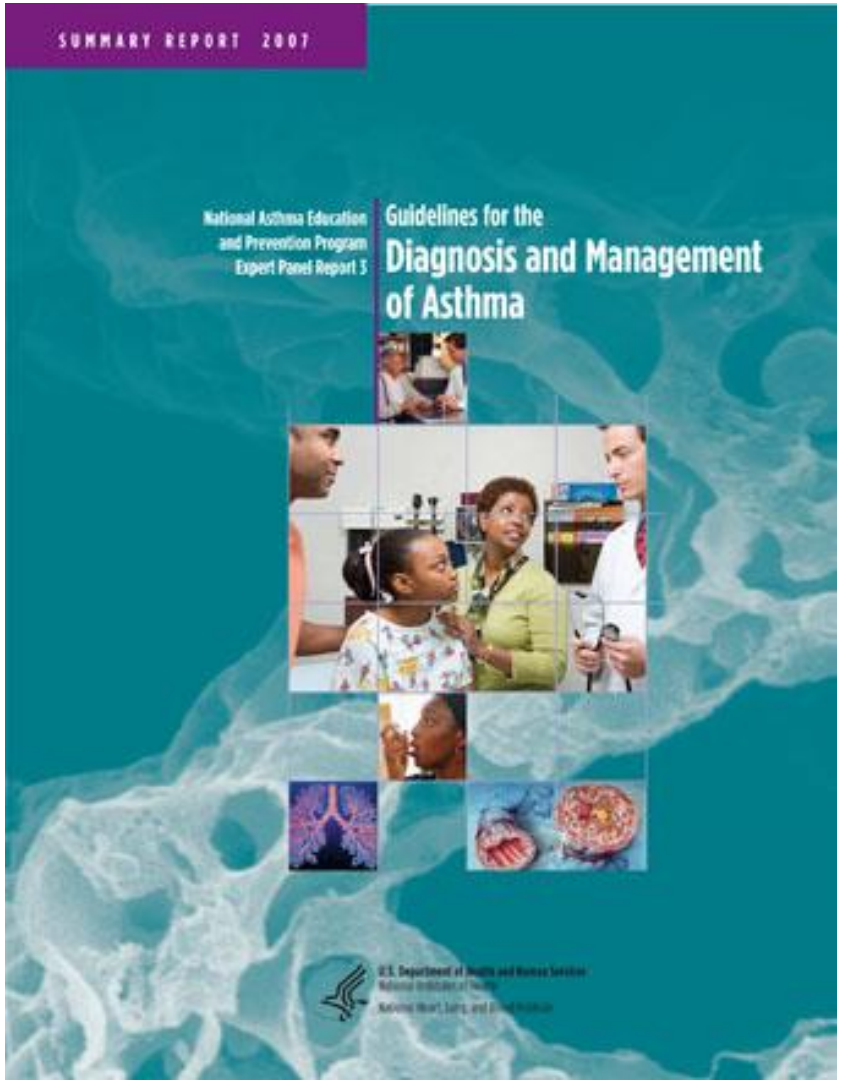

AIM study, 2009

# Factors Contributing to Uncontrolled Asthma

- Failure to recognize or respond to signs and symptoms of asthma
- Inadequate treatment for level of severity
- Non-adherence
- Insufficient monitoring
- Failure to avoid or reduce exposure to asthma triggers
- Suboptimal patient-provider communication/ partnership

National Heart, Lung, and Blood Institute. *NAEPP Expert Panel Report 3*. Bethesda, MD: National Institutes of Health; 2007.

Current standards for determining the diagnosis of asthma, as well as severity and control classifications




2007

Updated yearly

GLOBAL INITIATIVE FOR ASTHMA®

# Diagnosis of asthma

- The diagnosis of asthma should be based on:
  - A history of characteristic symptom patterns
  - Evidence of variable airflow limitation, from bronchodilator reversibility testing or other tests

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  - It is often more difficult to confirm the diagnosis after treatment has been started

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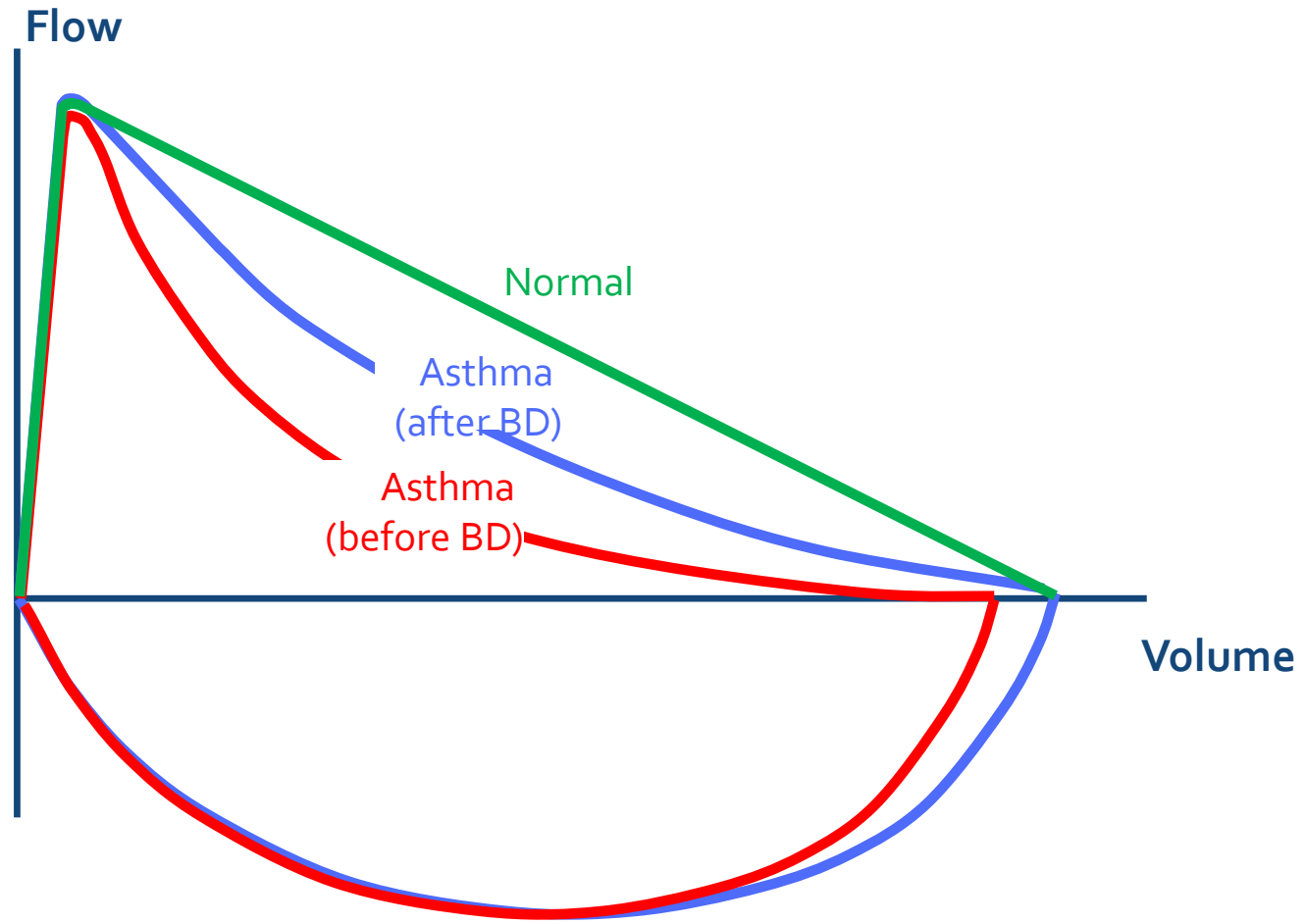
- Document evidence for the diagnosis in the patient's notes, preferably before starting controller treatment
  - It is often more difficult to confirm the diagnosis after treatment has been started
- Asthma is usually characterized by airway inflammation and airway hyperresponsiveness, but these are not necessary or sufficient to make the diagnosis of asthma.

# Typical spirometric tracings




Note: Each $FEV_1$ represents the highest of three reproducible measurements

# Measures of lung function in asthma

## Peak flow

- Used only for monitoring
- Can provide falsely high or falsely low readings
- More erroneous measures in children compared to adults
- SYMPTOM BASED ACTION PLAN IS PREFERABLE
- Efforts cannot be quality assured

## Spirometry

- Used for diagnosis and monitoring
  - 12% improvement in the $FEV_1$ pre- post- SABA
  - If – BD response, is asthma ruled out?
  - $FEV_1$/FVC is better for determining severity
  - $FEV_1$ is better for predicting an exacerbation
- Efforts can be quality assured

# MAPI: Predicting asthma in those 5 years and younger

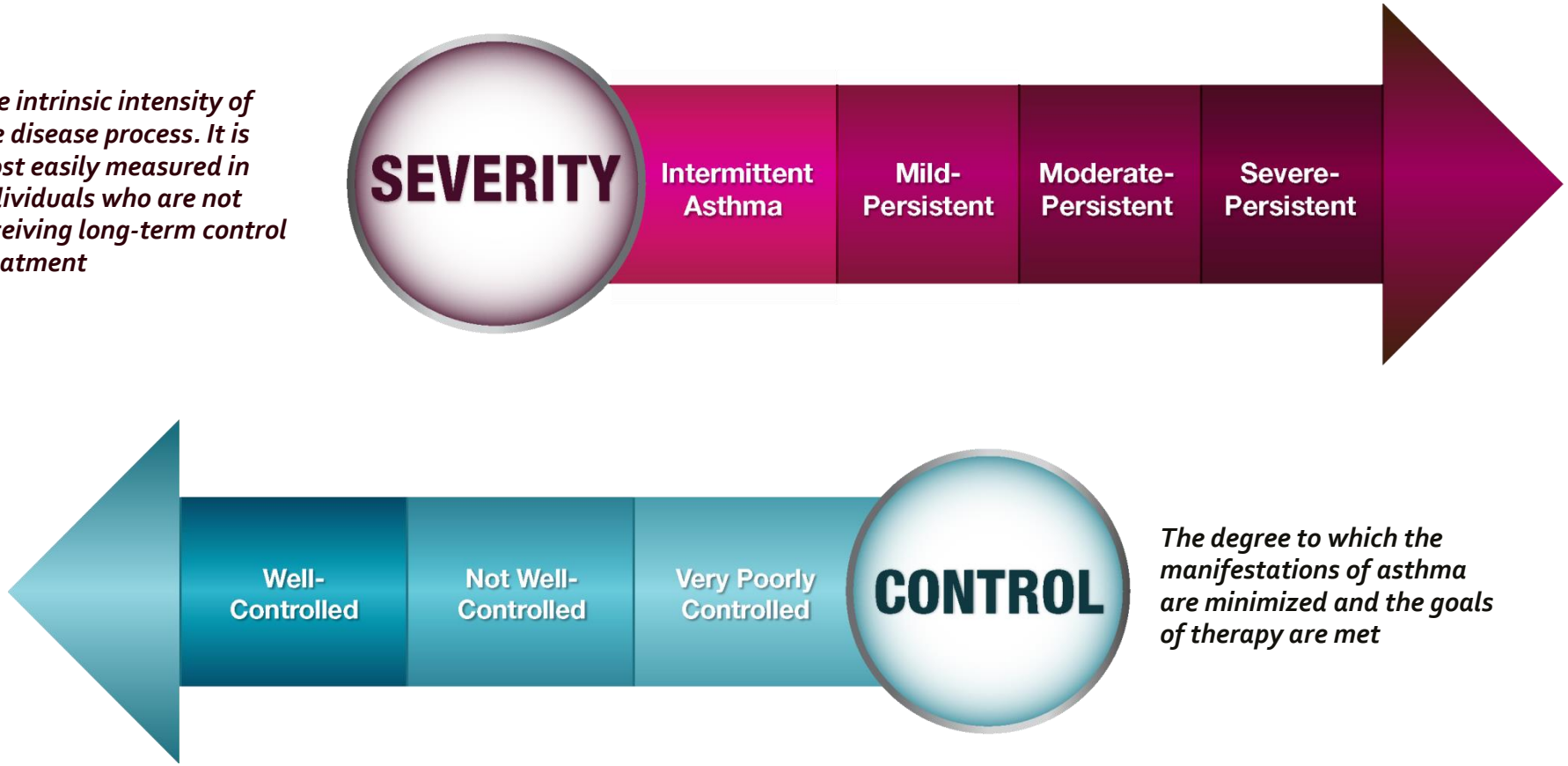
**Modified Asthma Predictive Index (mAPI)**

≥4 Wheezing Illnesses *and*

| ≥1 Major criteria | | ≥2 Minor criteria |
|---|---|---|
| -Parental asthma | | -Food sensitization |
| -Atopic dermatitis (MD diagnosed) | *OR* | -Peripheral blood eosinophils ≥4% |
| -Aeroallergen sensitization | | -Wheezing apart from colds |

# Asthma Severity and Control

*The intrinsic intensity of the disease process. It is most easily measured in individuals who are not receiving long-term control treatment*




*The degree to which the manifestations of asthma are minimized and the goals of therapy are met*

# Asthma severity

# The Pediatrician's Ready Reference Guide

Current NHLBI guidelines on assessing and monitoring asthma control

## TABLE 1 CLASSIFYING ASTHMA SEVERITY & INITIATION OF TREATMENT BY AGE

| COMPONENTS OF SEVERITY | | | INTERMITTENT | | | PERSISTENT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | MILD | | | MODERATE | | | SEVERE | | |
| AGE IN YEARS | | | 0-4 | 5-11 | >12 | 0-4 | 5-11 | >12 | 0-4 | 5-11 | >12 | 0-4 | 5-11 | >12 |
| IMPAIRMENT | Symptoms | | ≤2 days/week | | | ≤2 days/week but not daily | | | Daily | | | Throughout the day | | |
| | Nocturnal symptoms | | 0 | ≤2x/month | | 1-2x/ month | 3-4x/month | | 3-4x/ month | ≥1x/week | | ≥2x/ week | Often 7x/week | |
| | SABA use | | ≤2 days/week | | | ≥2 days/week | | | Daily | | | Several times/day | | |
| | Interferes with normal activity | | None | | | Minor | | | Some | | | Extremely | | |
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| RISK | Exacerbations requiring systemic corticosteroids | | 0-1x/year | | | ≥2x/6 months **OR** >4x/year + risk factors | >2x/year → | | | | | | | |
| RECOMMENDED STEP FOR INITIATING TREATMENT | | | STEP 1 | | | STEP 2 | | | STEP 3 | | | STEP 3 | | STEP 4 **OR** STEP 5 |

Abbreviation: FEV, forced expiratory volume; FVC, forced vital capacity; PFT, pulmonary function test; NHLBI, National Heart, Lung, and Blood Institute; SABA, short-acting beta agonist.

From Reddy AP, et al.[4]

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| RECOMMENDED STEP FOR INITIATING TREATMENT | | | STEP 1 | | | STEP 2 | | | STEP 3 | | | STEP 3 | | STEP 4 **OR** STEP 5 |

Abbreviation: FEV, forced expiratory volume; FVC, forced vital capacity; PFT, pulmonary function test; NHLBI, National Heart, Lung, and Blood Institute; SABA, short-acting beta agonist.

From Reddy AP, et al.[4]

# The Pediatrician's Ready Reference Guide

## Current NHLBI guidelines on assessing and monitoring asthma control

### TABLE 1 CLASSIFYING ASTHMA SEVERITY & INITIATION OF TREATMENT BY AGE

| COMPONENTS OF SEVERITY | | INTERMITTENT | | | PERSISTENT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MILD | | | MODERATE | | | SEVERE | | |
| AGE IN YEARS | | 0-4 | 5-11 | >12 | 0-4 | 5-11 | >12 | 0-4 | 5-11 | >12 | 0-4 | 5-11 | >12 |
| IMPAIRMENT | Symptoms | ≤2 days/week | | | ≤2 days/week but not daily | | | Daily | | | Throughout the day | | |
| | Nocturnal symptoms | 0 | ≤2x/month | | 1-2x/ month | 3-4x/month | | 3-4x/ month | ≥1x/week | | ≥2x/ week | Often 7x/week | |
| | SABA use | ≤2 days/week | | | ≥2 days/week | | | Daily | | | Several times/day | | |
| | Interferes with normal activity | None | | | Minor | | | Some | | | Extremely | | |
| | PFT $FEV_1$ | n/a | >80% | | n/a | 80% | | n/a | 60%-80% | | n/a | <60% | |
| | PFT $FEV_1$/FVC | n/a | >85% | Normal ratio | n/a | >80% | Normal ratio | n/a | 75%-80% | Reduced by >5% | n/a | <75% | Reduced by >5% |
| RISK | Exacerbations requiring systemic corticosteroids | 0-1x/year | | | ≥2x/6 months **OR** >4x/year + risk factors | >2x/year → | | | | | | | |
| RECOMMENDED STEP FOR INITIATING TREATMENT | | STEP 1 | | | STEP 2 | | | STEP 3 | | | STEP 3 | | STEP 4 **OR** STEP 5 |

Abbreviation: FEV, forced expiratory volume; FVC, forced vital capacity; PFT, pulmonary function test; NHLBI, National Heart, Lung, and Blood Institute; SABA, short-acting beta agonist.

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### TABLE 1 CLASSIFYING ASTHMA SEVERITY & INITIATION OF TREATMENT BY AGE

| COMPONENTS OF SEVERITY | | INTERMITTENT | | | PERSISTENT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MILD | | | MODERATE | | | SEVERE | | |
| AGE IN YEARS | | 0-4 | 5-11 | >12 | 0-4 | 5-11 | >12 | 0-4 | 5-11 | >12 | 0-4 | 5-11 | >12 |
| IMPAIRMENT | Symptoms | ≤2 days/week | | | ≤2 days/week but not daily | | | Daily | | | Throughout the day | | |
| | Nocturnal symptoms | 0 | ≤2x/month | | 1-2x/ month | 3-4x/month | | 3-4x/ month | ≥1x/week | | ≥2x/ week | Often 7x/week | |
| | SABA use | ≤2 days/week | | | ≥2 days/week | | | Daily | | | Several times/day | | |
| | Interferes with normal activity | None | | | Minor | | | Some | | | Extremely | | |
| | PFT: $FEV_1$ | n/a | >80% | | n/a | 80% | | n/a | 60%-80% | | n/a | <60% | |
| | PFT: $FEV_1$/FVC | n/a | >85% | Normal ratio | n/a | >80% | Normal ratio | n/a | 75%-80% | Reduced by >5% | n/a | <75% | Reduced by >5% |
| RISK | Exacerbations requiring systemic corticosteroids | 0-1x/year | | | ≥2x/6 months **OR** >4x/year + risk factors | >2x/year → | | | | | | | |
| RECOMMENDED STEP FOR INITIATING TREATMENT | | STEP 1 | | | STEP 2 | | | STEP 3 | | | STEP 3 | | STEP 4 **OR** STEP 5 |

Abbreviation: FEV, forced expiratory volume; FVC, forced vital capacity; PFT, pulmonary function test; NHLBI, National Heart, Lung, and Blood Institute; SABA, short-acting beta agonist.

From Reddy AP, et al.[4]

# The Pediatrician's Ready Reference Guide

## Current NHLBI guidelines on assessing and monitoring asthma control

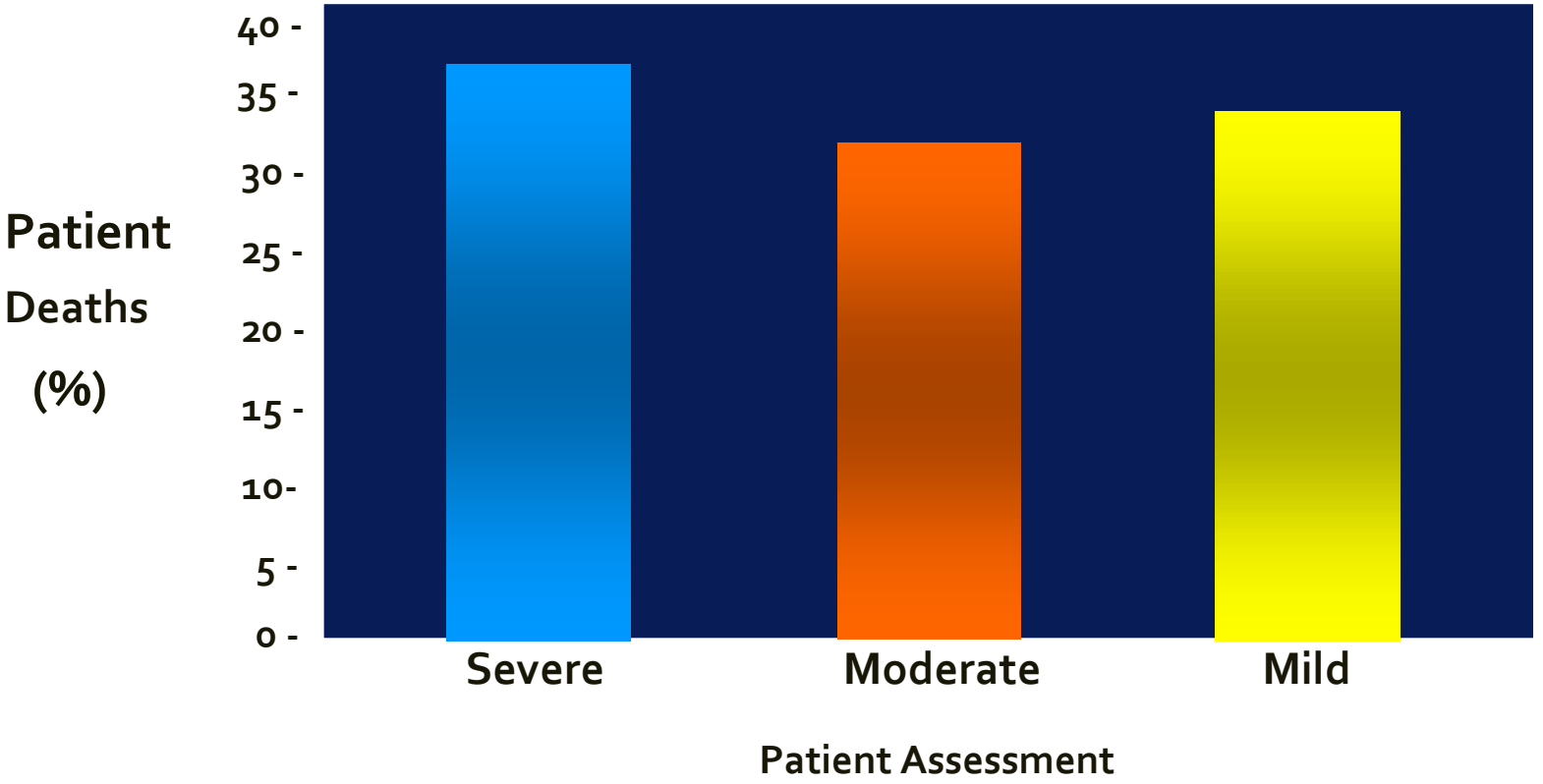
### TABLE 1 CLASSIFYING ASTHMA SEVERITY & INITIATION OF TREATMENT BY AGE

| COMPONENTS OF SEVERITY | | INTERMITTENT | | | PERSISTENT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MILD | | | MODERATE | | | SEVERE | | |
| AGE IN YEARS | | 0-4 | 5-11 | >12 | 0-4 | 5-11 | >12 | 0-4 | 5-11 | >12 | 0-4 | 5-11 | >12 |
| IMPAIRMENT | Symptoms | ≤2 days/week | | | ≤2 days/week but not daily | | | Daily | | | Throughout the day | | |
| | Nocturnal symptoms | 0 | ≤2x/month | | 1-2x/ month | 3-4x/month | | 3-4x/ month | ≥1x/week | | ≥2x/ week | Often 7x/week | |
| | SABA use | ≤2 days/week | | | ≥2 days/week | | | Daily | | | Several times/day | | |
| | Interferes with normal activity | None | | | Minor | | | Some | | | Extremely | | |
| | PFT: $FEV_1$ | n/a | >80% | | n/a | 80% | | n/a | 60%-80% | | n/a | <60% | |
| | PFT: $FEV_1$/FVC | n/a | >85% | Normal ratio | n/a | >80% | Normal ratio | n/a | 75%-80% | Reduced by >5% | n/a | <75% | Reduced by >5% |
| RISK | Exacerbations requiring systemic corticosteroids | 0-1x/year | | | ≥2x/6 months **OR** >4x/year + risk factors | >2x/year → | | | | | | | |
| RECOMMENDED STEP FOR INITIATING TREATMENT | | STEP 1 | | | STEP 2 | | | STEP 3 | | | STEP 3 | | STEP 4 **OR** STEP 5 |

Abbreviation: FEV, forced expiratory volume; FVC, forced vital capacity; PFT, pulmonary function test; NHLBI, National Heart, Lung, and Blood Institute; SABA, short-acting beta agonist.

From Reddy AP, et al.[4]

# Pediatric Patients With Mild Asthma: Mortality Risk




**Findings from a cohort study reviewing all pediatric asthma-related deaths (n = 51) in the Australian state of Victoria from 1986 to 1989**

Robertson et al. *Pediatr Pulmonol* . 1992;13:95-100

# Asthma control

| Components of Control | | Well Controlled | | | Not Well Controlled | | | Very Poorly Controlled | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ages 0–4 years | Ages 5–11 years | Ages ≥12 years | Ages 0–4 years | Ages 5–11 years | Ages ≥12 years | Ages 0–4 years | Ages 5–11 years | Ages ≥12 years |
| Impairment | Symptoms | ≤2 days/week | ≤2 days/week but not more than once on each day | ≤2 days/week | >2 days/week | >2 days/week or multiple times on ≤2 days/week | >2 days/week | Throughout the day | | |
| | Nighttime awakenings | ≤1x/month | | ≤2x/month | >1x/month | ≥2x/month | 1–3x/week | >1x/week | ≥2x/week | ≥4x/week |
| | Interference with normal activity | None | | | Some limitation | | | Extremely limited | | |
| | SABA* use for symptom control (not to prevent EIB*) | ≤2 days/week | | | >2 days/week | | | Several times per day | | |
| | Lung function | | | | | | | | | |
| | ➔ $FEV_1$* (% *predicted*) or peak flow (% *personal best*) | Not applicable | >80% | >80% | Not applicable | 60–80% | 60–80% | Not applicable | <60% | <60% |
| | ➔ $FEV_1$/FVC* | | >80% | Not applicable | | 75–80% | Not applicable | | <75% | Not applicable |
| | Validated questionnaires† | | | | | | | | | |
| | ➔ ATAQ* | Not applicable | Not applicable | 0 | Not applicable | Not applicable | 1–2 | Not applicable | Not applicable | 3–4 |
| | ➔ ACQ* | | | ≤0.75‡ | | | ≥1.5 | | | Not applicable |
| | ➔ ACT* | | | ≥20 | | | 16–19 | | | ≤15 |
| Risk | Asthma exacerbations requiring oral systemic corticosteroids§ | 0–1/year | | | 2–3/year | ≥2/year | | >3/year | ≥2/year | |
| | | *Consider severity and interval since last asthma exacerbation.* | | | | | | | | |
| | Reduction in lung growth/Progressive loss of lung function | Not applicable | Evaluation requires long-term follow-up care. | | Not applicable | Evaluation requires long-term follow-up care. | | Not applicable | Evaluation requires long-term follow-up care. | |
| | Treatment-related adverse effects | *Medication side effects can vary in intensity from none to very troublesome and worrisome. The level of intensity does not correlate to specific levels of control but should be considered in the overall assessment of risk.* | | | | | | | | |

| Components of Control | | Well Controlled | | | Not Well Controlled | | | Very Poorly Controlled | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ages 0–4 years | Ages 5–11 years | Ages ≥12 years | Ages 0–4 years | Ages 5–11 years | Ages ≥12 years | Ages 0–4 years | Ages 5–11 years | Ages ≥12 years |
| Impairment | Symptoms | ≤2 days/week | ≤2 days/week but not more than once on each day | ≤2 days/week | >2 days/week | >2 days/week or multiple times on ≤2 days/week | >2 days/week | Throughout the day | | |
| | Nighttime awakenings | ≤1x/month | | ≤2x/month | >1x/month | ≥2x/month | 1–3x/week | >1x/week | ≥2x/week | ≥4x/week |
| | Interference with normal activity | None | | | Some limitation | | | Extremely limited | | |
| | SABA* use for symptom control (not to prevent EIB*) | ≤2 days/week | | | >2 days/week | | | Several times per day | | |
| | Lung function | | | | | | | | | |
| | ➔ $FEV_1$* (% *predicted*) or peak flow (% *personal best*) | Not applicable | >80% | >80% | Not applicable | 60–80% | 60–80% | Not applicable | <60% | <60% |
| | ➔ $FEV_1$/FVC* | | >80% | Not applicable | | 75–80% | Not applicable | | <75% | Not applicable |
| | Validated questionnaires† | | | | | | | | | |
| | ➔ ATAQ* | Not applicable | Not applicable | 0 | Not applicable | Not applicable | 1–2 | Not applicable | Not applicable | 3–4 |
| | ➔ ACQ* | | | ≤0.75‡ | | | ≥1.5 | | | Not applicable |
| | ➔ ACT* | | | ≥20 | | | 16–19 | | | ≤15 |
| Risk | Asthma exacerbations requiring oral systemic corticosteroids§ | 0–1/year | | | 2–3/year | ≥2/year | | >3/year | ≥2/year | |
| | | *Consider severity and interval since last asthma exacerbation.* | | | | | | | | |
| | Reduction in lung growth/Progressive loss of lung function | Not applicable | Evaluation requires long-term follow-up care. | | Not applicable | Evaluation requires long-term follow-up care. | | Not applicable | Evaluation requires long-term follow-up care. | |
| | Treatment-related adverse effects | *Medication side effects can vary in intensity from none to very troublesome and worrisome. The level of intensity does not correlate to specific levels of control but should be considered in the overall assessment of risk.* | | | | | | | | |

| Components of Control | | Well Controlled | | | Not Well Controlled | | | Very Poorly Controlled | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ages 0–4 years | Ages 5–11 years | Ages ≥12 years | Ages 0–4 years | Ages 5–11 years | Ages ≥12 years | Ages 0–4 years | Ages 5–11 years | Ages ≥12 years |
| Impairment | Symptoms | ≤2 days/week | ≤2 days/week but not more than once on each day | ≤2 days/week | >2 days/week | >2 days/week or multiple times on ≤2 days/week | >2 days/week | Throughout the day | | |
| | Nighttime awakenings | ≤1x/month | | ≤2x/month | >1x/month | ≥2x/month | 1–3x/week | >1x/week | ≥2x/week | ≥4x/week |
| | Interference with normal activity | None | | | Some limitation | | | Extremely limited | | |
| | SABA* use for symptom control (not to prevent EIB*) | ≤2 days/week | | | >2 days/week | | | Several times per day | | |
| | Lung function | | | | | | | | | |
| | ➔ $FEV_1$* (% *predicted*) or peak flow (% *personal best*) | Not applicable | >80% | >80% | Not applicable | 60–80% | 60–80% | Not applicable | <60% | <60% |
| | ➔ $FEV_1/FVC$* | | >80% | Not applicable | | 75–80% | Not applicable | | <75% | Not applicable |
| | Validated questionnaires† | | | | | | | | | |
| | ➔ ATAQ* | Not applicable | Not applicable | 0 | Not applicable | Not applicable | 1–2 | Not applicable | Not applicable | 3–4 |
| | ➔ ACQ* | | | ≤0.75‡ | | | ≥1.5 | | | Not applicable |
| | ➔ ACT* | | | ≥20 | | | 16–19 | | | ≤15 |
| Risk | Asthma exacerbations requiring oral systemic corticosteroids§ | 0–1/year | | | 2–3/year | ≥2/year | | >3/year | ≥2/year | |
| | | *Consider severity and interval since last asthma exacerbation.* | | | | | | | | |
| | Reduction in lung growth/Progressive loss of lung function | Not applicable | Evaluation requires long-term follow-up care. | | Not applicable | Evaluation requires long-term follow-up care. | | Not applicable | Evaluation requires long-term follow-up care. | |
| | Treatment-related adverse effects | *Medication side effects can vary in intensity from none to very troublesome and worrisome. The level of intensity does not correlate to specific levels of control but should be considered in the overall assessment of risk.* | | | | | | | | |

| Components of Control | | Well Controlled | | | Not Well Controlled | | | Very Poorly Controlled | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ages 0–4 years | Ages 5–11 years | Ages ≥12 years | Ages 0–4 years | Ages 5–11 years | Ages ≥12 years | Ages 0–4 years | Ages 5–11 years | Ages ≥12 years |
| Impairment | Symptoms | ≤2 days/week | ≤2 days/week but not more than once on each day | ≤2 days/week | >2 days/week | >2 days/week or multiple times on ≤2 days/week | >2 days/week | Throughout the day | | |
| | Nighttime awakenings | ≤1x/month | | ≤2x/month | >1x/month | ≥2x/month | 1–3x/week | >1x/week | ≥2x/week | ≥4x/week |
| | Interference with normal activity | None | | | Some limitation | | | Extremely limited | | |
| | SABA* use for symptom control (not to prevent EIB*) | ≤2 days/week | | | >2 days/week | | | Several times per day | | |
| | Lung function | | | | | | | | | |
| | ➔ $FEV_1$* (% *predicted*) or peak flow (% *personal best*) | Not applicable | >80% | >80% | Not applicable | 60–80% | 60–80% | Not applicable | <60% | <60% |
| | ➔ $FEV_1$/FVC* | | >80% | Not applicable | | 75–80% | Not applicable | | <75% | Not applicable |
| | Validated questionnaires† | | | | | | | | | |
| | ➔ ATAQ* | Not applicable | Not applicable | 0 | Not applicable | Not applicable | 1–2 | Not applicable | Not applicable | 3–4 |
| | ➔ ACQ* | | | ≤0.75‡ | | | ≥1.5 | | | Not applicable |
| | ➔ ACT* | | | ≥20 | | | 16–19 | | | ≤15 |
| Risk | Asthma exacerbations requiring oral systemic corticosteroids§ | 0–1/year | | | 2–3/year | ≥2/year | | >3/year | ≥2/year | |
| | | *Consider severity and interval since last asthma exacerbation.* | | | | | | | | |
| | Reduction in lung growth/Progressive loss of lung function | Not applicable | Evaluation requires long-term follow-up care. | | Not applicable | Evaluation requires long-term follow-up care. | | Not applicable | Evaluation requires long-term follow-up care. | |
| | Treatment-related adverse effects | *Medication side effects can vary in intensity from none to very troublesome and worrisome. The level of intensity does not correlate to specific levels of control but should be considered in the overall assessment of risk.* | | | | | | | | |

| Components of Control | | Well Controlled | | | Not Well Controlled | | | Very Poorly Controlled | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ages 0–4 years | Ages 5–11 years | Ages ≥12 years | Ages 0–4 years | Ages 5–11 years | Ages ≥12 years | Ages 0–4 years | Ages 5–11 years | Ages ≥12 years |
| Impairment | Symptoms | ≤2 days/week | ≤2 days/week but not more than once on each day | ≤2 days/week | >2 days/week | >2 days/week or multiple times on ≤2 days/week | >2 days/week | Throughout the day | | |
| | Nighttime awakenings | ≤1x/month | | ≤2x/month | >1x/month | ≥2x/month | 1–3x/week | >1x/week | ≥2x/week | ≥4x/week |
| | Interference with normal activity | None | | | Some limitation | | | Extremely limited | | |
| | SABA* use for symptom control (not to prevent EIB*) | ≤2 days/week | | | >2 days/week | | | Several times per day | | |
| | Lung function | | | | | | | | | |
| | ➔ $FEV_1$* (% *predicted*) or peak flow (% *personal best*) | Not applicable | >80% | >80% | Not applicable | 60–80% | 60–80% | Not applicable | <60% | <60% |
| | ➔ $FEV_1$/FVC* | | >80% | Not applicable | | 75–80% | Not applicable | | <75% | Not applicable |
| | Validated questionnaires† | | | | | | | | | |
| | ➔ ATAQ* | Not applicable | Not applicable | 0 | Not applicable | Not applicable | 1–2 | Not applicable | Not applicable | 3–4 |
| | ➔ ACQ* | | | ≤0.75‡ | | | ≥1.5 | | | Not applicable |
| | ➔ ACT* | | | ≥20 | | | 16–19 | | | ≤15 |
| Risk | Asthma exacerbations requiring oral systemic corticosteroids§ | 0–1/year | | | 2–3/year | ≥2/year | | >3/year | ≥2/year | |
| | | *Consider severity and interval since last asthma exacerbation.* | | | | | | | | |
| | Reduction in lung growth/Progressive loss of lung function | Not applicable | Evaluation requires long-term follow-up care. | | Not applicable | Evaluation requires long-term follow-up care. | | Not applicable | Evaluation requires long-term follow-up care. | |
| | Treatment-related adverse effects | *Medication side effects can vary in intensity from none to very troublesome and worrisome. The level of intensity does not correlate to specific levels of control but should be considered in the overall assessment of risk.* | | | | | | | | |

| Components of Control | | Well Controlled | | | Not Well Controlled | | | Very Poorly Controlled | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ages 0–4 years | Ages 5–11 years | Ages ≥12 years | Ages 0–4 years | Ages 5–11 years | Ages ≥12 years | Ages 0–4 years | Ages 5–11 years | Ages ≥12 years |
| Impairment | Symptoms | ≤2 days/week | ≤2 days/week but not more than once on each day | ≤2 days/week | >2 days/week | >2 days/week or multiple times on ≤2 days/week | >2 days/week | Throughout the day | | |
| | Nighttime awakenings | ≤1x/month | | ≤2x/month | >1x/month | ≥2x/month | 1–3x/week | >1x/week | ≥2x/week | ≥4x/week |
| | Interference with normal activity | None | | | Some limitation | | | Extremely limited | | |
| | SABA* use for symptom control (not to prevent EIB*) | ≤2 days/week | | | >2 days/week | | | Several times per day | | |
| | Lung function | | | | | | | | | |
| | ➔ $FEV_1$* (% *predicted*) or peak flow (% *personal best*) | Not applicable | >80% | >80% | Not applicable | 60–80% | 60–80% | Not applicable | <60% | <60% |
| | ➔ $FEV_1$/FVC* | | >80% | Not applicable | | 75–80% | Not applicable | | <75% | Not applicable |
| | Validated questionnaires† | | | | | | | | | |
| | ➔ ATAQ* | Not applicable | Not applicable | 0 | Not applicable | Not applicable | 1–2 | Not applicable | Not applicable | 3–4 |
| | ➔ ACQ* | | | ≤0.75‡ | | | ≥1.5 | | | Not applicable |
| | ➔ ACT* | | | ≥20 | | | 16–19 | | | ≤15 |
| Risk | Asthma exacerbations requiring oral systemic corticosteroids§ | 0–1/year | | | 2–3/year | ≥2/year | | >3/year | ≥2/year | |
| | | *Consider severity and interval since last asthma exacerbation.* | | | | | | | | |
| | Reduction in lung growth/Progressive loss of lung function | Not applicable | Evaluation requires long-term follow-up care. | | Not applicable | Evaluation requires long-term follow-up care. | | Not applicable | Evaluation requires long-term follow-up care. | |
| | Treatment-related adverse effects | *Medication side effects can vary in intensity from none to very troublesome and worrisome. The level of intensity does not correlate to specific levels of control but should be considered in the overall assessment of risk.* | | | | | | | | |

| Components of Control | | Well Controlled | | | Not Well Controlled | | | Very Poorly Controlled | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ages 0–4 years | Ages 5–11 years | Ages ≥12 years | Ages 0–4 years | Ages 5–11 years | Ages ≥12 years | Ages 0–4 years | Ages 5–11 years | Ages ≥12 years |
| Impairment | Symptoms | ≤2 days/week | ≤2 days/week but not more than once on each day | ≤2 days/week | >2 days/week | >2 days/week or multiple times on ≤2 days/week | >2 days/week | Throughout the day | | |
| | Nighttime awakenings | ≤1x/month | | ≤2x/month | >1x/month | ≥2x/month | 1–3x/week | >1x/week | ≥2x/week | ≥4x/week |
| | Interference with normal activity | None | | | Some limitation | | | Extremely limited | | |
| | SABA* use for symptom control (not to prevent EIB*) | ≤2 days/week | | | >2 days/week | | | Several times per day | | |
| | Lung function | | | | | | | | | |
| | ➔ $FEV_1$* (% *predicted*) or peak flow (% *personal best*) | Not applicable | >80% | >80% | Not applicable | 60–80% | 60–80% | Not applicable | <60% | <60% |
| | ➔ $FEV_1$/FVC* | | >80% | Not applicable | | 75–80% | Not applicable | | <75% | Not applicable |
| | Validated questionnaires† | | | | | | | | | |
| | ➔ ATAQ* | Not applicable | Not applicable | 0 | Not applicable | Not applicable | 1–2 | Not applicable | Not applicable | 3–4 |
| | ➔ ACQ* | | | ≤0.75‡ | | | ≥1.5 | | | Not applicable |
| | ➔ ACT* | | | ≥20 | | | 16–19 | | | ≤15 |
| Risk | Asthma exacerbations requiring oral systemic corticosteroids§ | 0–1/year | | | 2–3/year | ≥2/year | | >3/year | ≥2/year | |
| | | *Consider severity and interval since last asthma exacerbation.* | | | | | | | | |
| | Reduction in lung growth/Progressive loss of lung function | Not applicable | Evaluation requires long-term follow-up care. | | Not applicable | Evaluation requires long-term follow-up care. | | Not applicable | Evaluation requires long-term follow-up care. | |
| | Treatment-related adverse effects | *Medication side effects can vary in intensity from none to very troublesome and worrisome. The level of intensity does not correlate to specific levels of control but should be considered in the overall assessment of risk.* | | | | | | | | |

| Components of Control | | Well Controlled | | | Not Well Controlled | | | Very Poorly Controlled | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Ages 0–4 years | Ages 5–11 years | Ages ≥12 years | Ages 0–4 years | Ages 5–11 years | Ages ≥12 years | Ages 0–4 years | Ages 5–11 years | Ages ≥12 years |
| Impairment | Symptoms | ≤2 days/week | ≤2 days/week but not more than once on each day | ≤2 days/week | >2 days/week | >2 days/week or multiple times on ≤2 days/week | >2 days/week | Throughout the day | | |
| | Nighttime awakenings | ≤1x/month | | ≤2x/month | >1x/month | ≥2x/month | 1–3x/week | >1x/week | ≥2x/week | ≥4x/week |
| | Interference with normal activity | None | | | Some limitation | | | Extremely limited | | |
| | SABA* use for symptom control (not to prevent EIB*) | ≤2 days/week | | | >2 days/week | | | Several times per day | | |
| | Lung function | | | | | | | | | |
| | ➔ $FEV_1$* (% *predicted*) or peak flow (% *personal best*) | Not applicable | >80% | >80% | Not applicable | 60–80% | 60–80% | Not applicable | <60% | <60% |
| | ➔ $FEV_1$/FVC* | | >80% | Not applicable | | 75–80% | Not applicable | | <75% | Not applicable |
| | Validated questionnaires† | | | | | | | | | |
| | ➔ ATAQ* | Not applicable | Not applicable | 0 | Not applicable | Not applicable | 1–2 | Not applicable | Not applicable | 3–4 |
| | ➔ ACQ* | | | ≤0.75‡ | | | ≥1.5 | | | Not applicable |
| | ➔ ACT* | | | ≥20 | | | 16–19 | | | ≤15 |
| Risk | Asthma exacerbations requiring oral systemic corticosteroids§ | 0–1/year | | | 2–3/year | ≥2/year | | >3/year | ≥2/year | |
| | | *Consider severity and interval since last asthma exacerbation.* | | | | | | | | |
| | Reduction in lung growth/Progressive loss of lung function | Not applicable | Evaluation requires long-term follow-up care. | | Not applicable | Evaluation requires long-term follow-up care. | | Not applicable | Evaluation requires long-term follow-up care. | |
| | Treatment-related adverse effects | *Medication side effects can vary in intensity from none to very troublesome and worrisome. The level of intensity does not correlate to specific levels of control but should be considered in the overall assessment of risk.* | | | | | | | | |

# Asthma Control Test™ (ACT)

| | | | | | | SCORE |
|---|---|---|---|---|---|---|
| 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? | All of the time 1 | Most of the time 2 | Some of the time 3 | A little of the time 4 | None of the time 5 | 5 |
| 2. During the past **4 weeks**, how often have you had shortness of breath? | More than once a day 1 | Once a day 2 | 3 to 6 times a week 3 | Once or twice a week 4 | Not at all 5 | 2 |
| 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? | 4 or more nights a week 1 | 2 or 3 nights a week 2 | Once a week 3 | Once or twice 4 | Not at all 5 | 1 |
| 4. During the past **4 weeks**, how often have you used your rescue inhaler or nebulizer medication (such as albuterol)? | 3 or more times per day 1 | 1 or 2 times per day 2 | 2 or 3 times per week 3 | Once a week or less 4 | Not at all 5 | 3 |
| 5. How would you rate your **asthma** control during the **past 4 weeks**? | Not controlled at all 1 | Poorly controlled 2 | Somewhat controlled 3 | Well controlled 4 | Completely controlled 5 | 5 |
| | | | | | | TOTAL 16 |



Supported, in part, by Mead Johnson Nutrition

American Academy of Pediatrics

# Referral to A Specialist

- ☑ When additional diagnostic testing or disease management education is needed
- ☑ When the patient needs an evaluation for immunotherapy
- ☑ When the patient requires an increase in the dose and number of medications as well as frequency of administration
- ☑ If a patient required >2 bursts of oral steroids in a 12-month period, or was hospitalized for asthma
- ☑ Following a life-threatening exacerbation
- ☑ When the patient is not meeting goals of therapy after 3-6 months of treatment
- ☑ When the patient has atypical signs or symptoms
- ☑ When comorbidities are complicating the case, including occupational or environmental exposures

National Heart, Lung, and Blood Institute. *NAEPP Expert Panel Report 3*. Bethesda, MD: National Institutes of Health; 2007.

# Assessment of asthma summary

1. Asthma control - two domains
   - Assess symptom control
   - Assess risk factors for poor outcomes, including low lung function

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3. Comorbidities
   - Think of rhinosinusitis, GERD, obesity, obstructive sleep apnea, depression, anxiety
   - These may contribute to symptoms and poor quality of life

# Component 2: Control of Environmental Factors and Comorbid Conditions that Affect Asthma

# Allergens and Irritants

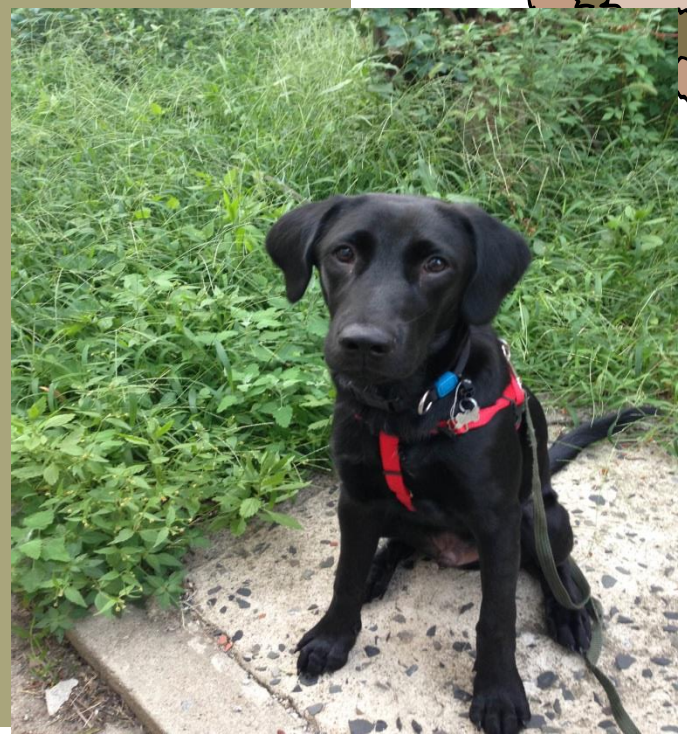
- Allergens
  - Animal dander
  - Cockroach
  - Dust mites
  - Indoor mold
  - Pollen
  - Outdoor Mold

- Irritants
  - Smoke
  - Strong odors
  - Sprays
  - Sulfites in foods

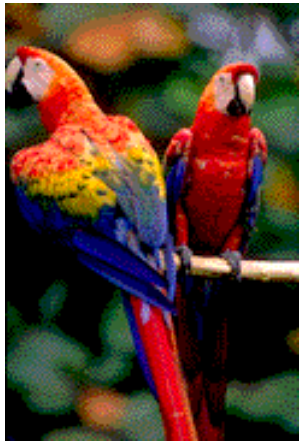
Miscellaneous

- Exercise
- Other medicines
- Weather
- Co-morbid conditions

If allergic to any fur-bearing or feathered animals:



- Remove pets from home
- Keep pets 100% out of bedroom and keep door closed
- Remove carpet and cloth-covered furniture from the home or keep pet out of rooms with these



# Cockroach Avoidance

- Keep all food out of bedroom
- Store food and garbage in close containers
- Use bait traps
  - If you spray, stay out of home

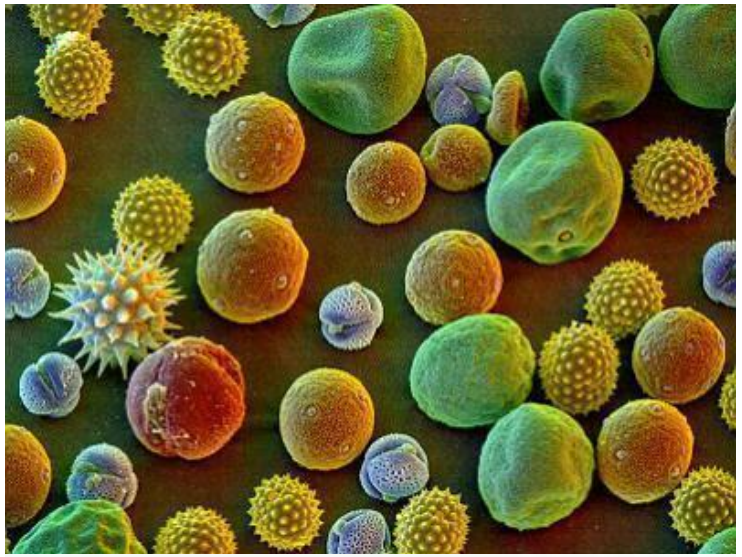
# Dust Mite Control

- Encase mattress/ pillow in zippered vinyl cover
- Wash bedding weekly at 130° F
- Reduce clutter
- Have someone vacuum/sweeping
  - Dustmask
  - Central cleaner with outside receptacle
  - Vacuum cleaner with HEPA filter or double-layered bag

# Indoor Mold

- Fix source of water
- Clean moldy areas
  - Do not use bleach!
- Remove rugs that have gotten wet
- Dehumidify basements

# Pollen and Outdoor Mold



Keep windows closed

Stay indoors from midday-afternoon

Re-evaluate need for additional medicines or intensification of asthma medicines during allergy seasons

# Thirdhand smoke

# All children are considered "sensitive"

| Air Quality Index (AQI) values | Levels of Health Concern | Colors |
|---|---|---|
| When the AQI is in this range: | ...air quality conditions are: | ...as symbolized by this color: |
| 0 to 50 | Good | Green |
| 51 to 100 | Moderate | Yellow |
| 101 to 150 | Unhealthy for Sensitive Groups | Orange |
| 151 to 200 | Unhealthy | Red |
| 201 to 300 | Very Unhealthy | Purple |
| 301 to 500 | Hazardous | Maroon |

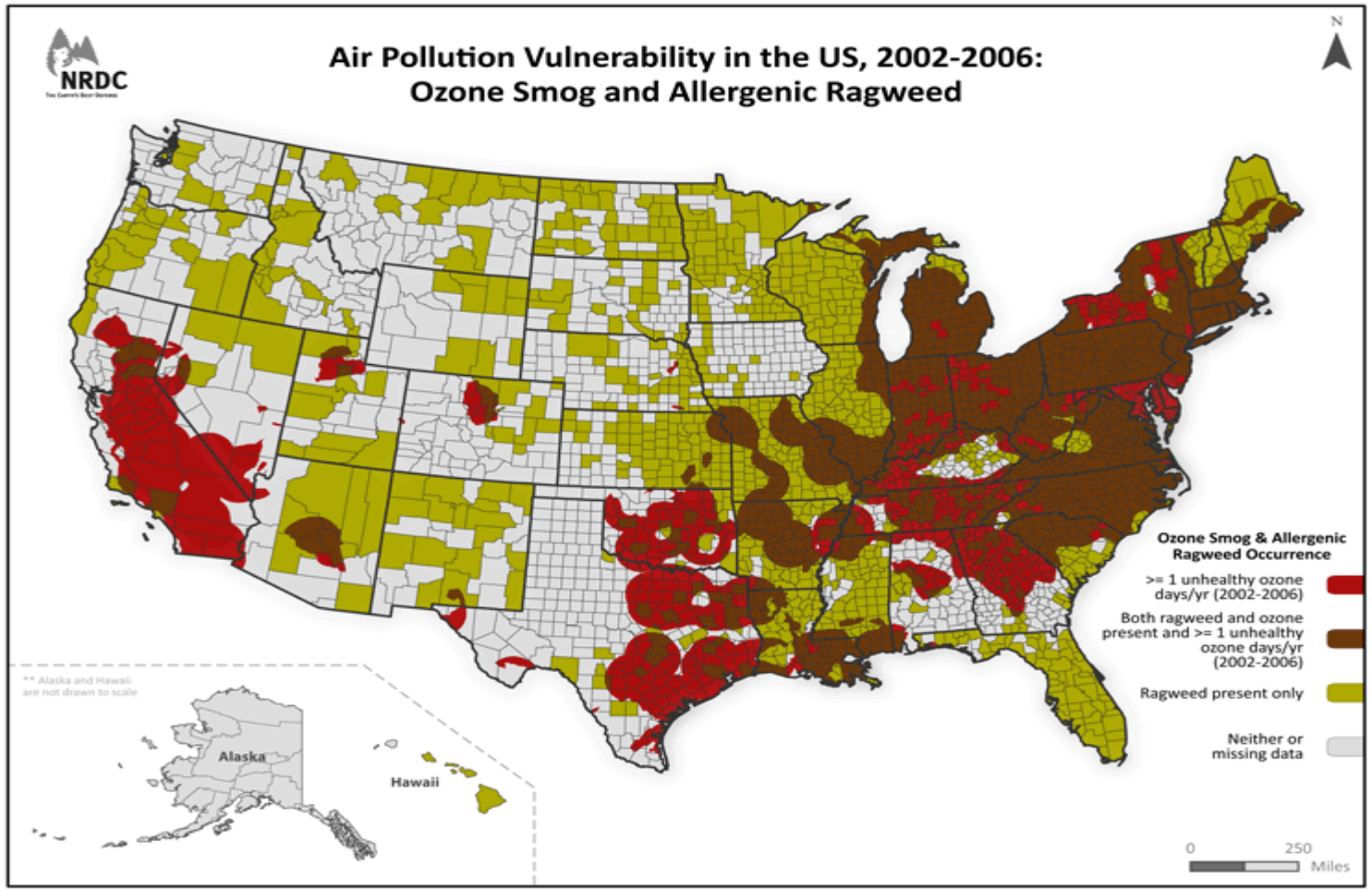
http://www.epa.gov/apti/ozonehealth/effects.html

# New risks for asthma related to climate change

# Climate change effects on asthma

- GHGs will drive
  - Higher rates of asthma due to changes in allergen exposure
  - More intense and more frequent storms ("thunderstorm asthma")
- More wildfires and dust storms will increase transport of PM, bacteria, fungi and influenza
- Excessive heat and/or poor air quality increases symptoms, decrease lung function
- Children are particularly vulnerable
- More flooding will increase mold and microbial growth

# Triple threat: Asthma, ozone and pollens



# Component 3:  Pharmacologic + Therapy

# Stepping up REMEMBER TO...

- Provide guided self-management education
- Treat modifiable risk factors and comorbidities
- Advise about non-pharmacological therapies and strategies
- Consider stepping up if … uncontrolled symptoms, exacerbations or risks,
  but check diagnosis, inhaler technique and adherence first
- Consider stepping down if … symptoms controlled for 3 months
  + low risk for exacerbations. Ceasing ICS is not advised.

# Stepwise Approach for Managing Asthma Long Term

Step UP if needed (first check inhaler technique, adherence, environmental control, and comorbid conditions)
ASSESS CONTROL
Step DOWN if possible (and asthma is well controlled for at least 3 months)

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| | Preferred | SABA as needed | Low-dose ICS | Medium-dose ICS | Medium-dose ICS<br>+<br>LABA or montelukast | High-dose ICS<br>+<br>LABA or montelukast | High-dose ICS<br>+<br>Oral corticosteroids<br>+<br>LABA or montelukast |
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| | Alternative | | Cromolyn, LTRA, Nedrocromil, or Theophylline | | Medium-dose ICS<br>+<br>LTRA or Theophylline | High-dose ICS<br>+<br>LTRA or Theophylline | High-dose ICS<br>+<br>LTRA or Theophylline<br>+<br>Oral corticosteroids |
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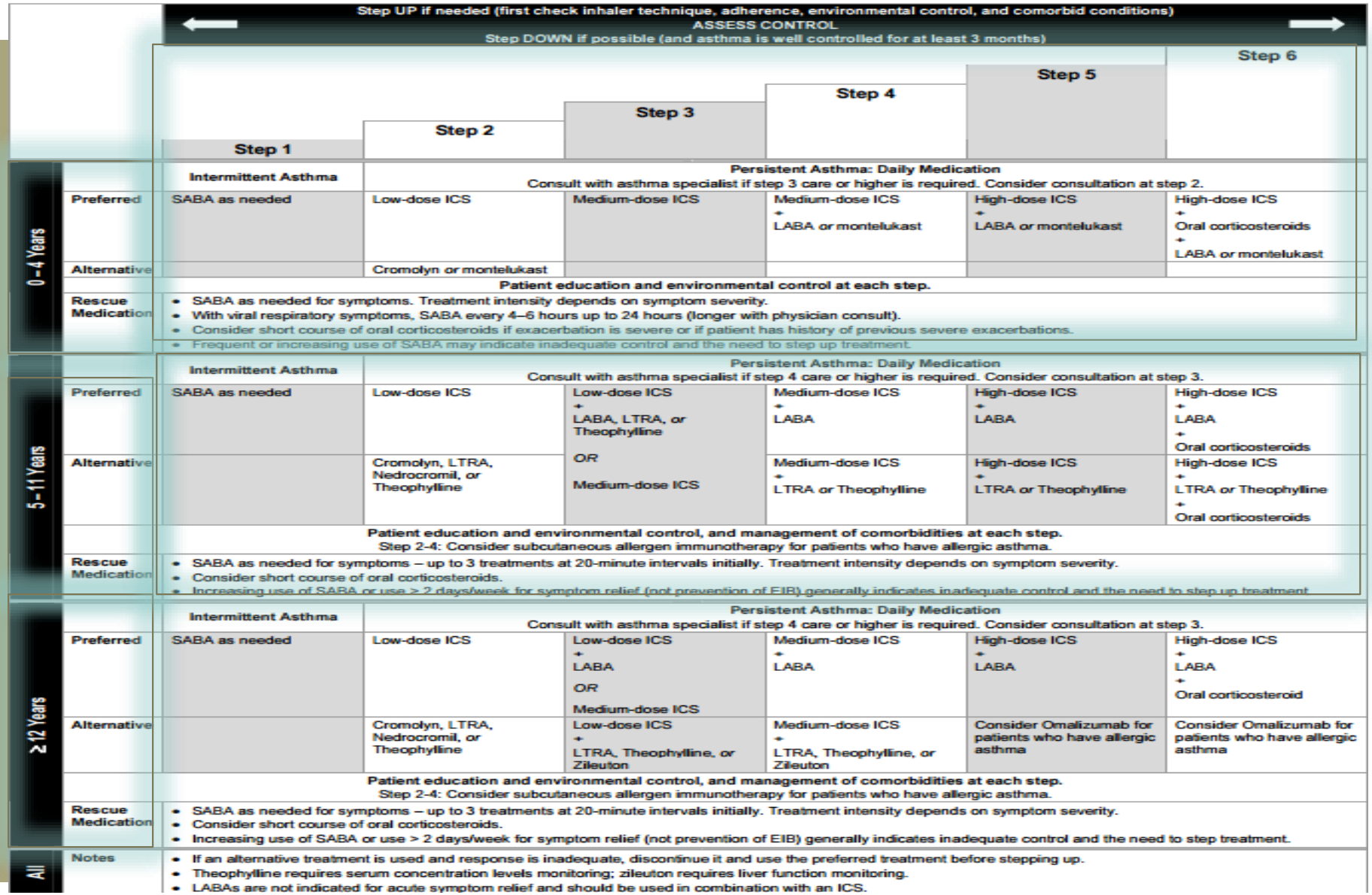
| | | Patient education and environmental control, and management of comorbidities at each step.<br>Step 2-4: Consider subcutaneous allergen immunotherapy for patients who have allergic asthma. | | | | | |
| | Rescue Medication | • SABA as needed for symptoms – up to 3 treatments at 20-minute intervals initially. Treatment intensity depends on symptom severity.<br>• Consider short course of oral corticosteroids.<br>• Increasing use of SABA or use > 2 days/week for symptom relief (not prevention of EIB) generally indicates inadequate control and the need to step treatment. | | | | | |
| All | Notes | • If an alternative treatment is used and response is inadequate, discontinue it and use the preferred treatment before stepping up.<br>• Theophylline requires serum concentration levels monitoring; zileuton requires liver function monitoring.<br>• LABAs are not indicated for acute symptom relief and should be used in combination with an ICS. | | | | | |

# Stepwise Approach for Managing Asthma Long Term



| | | Step 1 | Step 2 | Step 3 | Step 4 | Step 5 | Step 6 |
|---|---|---|---|---|---|---|---|
| | | Step UP if needed (first check inhaler technique, adherence, environmental control, and comorbid conditions) ASSESS CONTROL Step DOWN if possible (and asthma is well controlled for at least 3 months) | | | | | |
| 0–4 Years | | Intermittent Asthma | Persistent Asthma: Daily Medication<br>Consult with asthma specialist if step 3 care or higher is required. Consider consultation at step 2. | | | | |
| | Preferred | SABA as needed | Low-dose ICS | Medium-dose ICS | Medium-dose ICS<br>+<br>LABA or montelukast | High-dose ICS<br>+<br>LABA or montelukast | High-dose ICS<br>+<br>Oral corticosteroids<br>+<br>LABA or montelukast |
| | Alternative | | Cromolyn or montelukast | | | | |
| | | Patient education and environmental control at each step. | | | | | |
| | Rescue Medication | • SABA as needed for symptoms. Treatment intensity depends on symptom severity.<br>• With viral respiratory symptoms, SABA every 4–6 hours up to 24 hours (longer with physician consult).<br>• Consider short course of oral corticosteroids if exacerbation is severe or if patient has history of previous severe exacerbations.<br>• Frequent or increasing use of SABA may indicate inadequate control and the need to step up treatment. | | | | | |
| 5–11 Years | | Intermittent Asthma | Persistent Asthma: Daily Medication<br>Consult with asthma specialist if step 4 care or higher is required. Consider consultation at step 3. | | | | |
| | Preferred | SABA as needed | Low-dose ICS | Low-dose ICS<br>+<br>LABA, LTRA, or Theophylline<br>OR<br>Medium-dose ICS | Medium-dose ICS<br>+<br>LABA | High-dose ICS<br>+<br>LABA | High-dose ICS<br>+<br>LABA<br>+<br>Oral corticosteroids |
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| ≥ 12 Years | | Intermittent Asthma | Persistent Asthma: Daily Medication<br>Consult with asthma specialist if step 4 care or higher is required. Consider consultation at step 3. | | | | |
| | Preferred | SABA as needed | Low-dose ICS | Low-dose ICS<br>+<br>LABA<br>OR<br>Medium-dose ICS | Medium-dose ICS<br>+<br>LABA | High-dose ICS<br>+<br>LABA | High-dose ICS<br>+<br>LABA<br>+<br>Oral corticosteroid |
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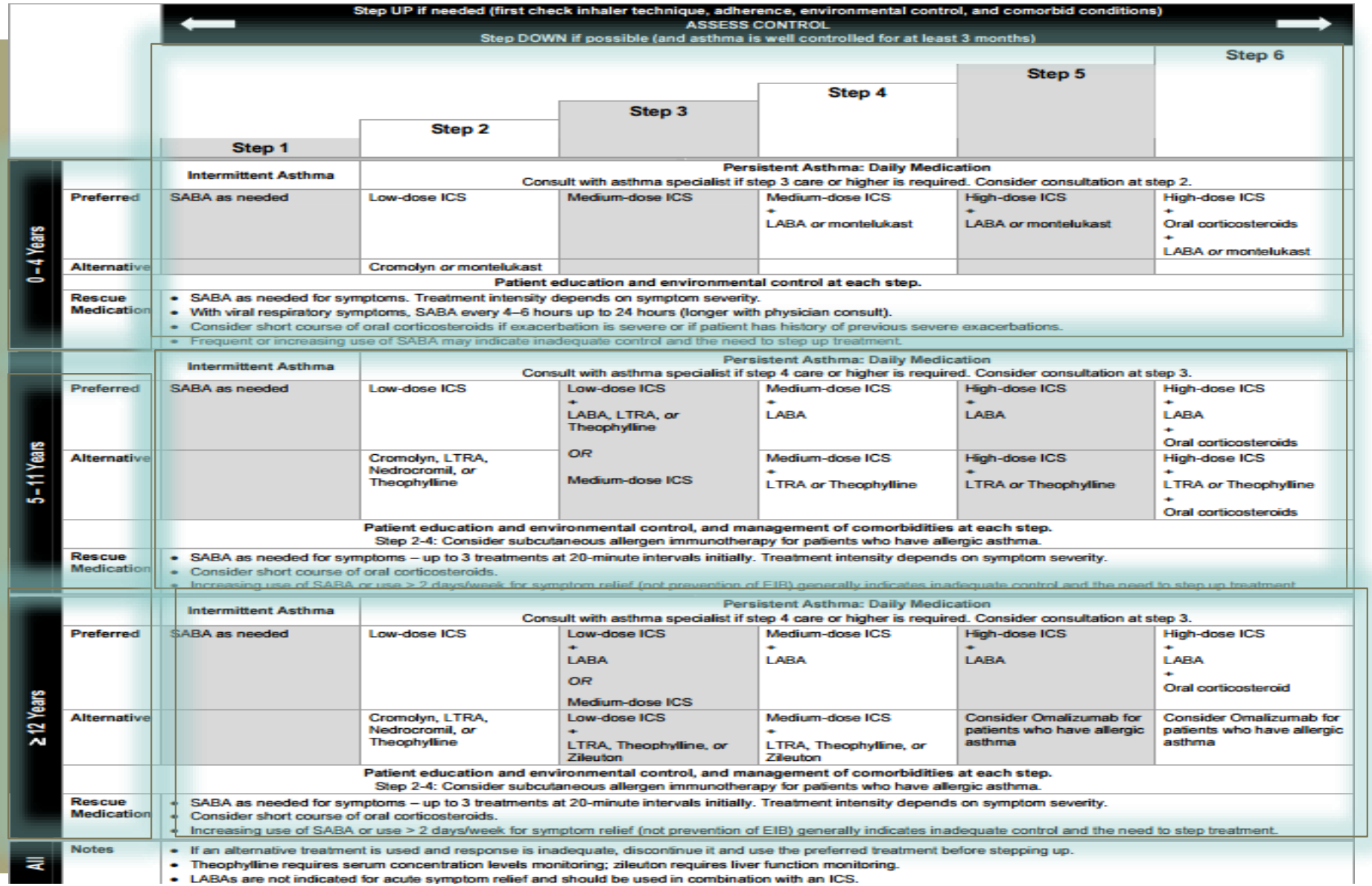

# Common treatments for the medical management of Asthma

| Quick-relief "rescue" | Long-term control |
| --- | --- |
| Short-acting bronchodilators prn (beta 2 agonists - SABAs - preferred) | Inhaled corticosteroids (ICS) |
| "Burst" of systemic corticosteroids | Combination therapy (inhaled corticosteroids and long-acting beta 2 agonists (ICS/LABA) |
| | Leukotriene modifiers |
| | Biologic agents |

*At each treatment step, patient education, environmental control, and management of comorbidities need to be addressed*

National Heart, Lung, and Blood Institute. *NAEPP Expert Panel Report 3*. Bethesda, MD: National Institutes of Health; 2007.

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# Rescue SABAs

Quick-relief "rescue"

Long-term control

SABAs preferred: Ventolin, Proventil. Proair MDI and Respiclick-ALL ALBUTEROL,

Xopenex (LEVALBUTEROL)

SAMAs in the ER: Atrovent (IPRATROPIUM), Duoneb, Combivent (BOTH ALBUTEROL & IPRATROPIUM)

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SQ q 4 wks

Cinqair (RESLIZUMAB)

IV q 4 weeks over 20-50 "

Anti-IgE mab: Xolair (OMALIZUMAB)

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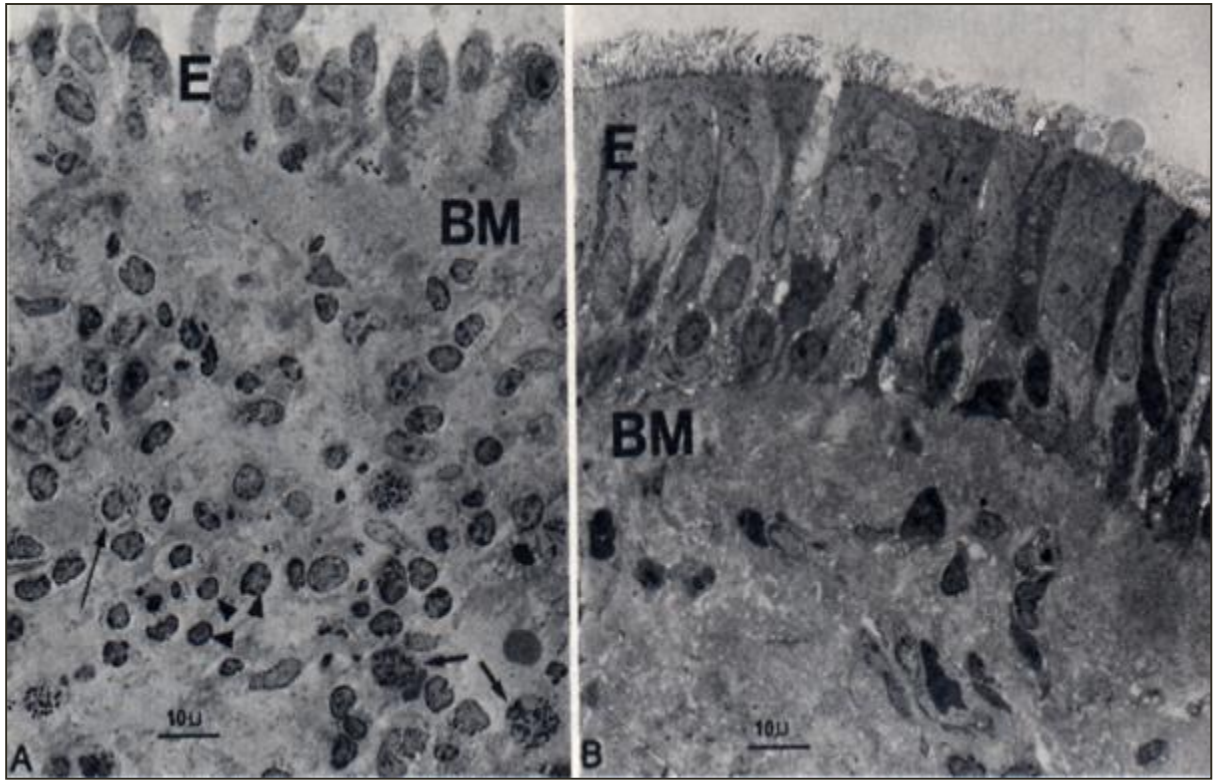
# Effects of Inhaled Corticosteroids on Inflammation

E = Epithelium

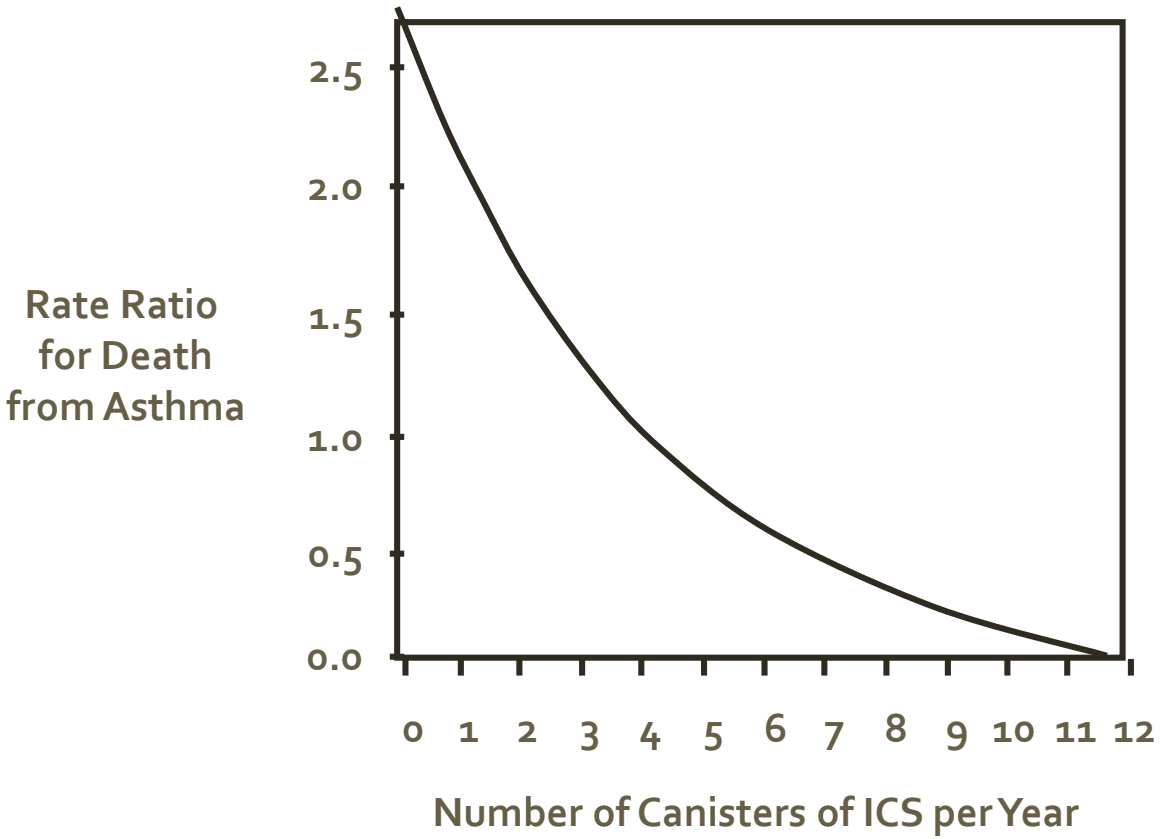
BM = Basement Membrane




**Pre– and post–3-month treatment with budesonide (BUD) 600 mcg b.i.d.**

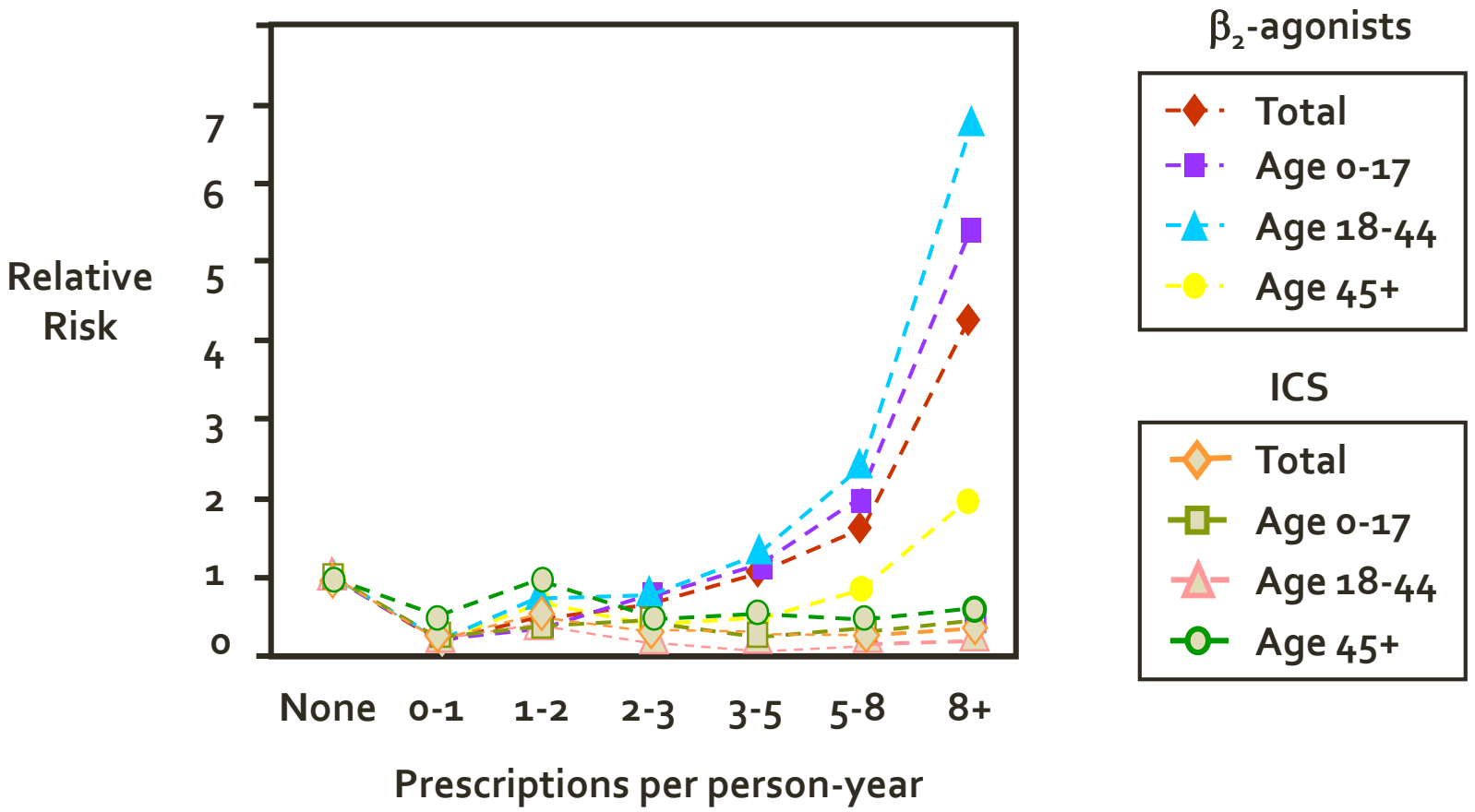
Laitinen et al. *J Allergy Clin Immunol.* 1992;90:32-42.

# Low-dose ICS and the Prevention of Death From Asthma in Canada




Suissa et al. *N Engl J Med.* 2000;343:332-336.

# Relative Risk of Hospitalization in the US




Donahue et al. *JAMA*. 1997;277:887-891.

# Characteristics of fluticasone esters (propionate vs. furoate)

- Steroidal backbone (fluticasone)
- Ester substituent (furoate/propionate)
- FF confers higher affinity for both nasal and lung tissue compared with FP
  - Translates to enhanced lung residency and once-daily efficacy in asthma
  - Some evidence that the characteristics of FF may result in superior symptom reduction compared with FP

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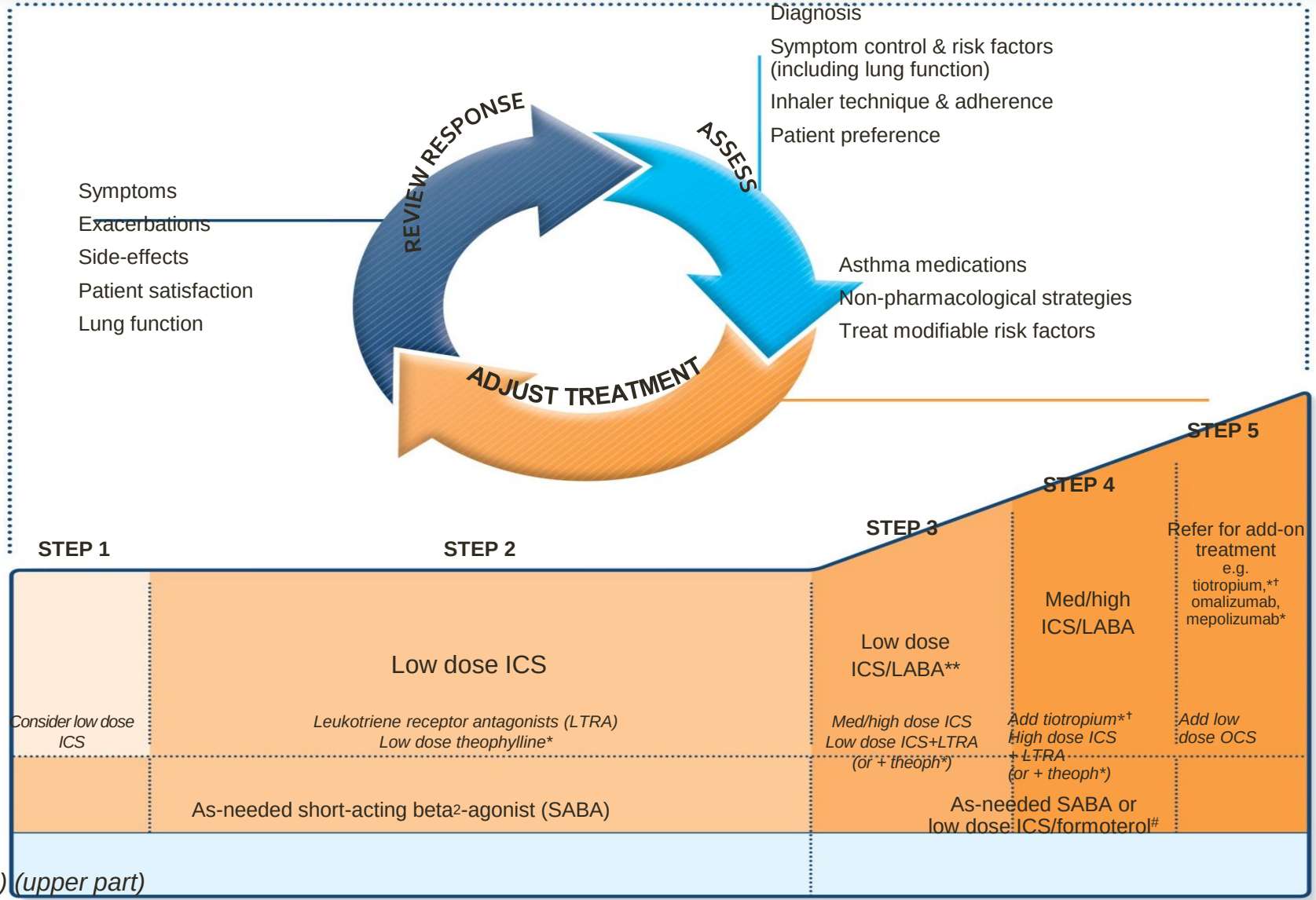
# New therapeutic agents/interventions for asthma from 2017 Global Initiative for Asthma (GINA) and 2018 EPR-4 guidelines

ICS/LAMAs
ICS/LABA/LAMA?

# Stepwise management - pharmacotherapy




*Not for children <12 years

**For children 6-11 years, the preferred Step 3 treatment is medium dose ICS

#For patients prescribed BDP/formoterol or BUD/ formoterol maintenance and reliever therapy

† **Tiotropium by mist inhaler is an add-on treatment for patients ≥12 years with a history of exacerbations**

Low-dose fluticasone furoate/vilanterol an option for Step 3

*GINA 2016, Box 3-5 (2/8) (upper part)*

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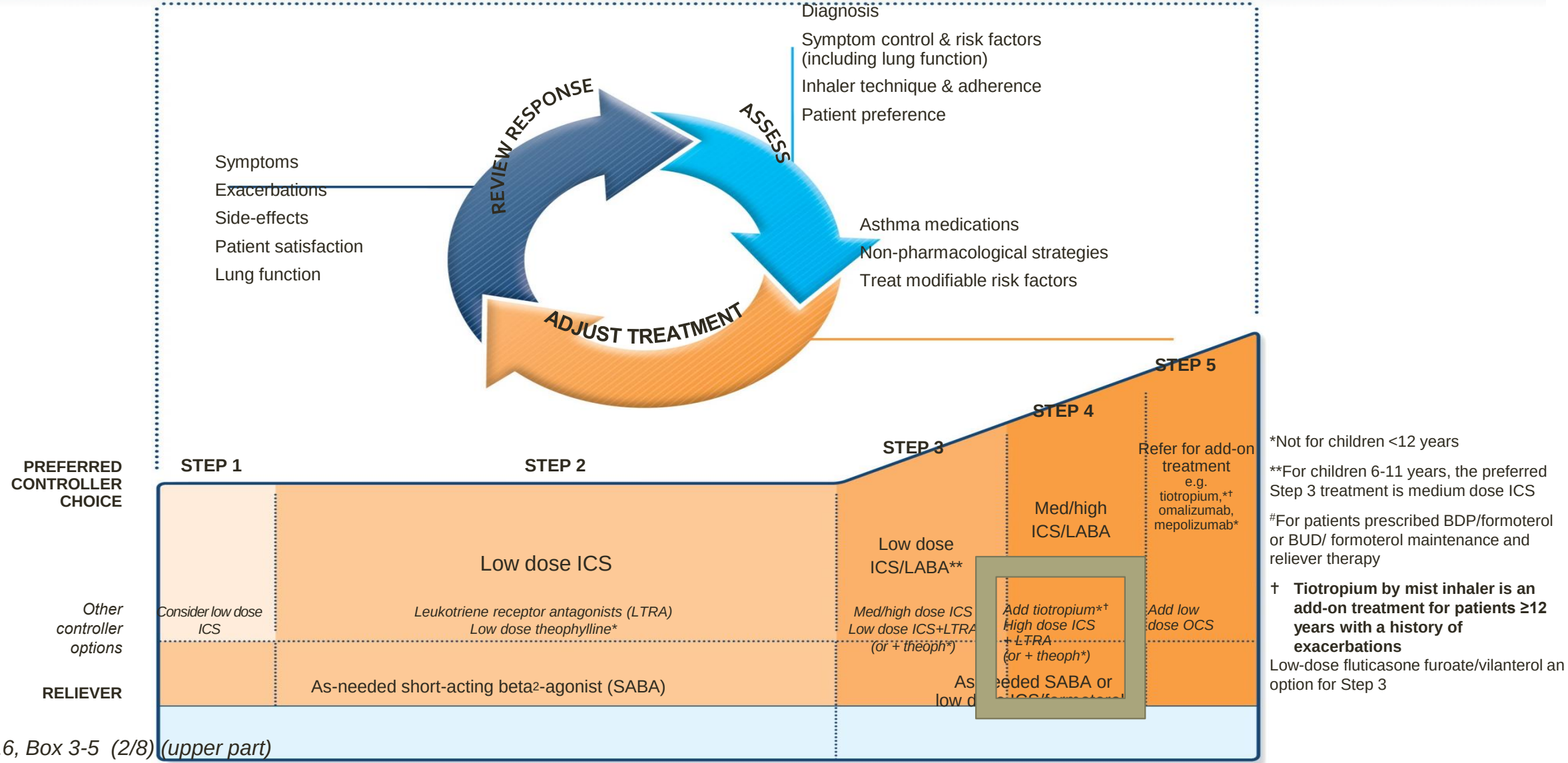


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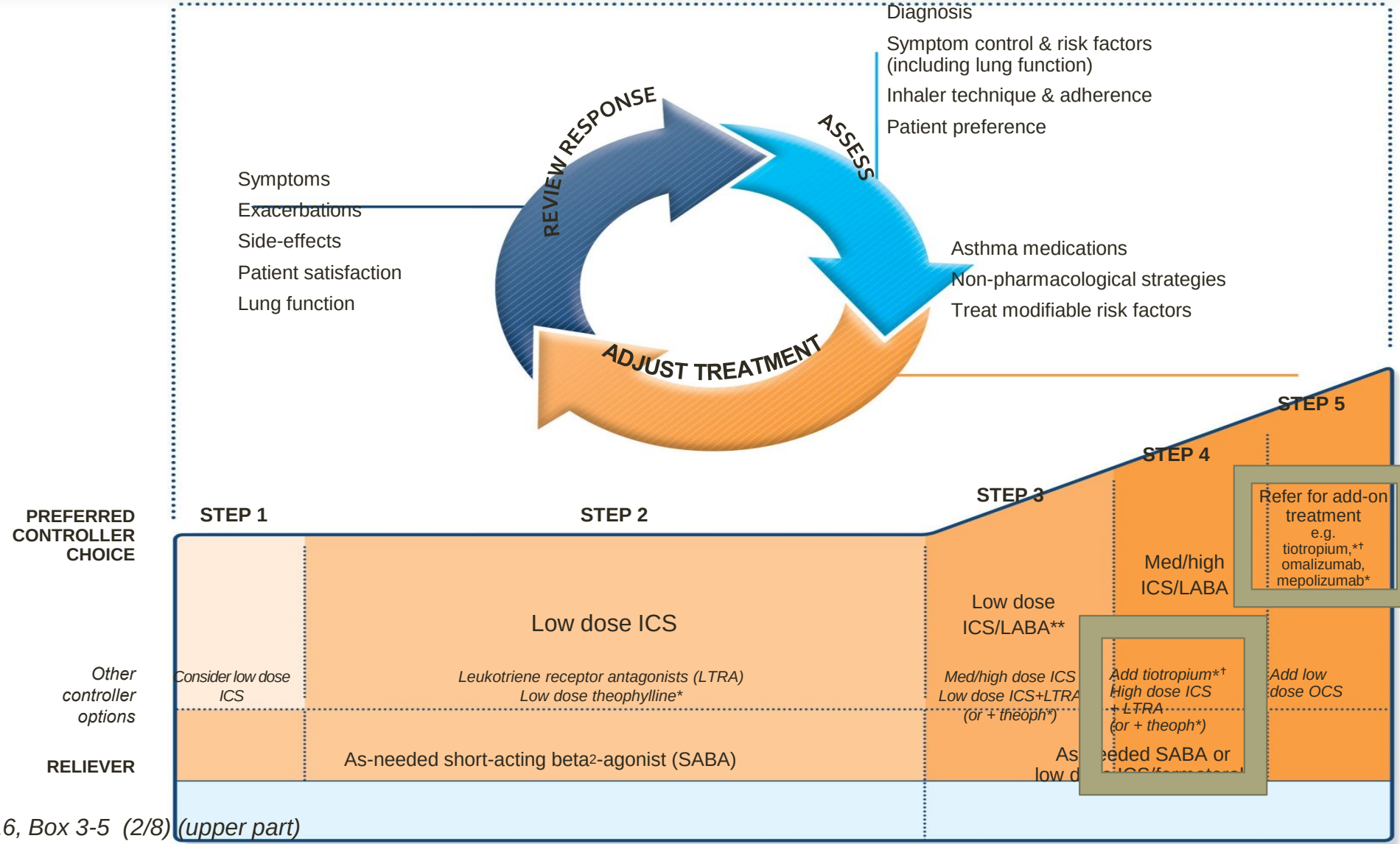


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Leukotriene modifiers: Singulair (MONTELUKAST) , Accolate (ZAFIRUkAST),

Zyflo (ZILEUTON)

# Common treatments for the medical management of Asthma

## Quick-relief "rescue"

SABAs preferred: Ventolin, Proventil. Proair MDI and Respiclick-ALL ALBUTEROL,

Xopenex (LEVALBUTEROL)

SAMAs in the ER: Atrovent (IPRATROPIUM), Duoneb, Combivent (BOTH ALBUTEROL & IPRATROPIUM)

OCS: Prednisone, Medrol, Prelone

## Long-term control

ICS:

QVAR (BECLOMETHASONE), Flovent (FP),

Alvesco (CICLESONIDE), Aerospan (FLUNISOLIDE), Asmanex (MOMETASONE), Pulmicort (BUDESONIDE), Arnuity (FF),

ArmonAir (FP)

Anti-IL-5 mab: Nucala (MEPOLIZUMAB)

SQ q 4 wks

Cinqair (RESLIZUMAB)

IV q 4 weeks over 20-50 "

Anti-IgE mab: Xolair (OMALIZUMAB)

SQ q 2-4 wks

Combination therapy:

Advair (FP/SALMETEROL),

Symbicort (BUDESONIDE/FORMOTEROL ),

Dulera (MOMETASONE/FORMOTEROL ), Breo FF/VILANTEROL,

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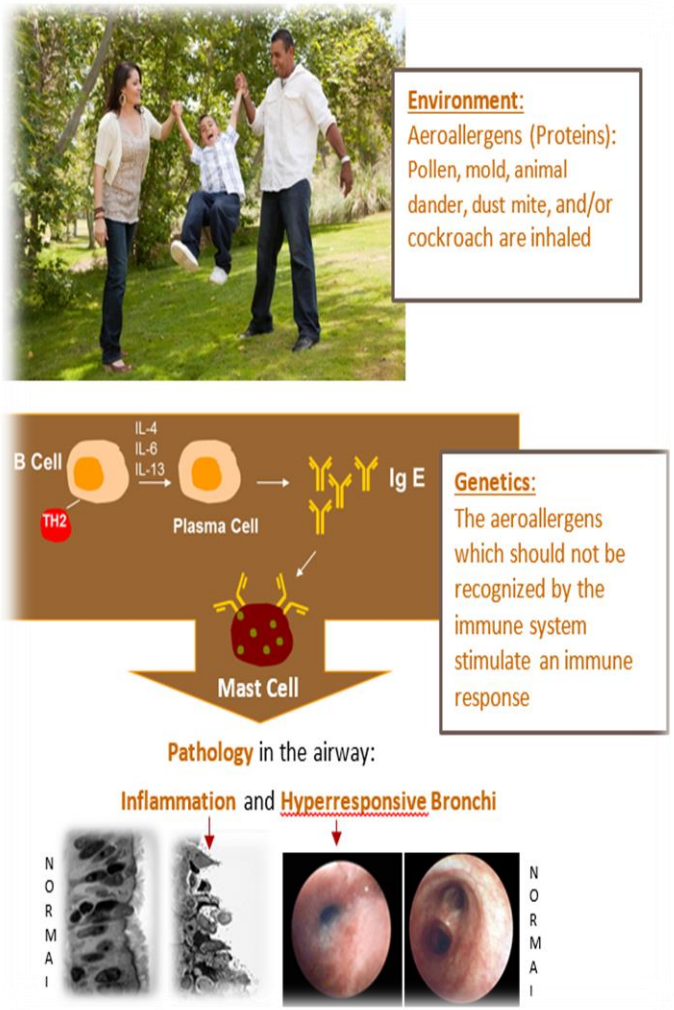
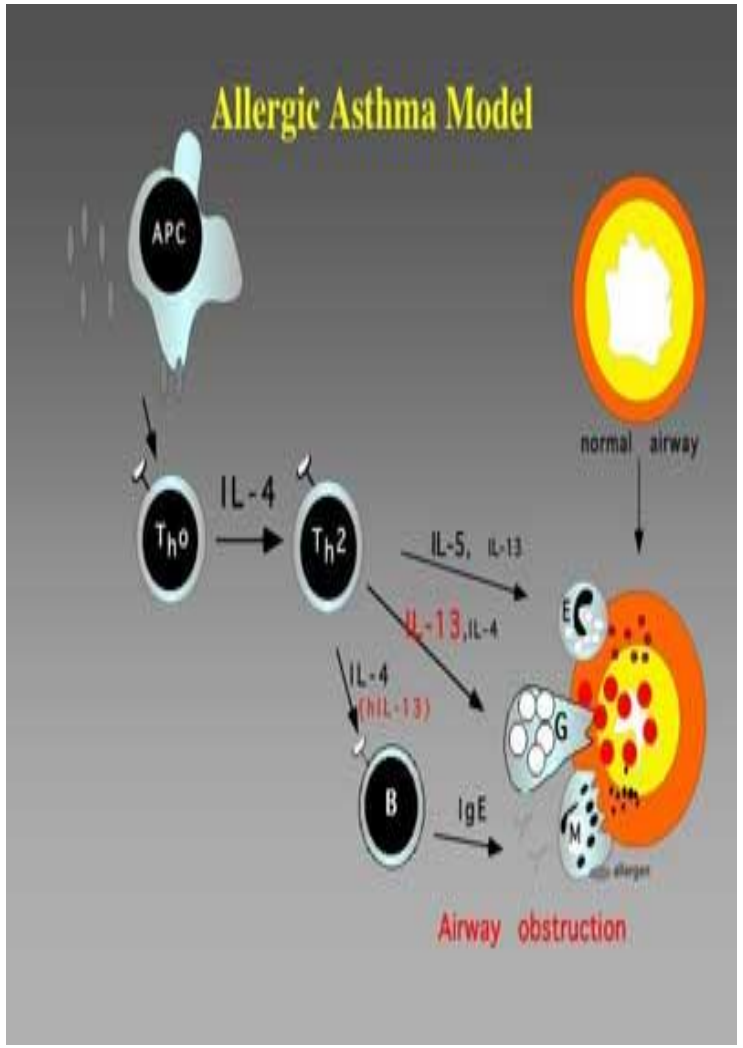
# Anti-IgE biologic

- Monoclonal antibody for those
  - 6 and older
  - With severe persistent asthma
  - Which cannot be controlled on conventional therapies
- 1-3 injections every 2 -4 weeks based on IgE levels and weight
- Serum IgE rises
- Black box warning
  - Carry epipen

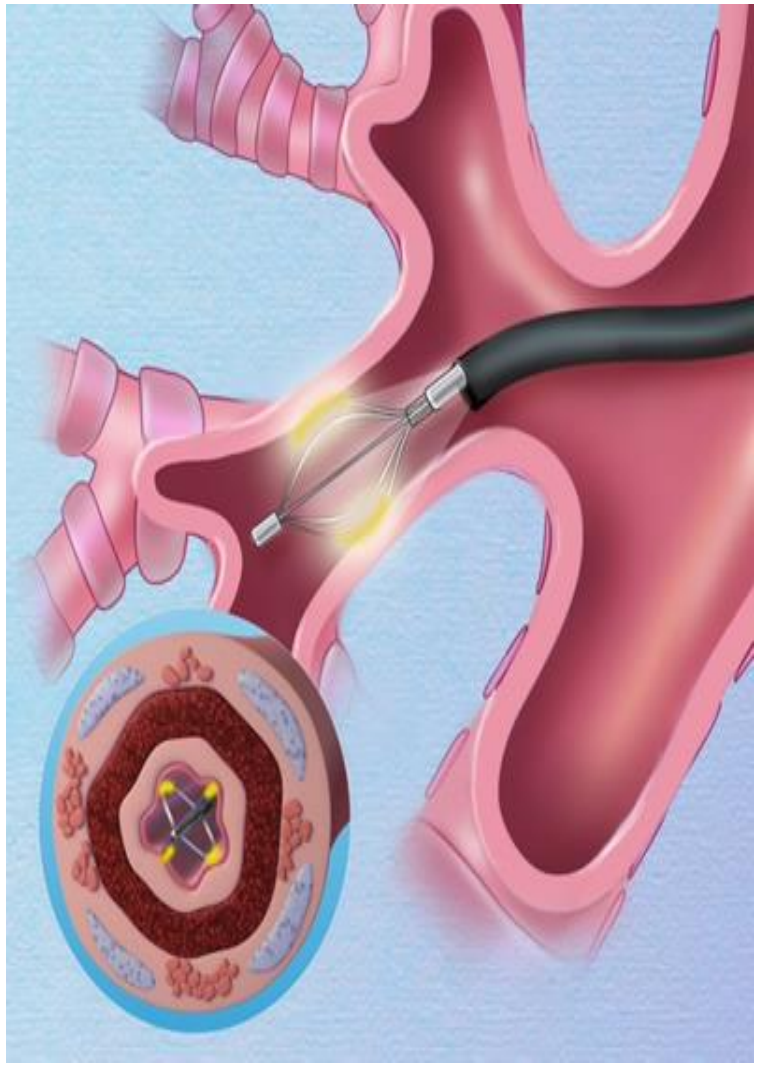


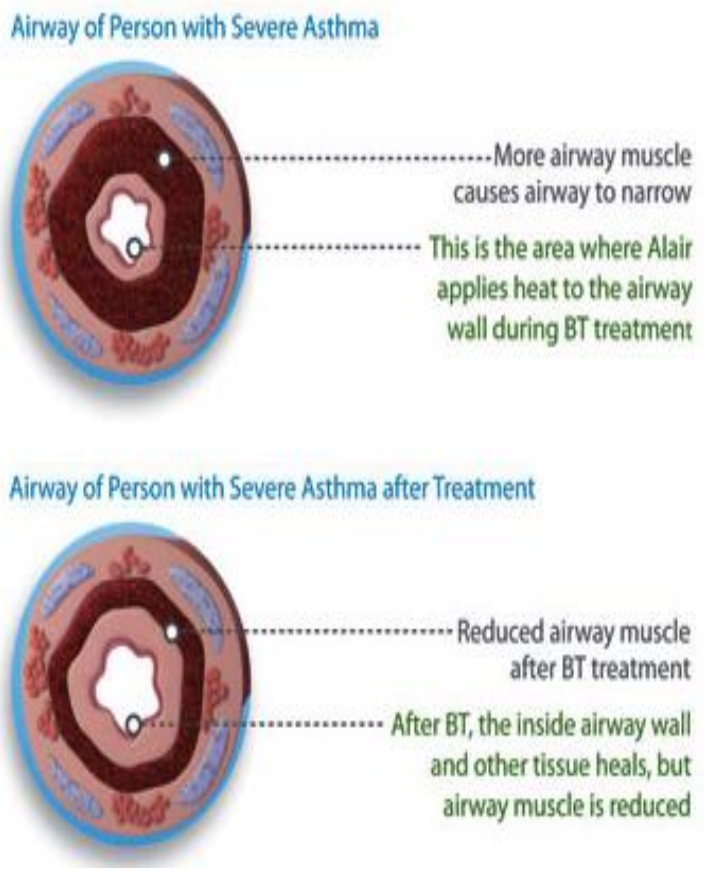
# Anti-IL-5 biologics

- Monoclonal antibody for those
  - Severe persistent asthma w/ an eosinophilic phenotype
  - Cannot be controlled on conventional therapies
  - Serum eosinophils decrease
- Monoclonal antibody for those
  - 18 and older with severe attacks despite treatment
    - reslizumab (Cinqair) IV every 4 weeks over 20-50 minutes
  - 12 and older
    - mepolizumab (Nucala) 1 injection every 4 weeks



# Bronchial thermoplasty






Apply radio frequency energy to airway wall to decrease smooth muscle
Treat airways > 3 mm during three separate procedures (RLL, LLL, R/LUL)

# Bronchial Thermoplasty

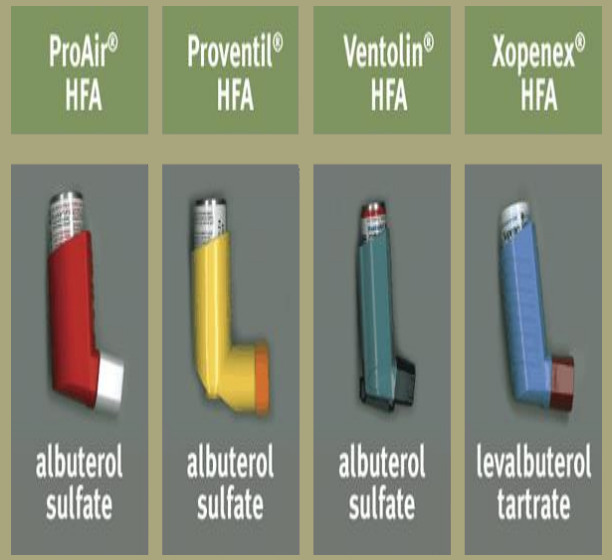
Castro M, et al. Am J Respir Crit Care Med. 2010 (n = 288)

- Severe asthmatics randomized to either BT/Sham BT
- 79% vs. 64% improved AQOL scores ( ≥ 0.5) → large placebo effect
- Reduced/less severe exacerbations and ↓ ED visits & missed days of work
- 8.4% exacerbated with short hospitalization post-BT
- Excluded higher risk group
  (> 3 exacerbations/URI or more than 4 steroids pulses in prior year)
- Did not follow placebo group long term

- Five follow-up: Persistent benefit year 1 vs. 5

# Component 4- Education for a Partnership in Asthma Care

# Pressurized Metered-Dose Inhaler Technique




- 1 r

**FIGURE 3–14. HOW TO USE YOUR METERED-DOSE INHALER**

## How To Use Your Metered-Dose Inhaler

Using an inhaler seems simple, but most patients do not use it the right way. When you use your inhaler the wrong way, less medicine gets to your lungs.

For the next few days, read these steps aloud as you do them or ask someone to read them to you. Ask your doctor or nurse to check how well you are using your inhaler.

Use your inhaler in one of the three ways pictured below. A or B are best, but C can be used if you have trouble with A and B. Your doctor may give you other types of inhalers.

### Steps for Using Your Inhaler

**Getting ready**

1. Take off the cap and shake the inhaler.
2. Breathe out all the way.
3. Hold your inhaler the way your doctor said (A, B, or C below).

**Breathe in slowly**

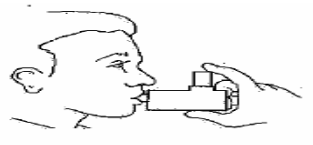
4. As you start breathing in slowly through your mouth, press down on the inhaler one time. (If you use a holding chamber, first press down on the inhaler. Within 5 seconds, begin to breathe in slowly.)
5. Keep breathing in slowly, as deeply as you can.

**Hold your breath**

6. Hold your breath as you count to 10 slowly, if you can.
7. For inhaled quick-relief medicine (beta$_2$-agonists), wait about 15–30 seconds between puffs. There is no need to wait between puffs for other medicines.

A. Hold inhaler 1 to 2 inches in front of your mouth (about the width of two fingers).

B. Use a spacer/holding chamber. These come in many shapes and can be useful to any patient.



C. Put the inhaler in your mouth. Do not use for steroids.

Clean your inhaler as needed, and know when to replace your inhaler. For instructions, read the package insert or talk to your doctor, other health care provider, or pharmacist.

# Dry powder inhalers

- Rapid inspiration
- Technique is device specific

# Choosing an inhaler device for children ≤5 years

| Age | Preferred device | Alternate device |
|---|---|---|
| 0–3 years | Pressurized metered dose inhaler plus dedicated spacer with face mask | Nebulizer with face mask |
| 4–5 years | Pressurized metered dose inhaler plus dedicated spacer with mouthpiece | Pressurized metered dose inhaler plus dedicated spacer with face mask, or nebulizer with mouthpiece or face mask |

# Spacers and VHCs

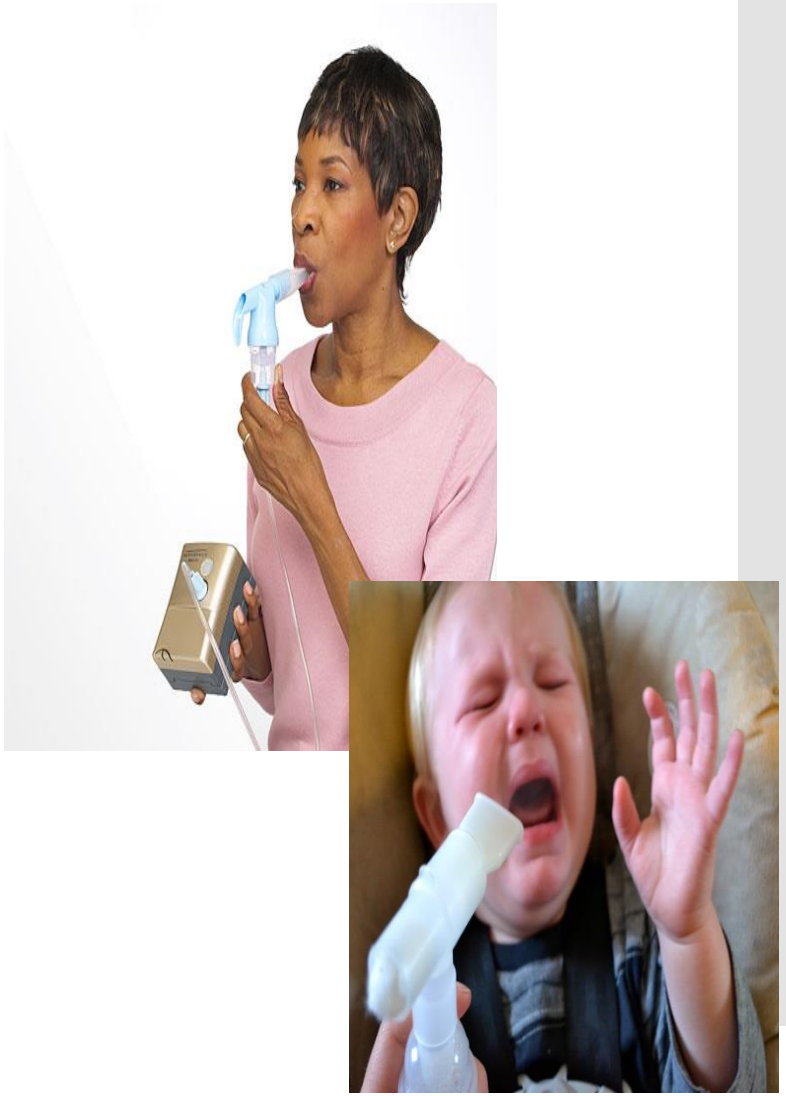
- Increase medication delivery to the lower airways by reducing oral deposition of particles and by enhancing hand-mouth coordination with activation
- Spacer is a generic term for any open tube placed on the MDI mouthpiece to extend its distance from the mouth
- VHCs are manufactured with a one-way valve that prevents exhalation into the device
- Activate only once into VHC/spacer
- Rinsing with diluted household detergents should prevent static electricity and enhance delivery to lungs (or use anti-static device)

# Priming, care

- Priming is necessary to deliver a correct dose into the lungs
- Priming and care is drug/device specific

# Nebulizers

- Never use "blow by"
- More expensive and time-consuming than MDIs with VHCs; not any better
- If not cleaned properly, there is a risk of bacterial infections
- After each use, take apart the nebulizer and wash all parts (except tubing and finger valve) in liquid dish soap and water. Rinse with water and shake off any excess. Reattach the nebulizer pieces and tubing to the air compressor and turn on the compressor to dry the nebulizer quickly. Make sure the nebulizer is completely dry before storing



# Asthma action plans

- Symptom-based is favored
- "Rules of 2"
- AAP and routine care are the most critical components for good outcomes

# Should asthma action plans be based peak flows or symptoms?

- Children assigned to a symptom-based asthma action plan less frequently required an acute care visit for asthma compared to those who received a peak flow based plan
- More children intended to continue using the symptom-based compared to the peak-flow based written action plan

*Cochrane systematic reviews Bhogal et al 2009*

# Symptom monitoring using the Rules of two

Do you….

…Use your rescue inhaler more than 2 times per week?

….Wake up from asthma more than 2 times per month?

….Need Prednisone to treat asthma attacks more than 2 times a year?

**If the answer is YES to ANY of ONE question your asthma may not be controlled**

# Asthma adherence

# Adherence

- Adherence is a process not only an outcome
- Adherence is not dichotomous
  - Chronic underuse
  - Erratic patterns of use
  - Mixed
  - Primary vs. secondary
  - Administration technique
  - Unintentional vs. intentional

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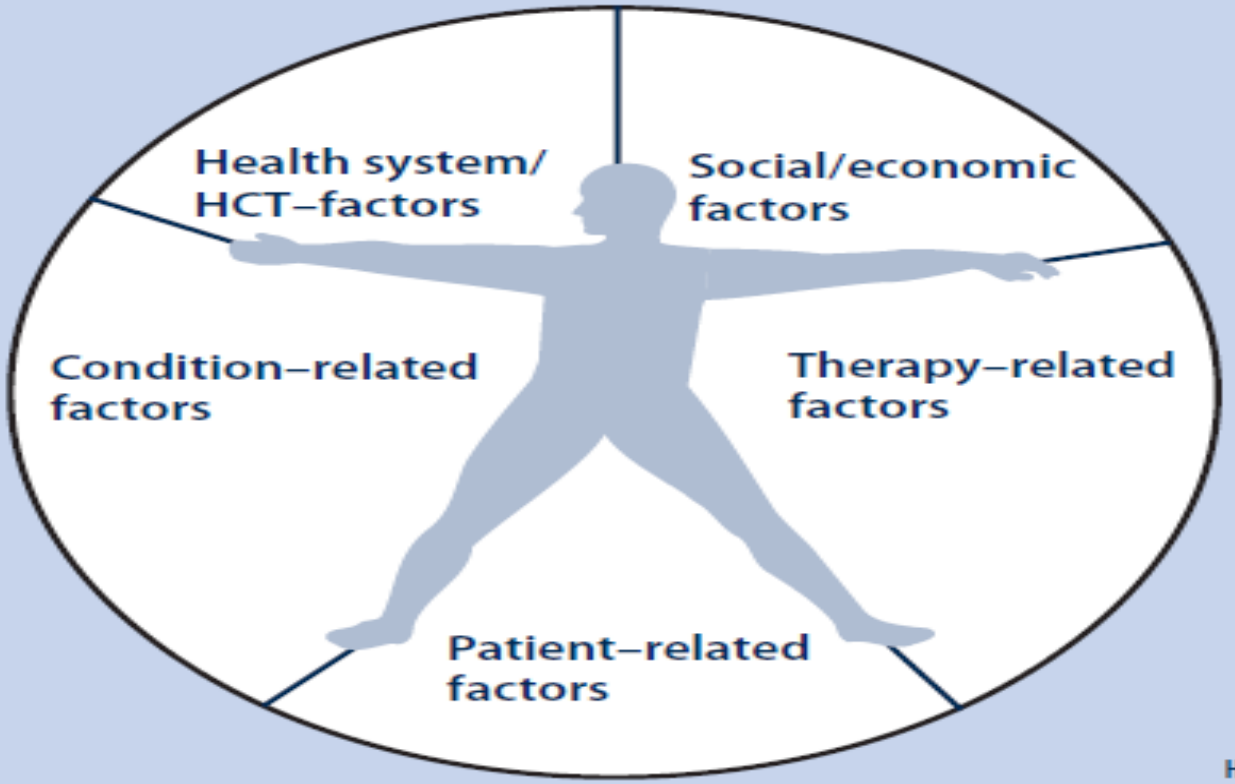
  - Chronic underuse
  - Erratic patterns of use
  - Mixed
  - Primary vs. secondary
  - Administration technique
  - Unintentional vs. intentional

**No factors reliably predict adherence**

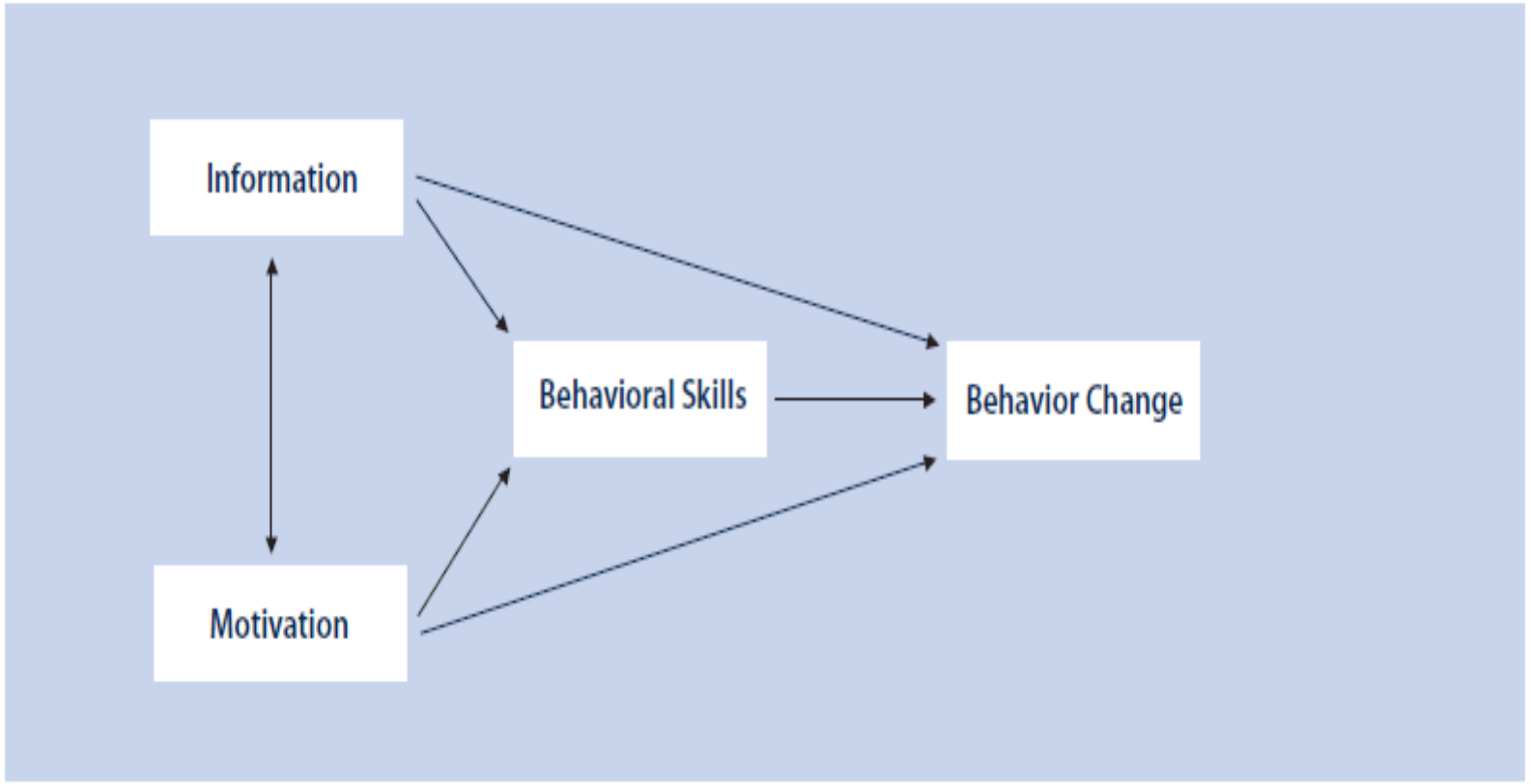
# ADHERENCE TO LONG-TERM THERAPIES Evidence for action. WHO, 2003

**Figure 3** The five dimensions of adherence




HCT, Health-care team

# ADHERENCE TO LONG-TERM THERAPIES
Evidence for action. WHO, 2003



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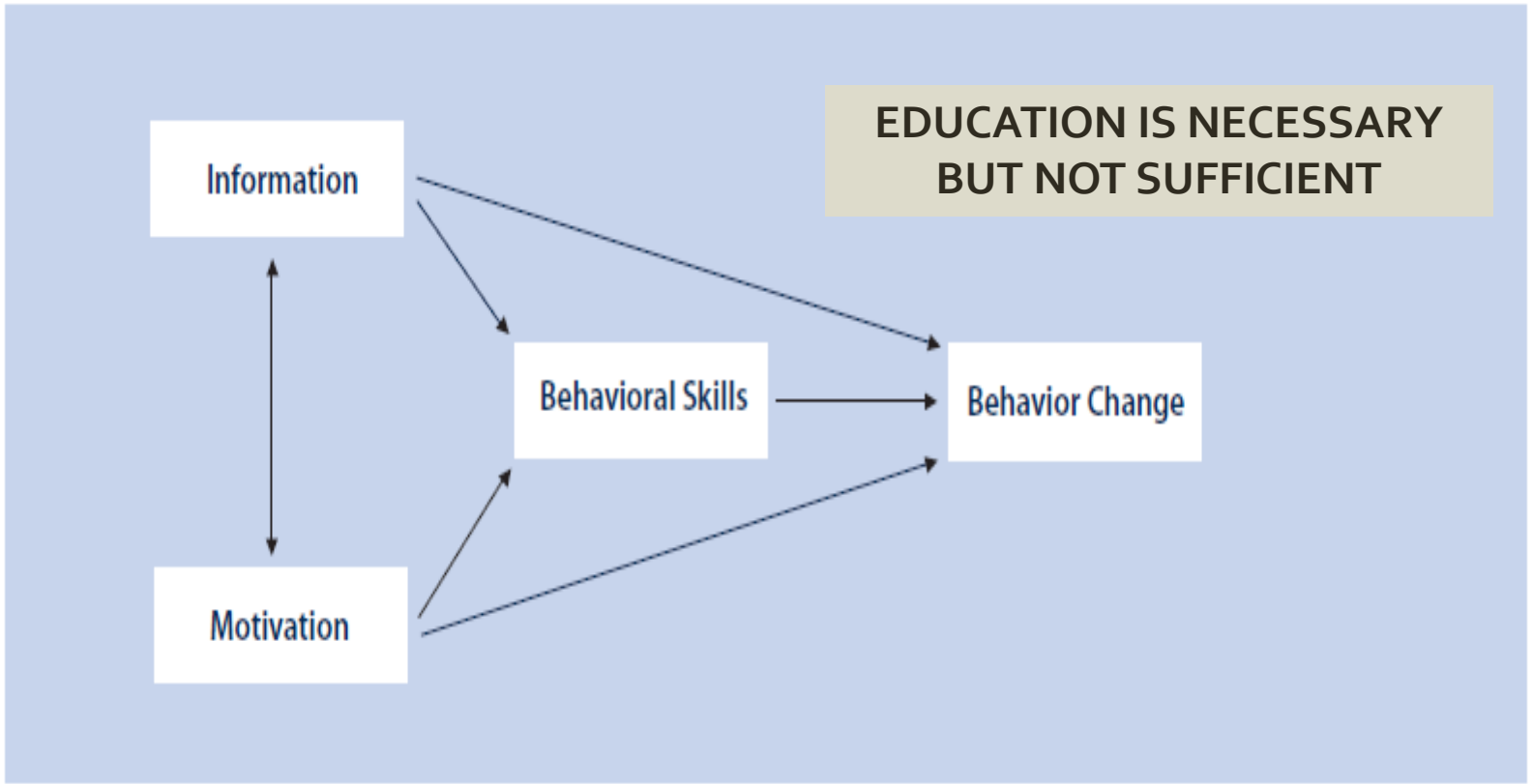
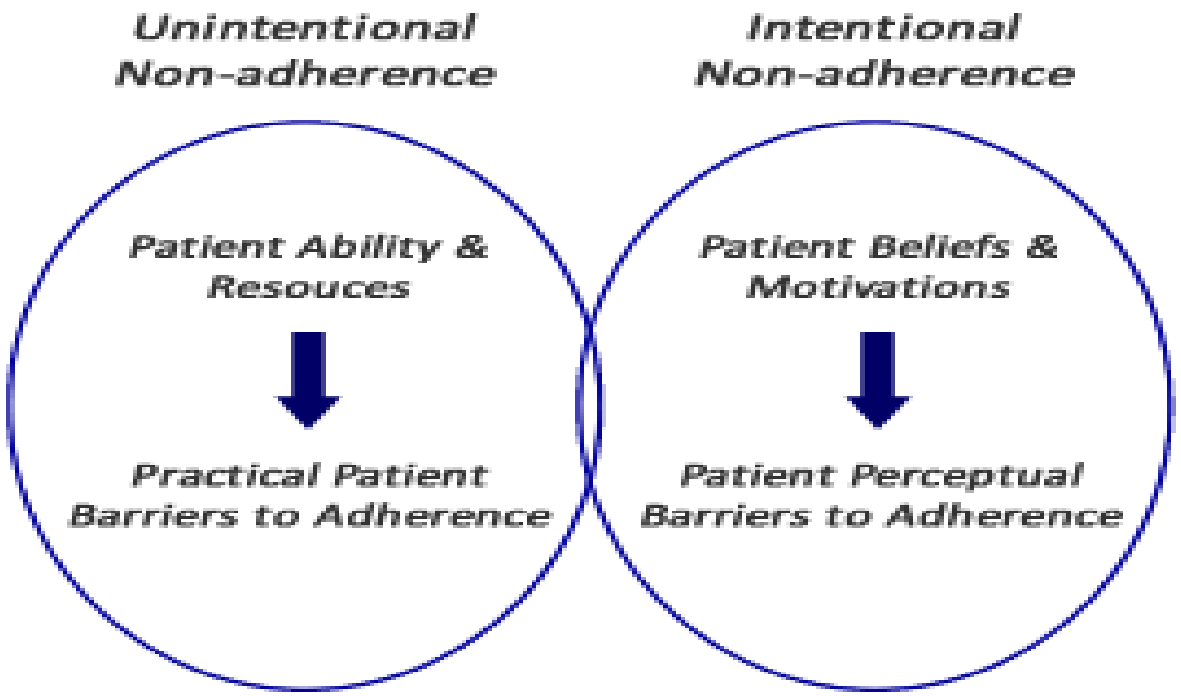


# Types of non-Adherence




**SMART INHALERS**

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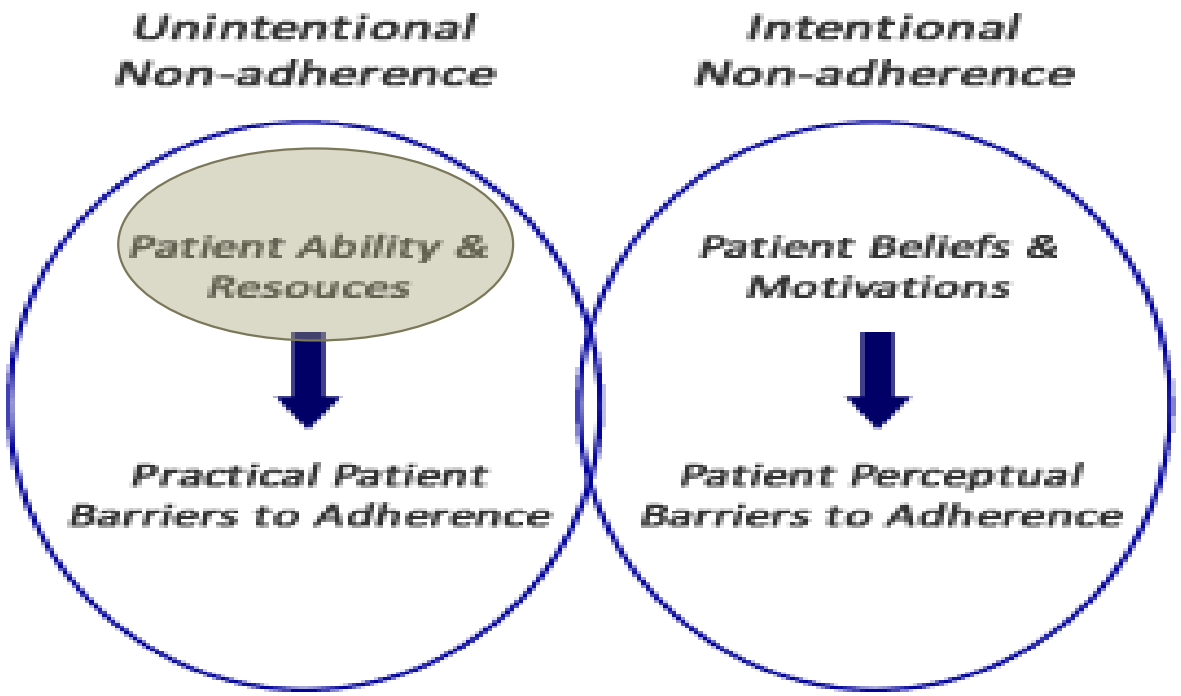


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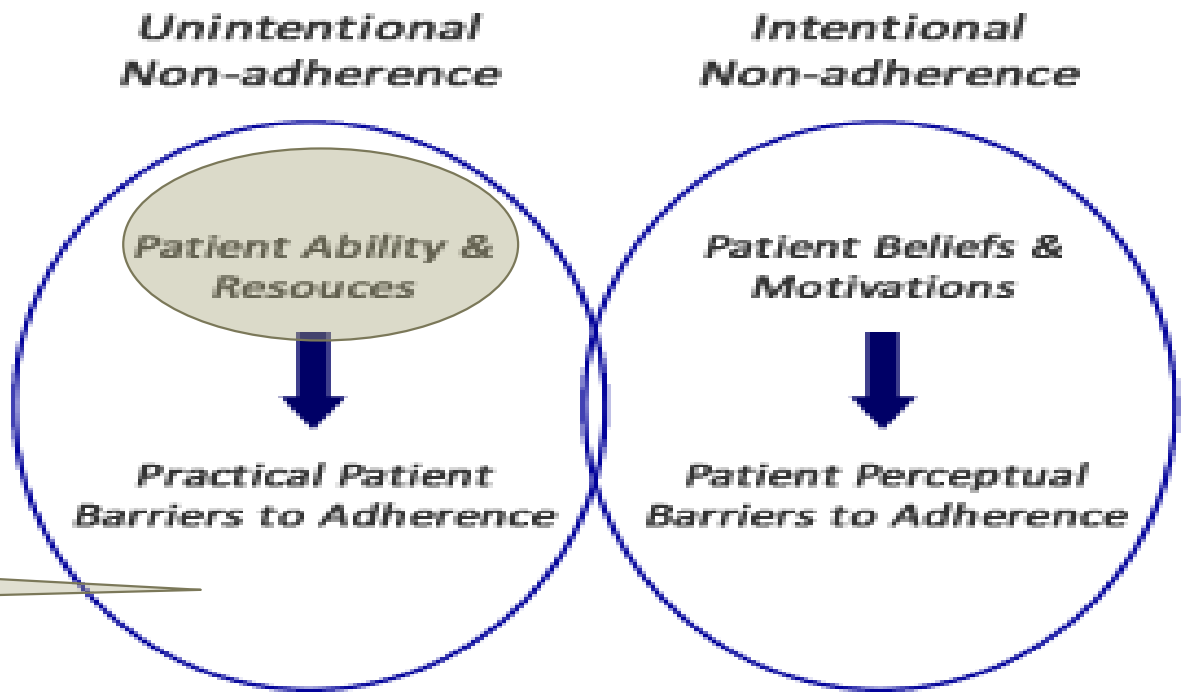
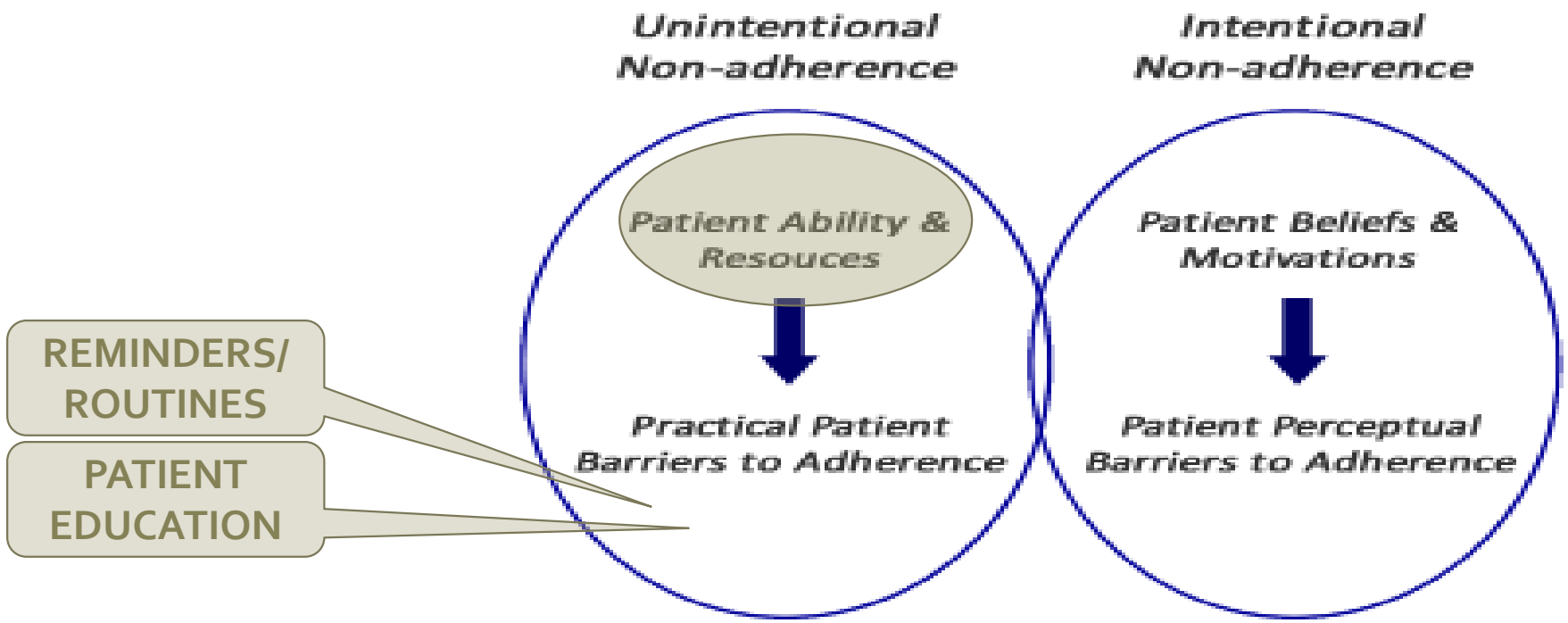



PATIENT EDUCATION

SMART INHALERS

# Types of non-Adherence

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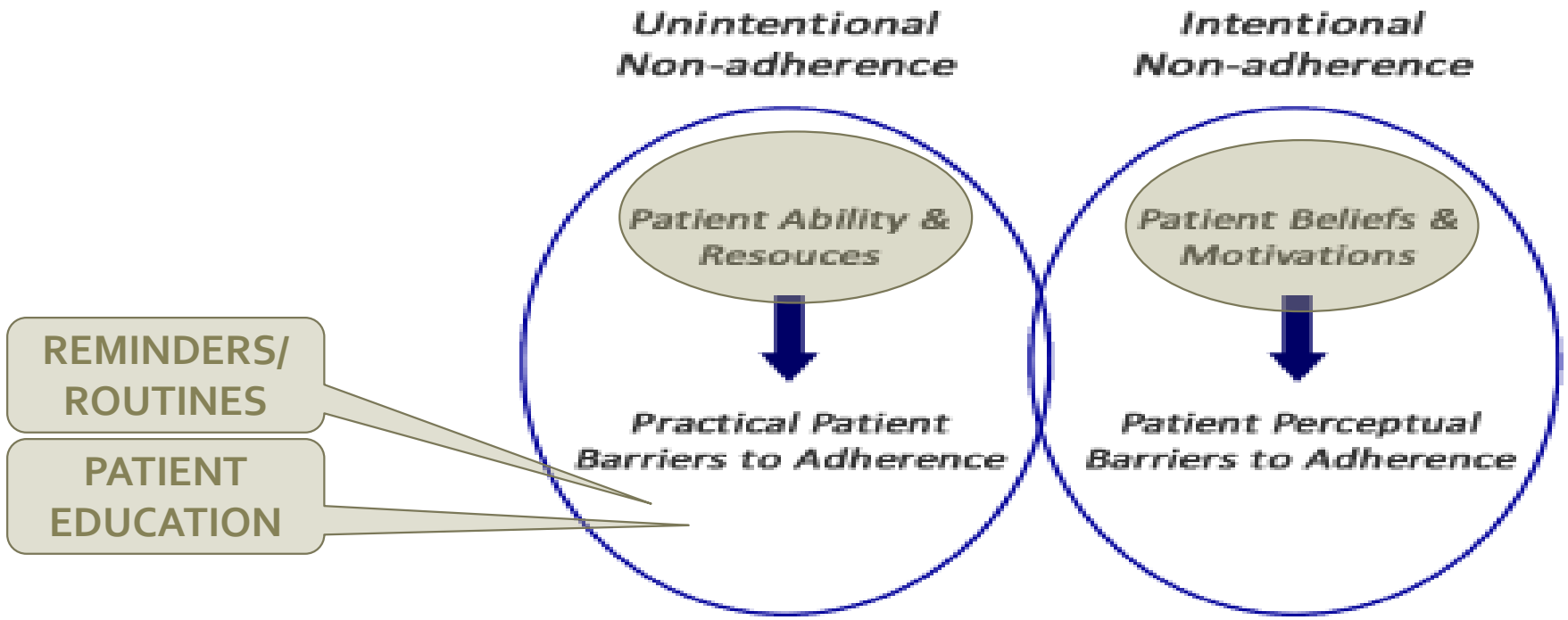


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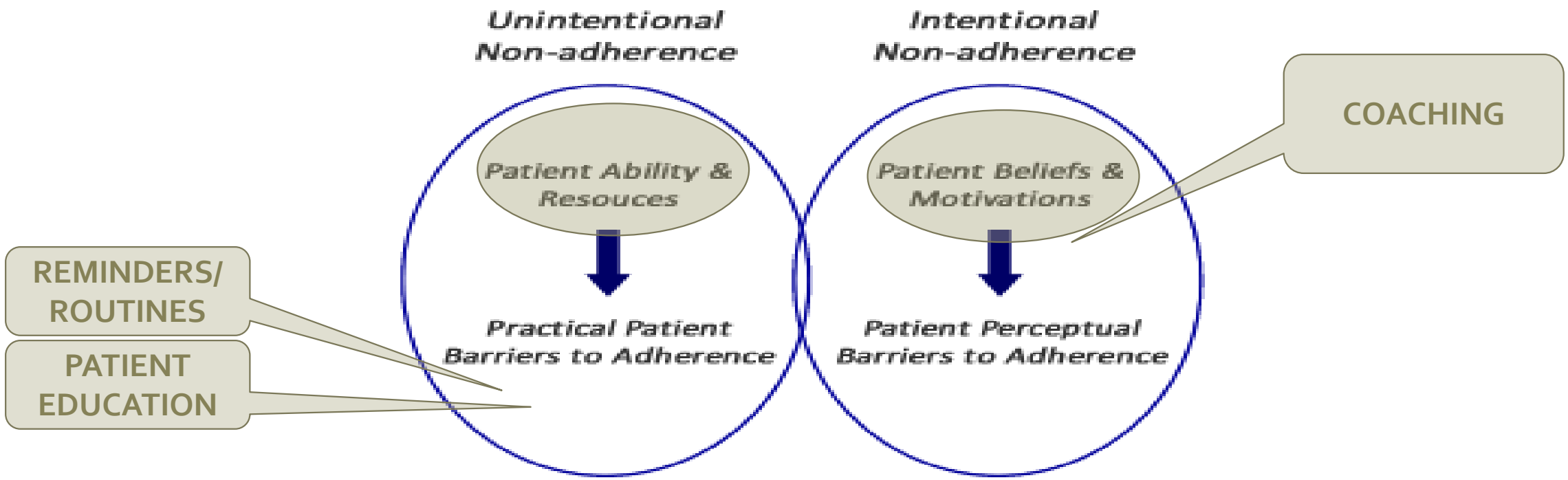


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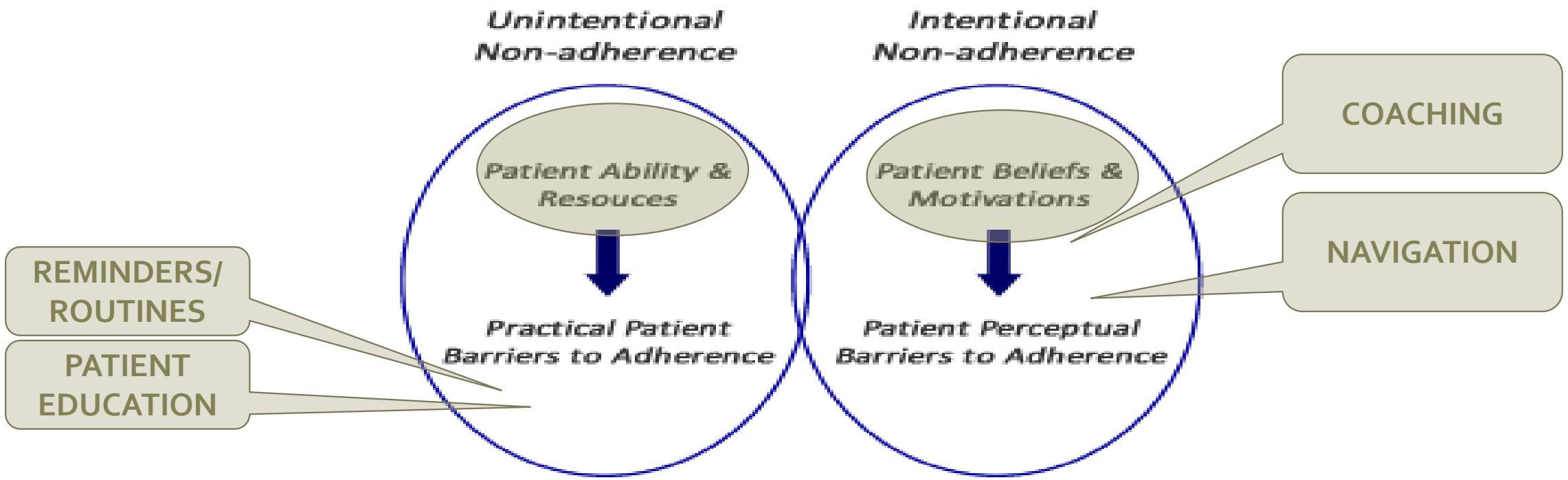


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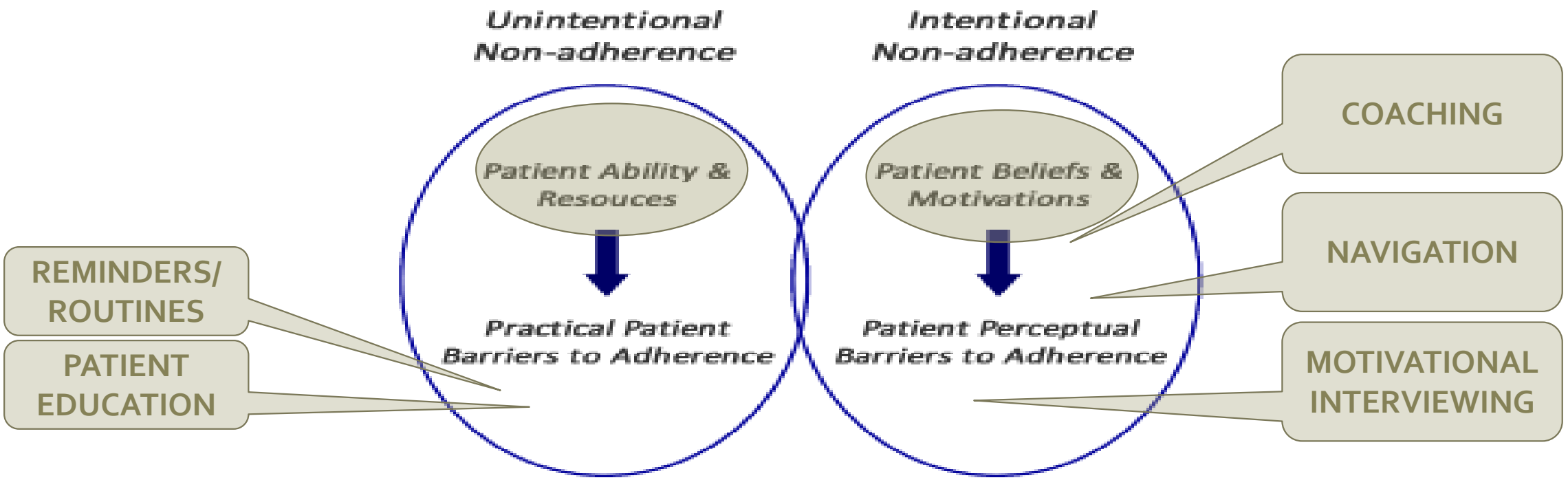


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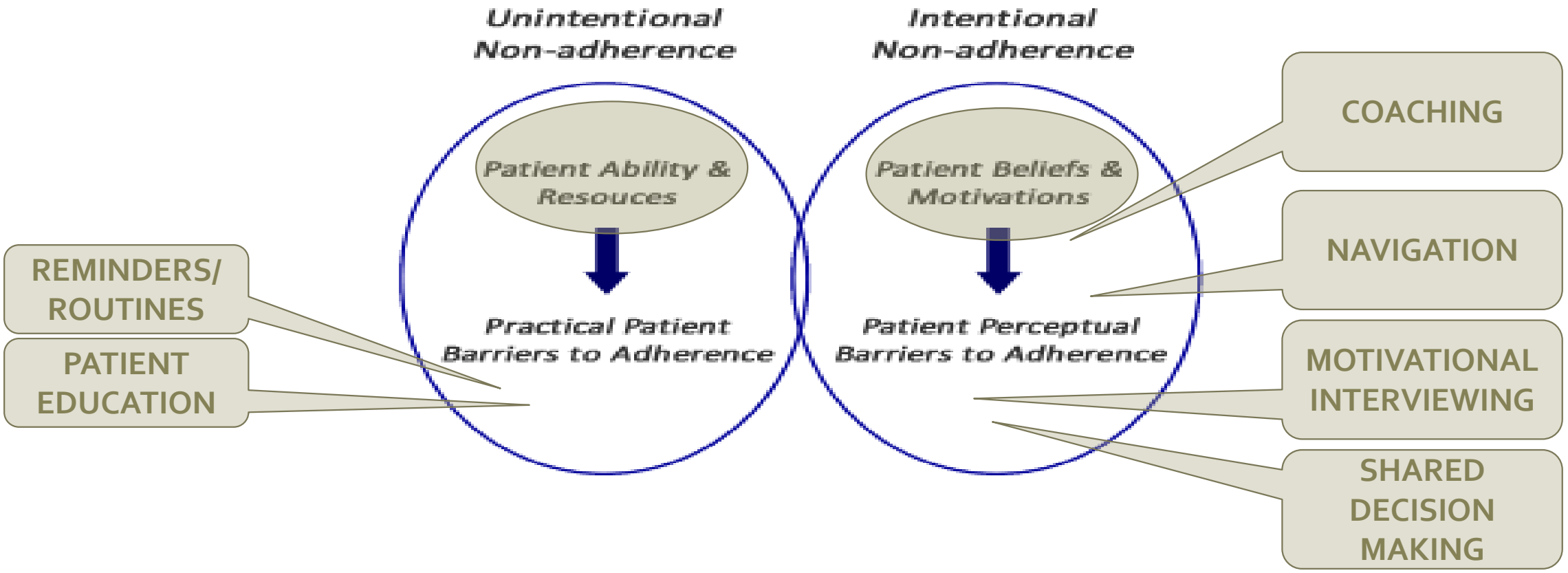

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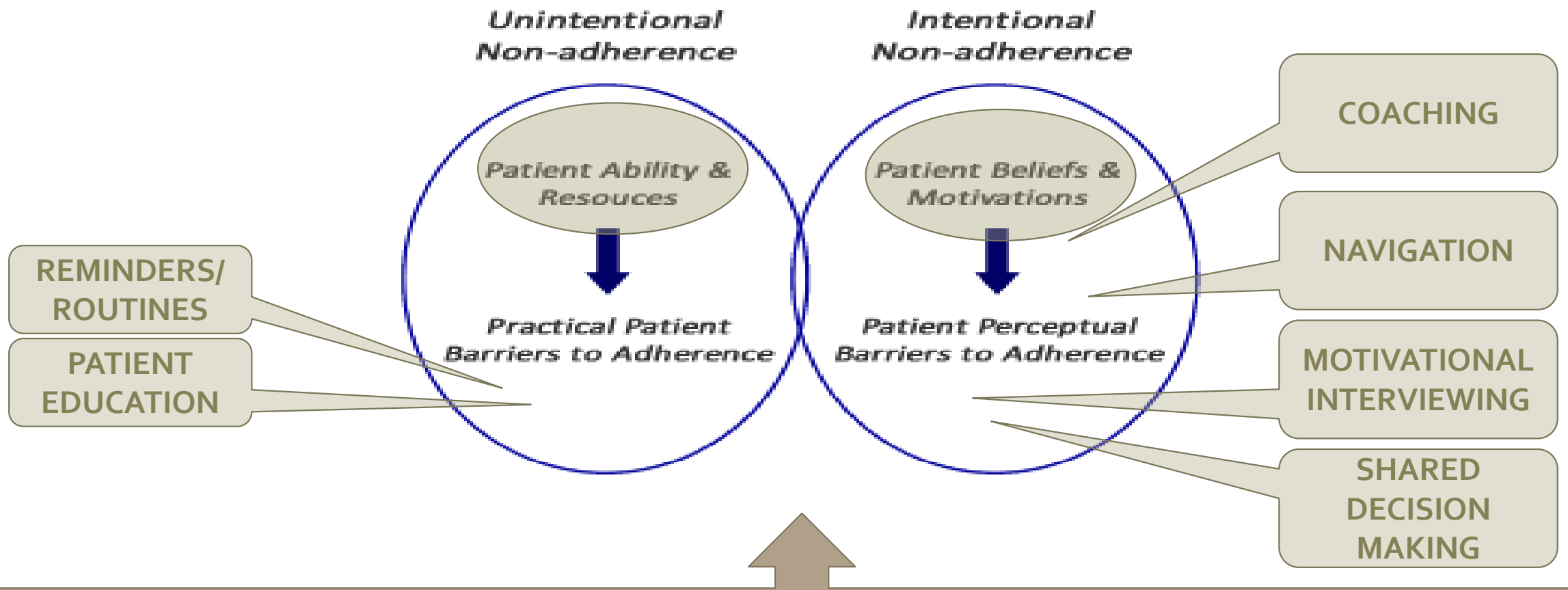


**SMART INHALERS**

# Asthma SELF-MANAGEMENT Adherence

| Asthma SM Behavior | Adherence | Reference |
|---|---|---|
| ICS | 47-57%<br>29 RCTs of 2210 pts | Normansell et al 2017 Cochrane Database of Sys Rev |
| SABA | N = 53; mean refill 5.1/1.3 canisters | Bollinger et al 2013 AAAI |
| Environmental Remediation | 48% | CDC Vital Signs 2011 |
| Appointment Keeping | 29% of pediatric primary care visits<br>(5326/7511 missed) | McGovern et al 2017 J Asthma |

# Looking ahead to EPR-4

EPR-4 Update in 2018

# Asthma Topics

1. Role of Adjustable Medication Dosing in Recurrent Wheezing and Asthma

2. Role of Long Acting Anti-Muscarinic Agents (LAMAs) in Asthma Management as Add-on to ICSs

3. Role of Bronchial Thermoplasty in Adult Severe Asthma

4. Role of Fractional exhaled Nitric Oxide (FeNO) in Diagnosis, Medication Selection, and Monitoring Treatment Response in Asthma

5. Role of Remediation of Indoor Allergens (e.g., House Dust Mites/Animals/Pests) in Asthma Management

6. Role of Immunotherapy in Treatment of Asthma