



Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

BMST4004

Respiratory Conditions

Trawsnewid Addysg; Trawsnewid Bywydau
Transforming Education; Transforming Lives



www.uwtsd.ac.uk

Learning Outcomes

- Describe benefits of physical activity on respiratory conditions
- Understand and explain potential strategies to minimise risk of respiratory conditions on overall health
- Describe CIs of physical activity in respiratory conditions
- Discuss prevalent respiratory conditions
- Explain the aetiology and epidemiology of respiratory conditions in the UK



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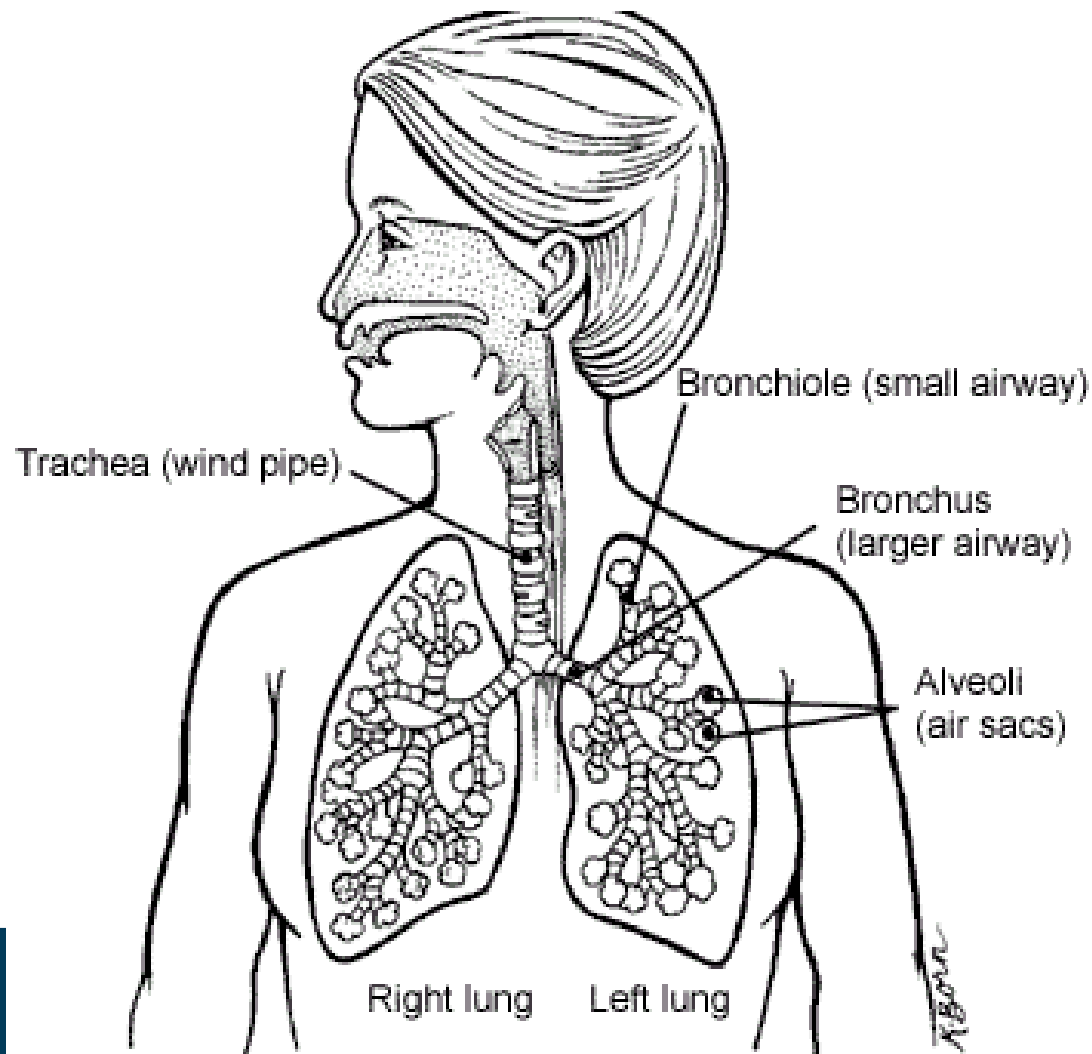
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MSc BSc MHCPC MCSP MAACP



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COPD & Asthma



Asthma

Chronic Bronchitis

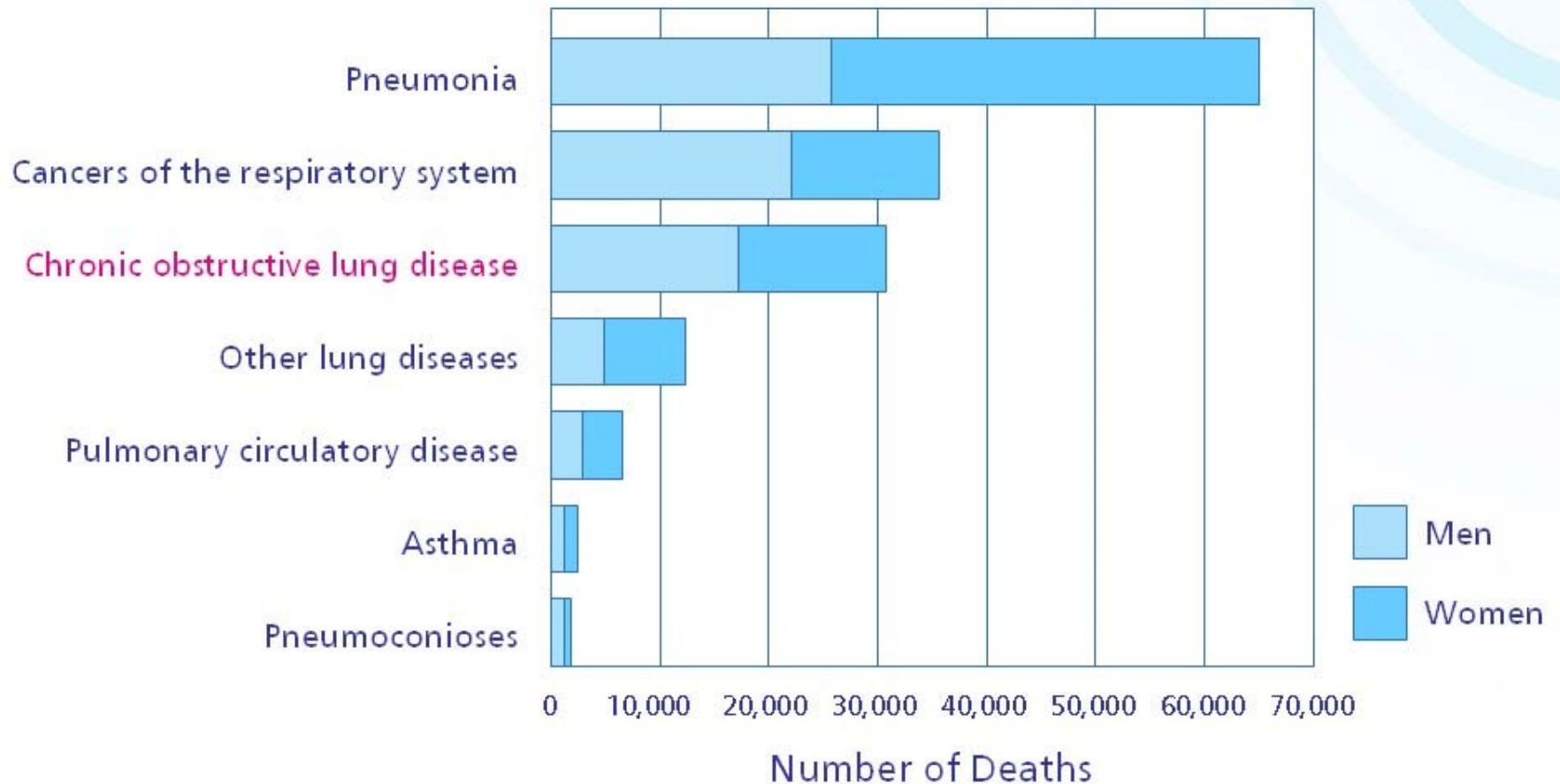
Emphysema

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snewid Bywydau
Transforming Lives

COPD BURDEN

Chronic obstructive lung disease, mainly chronic obstructive pulmonary disease, is the third biggest cause of respiratory death, and accounts for one fifth (20%) of respiratory mortality.



Chronic obstructive pulmonary disease (COPD)

- Chronic bronchitis
- Emphysema
- *Cystic fibrosis*
- Asthma?

Diseases of the lungs in which the airways become narrowed leads to a limitation of the flow of air to and from the lungs causing shortness of breath.

The limitation of airflow is poorly reversible and usually gets progressively worse over time.

Chronic bronchitis

- Defined in clinical terms as a cough with sputum production on most days for 3 months of a year, for 2 consecutive years.
- Caused by lung damage and inflammation in the large airways resulting in an increased number (hyperplasia) and increased size (hypertrophy) of the goblet cells and mucous glands of the airway.
- Resulting in more mucus than usual in the airways and contributing to narrowing of the airways and causing a cough with sputum.
- The consequence of these changes is a limitation of airflow.

Emphysema

- Enlargement of the air spaces distal to the terminal bronchioles, with destruction of the alveoli walls.
- The destruction of air space walls reduces the surface area available for the exchange of oxygen and carbon dioxide during breathing.
- The reduced elasticity of the lungs results in a loss of support for the airways increasing their likelihood to collapse causing further limitation to airflow.

Cystic Fibrosis

- Genetic condition (CFTR gene) in which the lungs and digestive system become clogged with thick sticky mucus.
- *This gene regulates membrane protein cystic fibrosis transmembrane conductance regulator which controls the flow of chloride ions out of the epithelia cell, sodium follows passively in to mucus increasing the electrolyte concentration. Water then moves out of the cell into the mucus by osmosis making it thinner.*

Asthma

- Chronic inflammatory disease of the airways characterized by:
 - Coughing
 - Recurrent episodes of wheezing
 - Shortness of breath
 - Chest tightness/pain

Caused by

- Airways are supersensitive and react to a variety of stimuli or triggers resulting in a transient swelling of the airways and increased mucus secretion

DIFFERENTIATING COPD FROM ASTHMA

CLINICAL FEATURES	COPD	Asthma
Smoker or ex-smoker	Nearly all	Possibly
Symptoms under age 35	Rare	Often
Chronic productive cough	Common	Uncommon
Breathlessness	Persistent and progressive	Variable
Night time waking with breathlessness and or wheeze	Uncommon	Common
Significant diurnal or day to day variability of symptoms	Uncommon	Common

CLASSIFICATION AND ASSESSMENT OF SEVERITY

- A full assessment should include:
 - spirometry
 - breathlessness (using MRC dyspnoea scale)
 - weight loss (calculate BMI)
 - estimate of frequency of exacerbations

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

DEFINITION OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

COPD is characterised by airflow obstruction. The airflow obstruction is usually progressive, not fully reversible and does not change markedly over several months. The disease is predominantly caused by smoking.

Airflow obstruction is defined as:

$FEV_1 < 80\%$ predicted

and

$FEV_1/FVC < 0.7$



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ASSESSMENT OF SEVERITY

Assess and record the severity of airflow obstruction according to the reduction in FEV_1 .

Severity of airflow obstruction	FEV_1 % predicted
Mild	50–80
Moderate	30–49
Severe	<30



FVC & FEV₍₁₎ Predictive equations

Men

- $FVC = (0.0576 \times \text{height}) - (0.026 \times \text{age}) - 4.34$ (SD: ± 0.61 litres)
- $FEV_1 = (0.043 \times \text{height}) - (0.029 \times \text{age}) - 2.49$ (SD: ± 0.51 litres)

Women

- $FVC = (0.0443 \times \text{height}) - (0.026 \times \text{age}) - 2.89$ (SD: ± 0.43 litres)
- $FEV_1 = (0.0395 \times \text{height}) - (0.025 \times \text{age}) - 2.60$ (SD: ± 0.38 litres)

Restrictive Respiratory Disease

A condition causing stiffness in the lungs themselves. In other cases, stiffness of the chest wall, weak muscles, or damaged nerves may cause the restriction in lung expansion

- Obesity
- Pulmonary fibrosis
- Neuromuscular disease

Identifying abnormalities

Spirometry indicates the presence of an abnormality if any of the following are recorded:

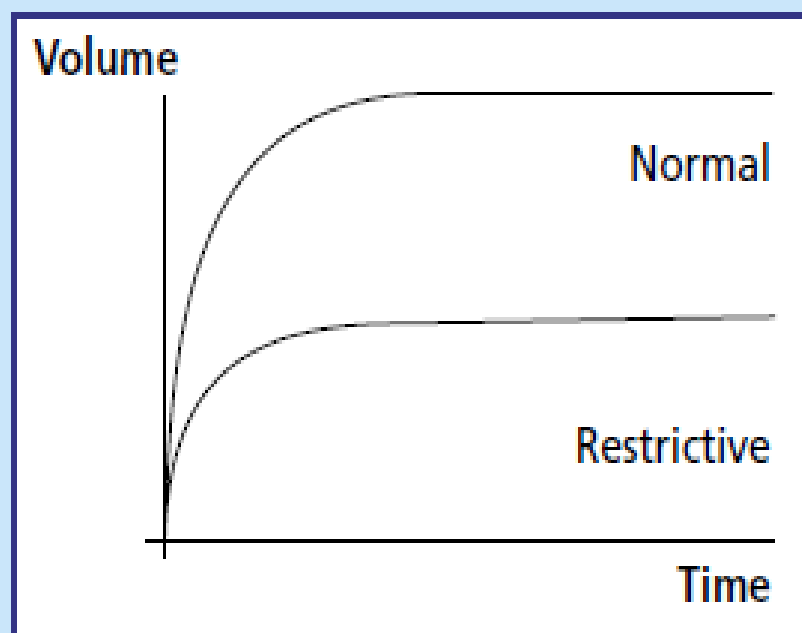
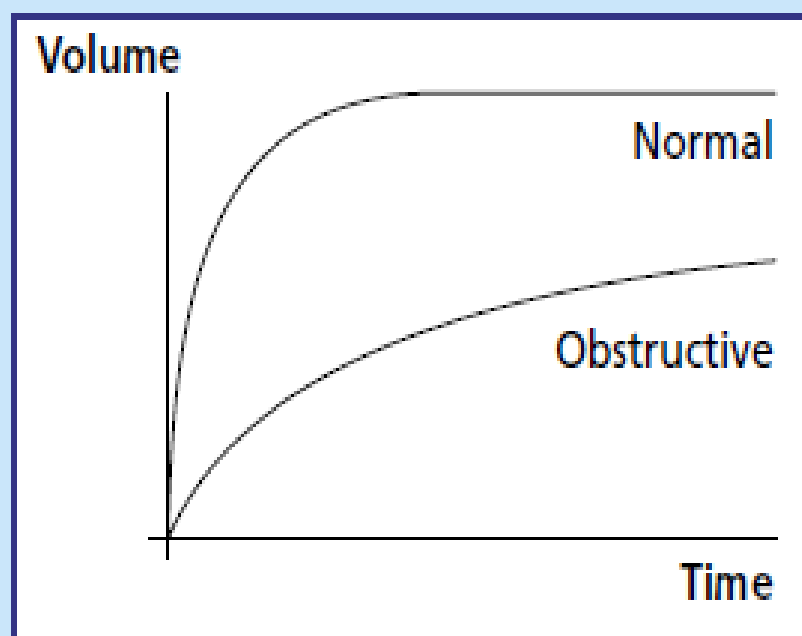
- $FEV_1 < 80\%$ predicted normal
- $FVC < 80\%$ predicted normal
- FEV_1/FVC ratio < 0.7

Obstructive disorder:

- FEV_1 reduced ($< 80\%$ predicted normal)
- FVC is usually reduced but to a lesser extent than FEV_1
- FEV_1/FVC ratio reduced (< 0.7)

Restrictive disorder:

- FEV_1 reduced ($< 80\%$ predicted normal)
- FVC reduced ($< 80\%$ predicted normal)
- FEV_1/FVC ratio normal (> 0.7)

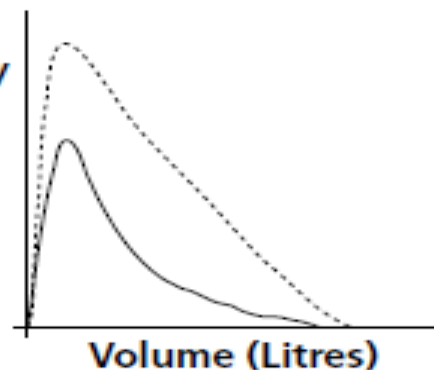


Identifying abnormalities with flow-volume curves

Obstructive disorder:

In this example of a patient with obstructive airways disease, the peak expiratory flow (PEF) is reduced and the decline in airflow to complete exhalation follows a distinctive dipping (or concave) curve.

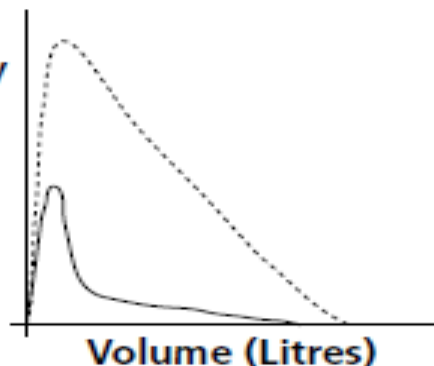
Expiratory
flow rate
(L/s)



Severe obstructive disorder:

In a severe airflow obstruction, particularly with emphysema, the characteristic 'steep pattern' is seen in the expiratory flow trace.

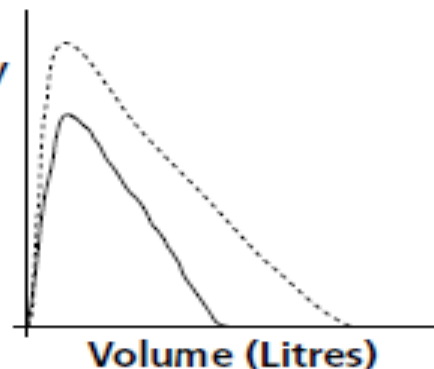
Expiratory
flow rate
(L/s)



Restrictive disorder:

The pattern observed in the expiratory trace of a patient with restrictive defect is normal in shape but there is an absolute reduction in volume.

Expiratory
flow rate
(L/s)



Prognosis of COPD

- COPD usually gradually gets worse over time and can lead to death.
- The factors that predict a poorer prognosis are:
 1. Severe airflow obstruction (low FEV1)
 2. Poor exercise capacity
 3. Shortness of breath
 4. Significantly underweight or overweight
 5. Complications like respiratory failure or cor pulmonale
 6. Continued smoking
 7. Frequent acute exacerbations

Asthma – Statistics!

- 5.4 million people in the UK are currently receiving treatment for asthma: 1.1 million children (1 in 11) and 4.3 million adults (1 in 12).
- There were 1,200 deaths from asthma in the UK in 2006 (40 were children aged 14 years or under). On average, 3 people per day or 1 person every 7 hours dies from asthma
- An estimated 75% of hospital admissions for asthma are avoidable and as many as 90% of the deaths from asthma are preventable.
- 42% of people with asthma say that traffic fumes stop them walking and shopping in congested areas
- 56% of people with asthma are sensitive to pet allergens.

Asthma and the Celtic nations

- In **Northern Ireland** 182,000 people are currently receiving treatment for asthma. This consists of 36,000 children and 146,000 adults.
- In **Scotland** 370,000 people are currently receiving treatment for asthma. This consists of 72,000 children and 296,000 adults.
- In **Wales** 314,000 people are currently receiving treatment for asthma. This consists of 36,000 children and 256,000 adults
- Costs UK £2.3b /year - £889m to NHS

Implications of Asthma

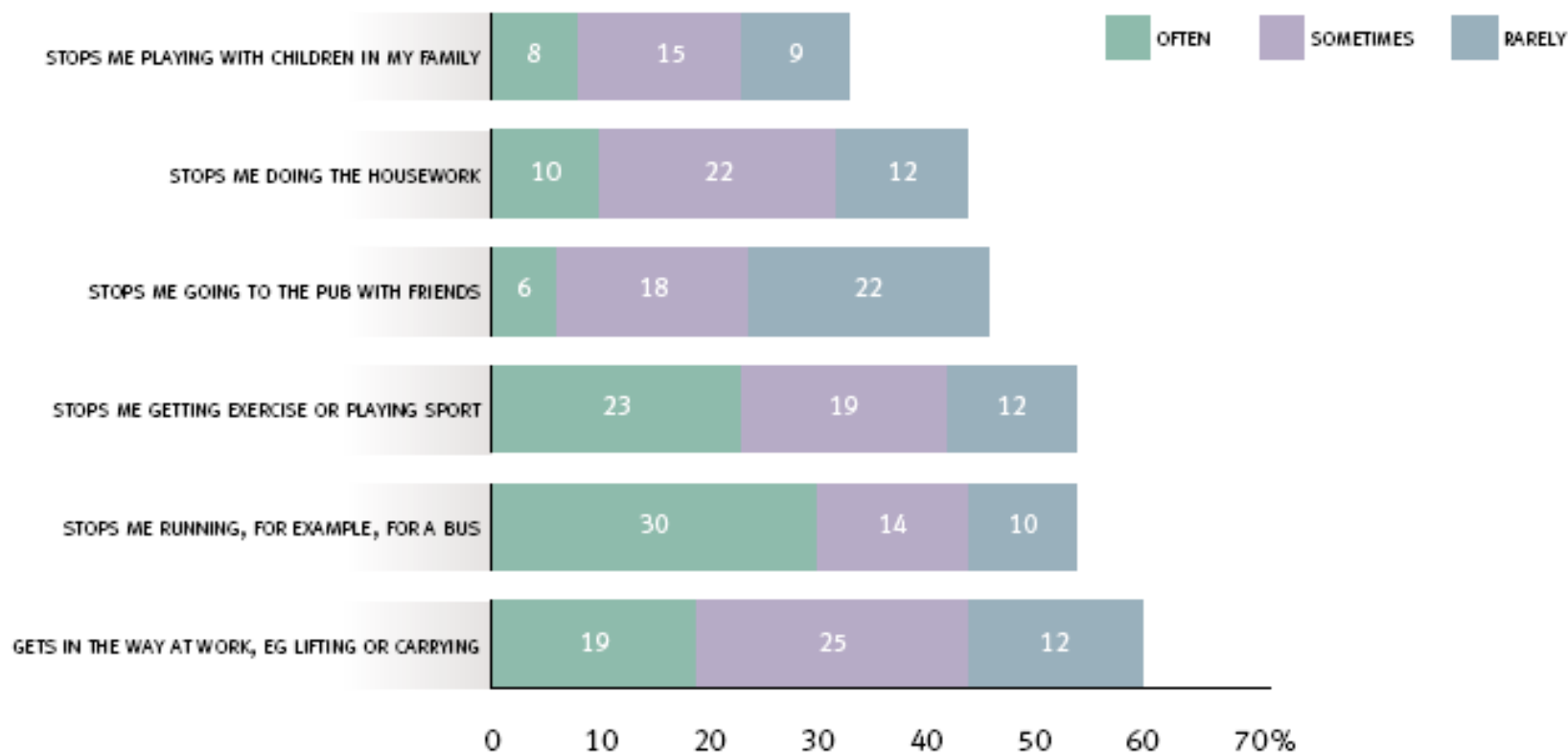
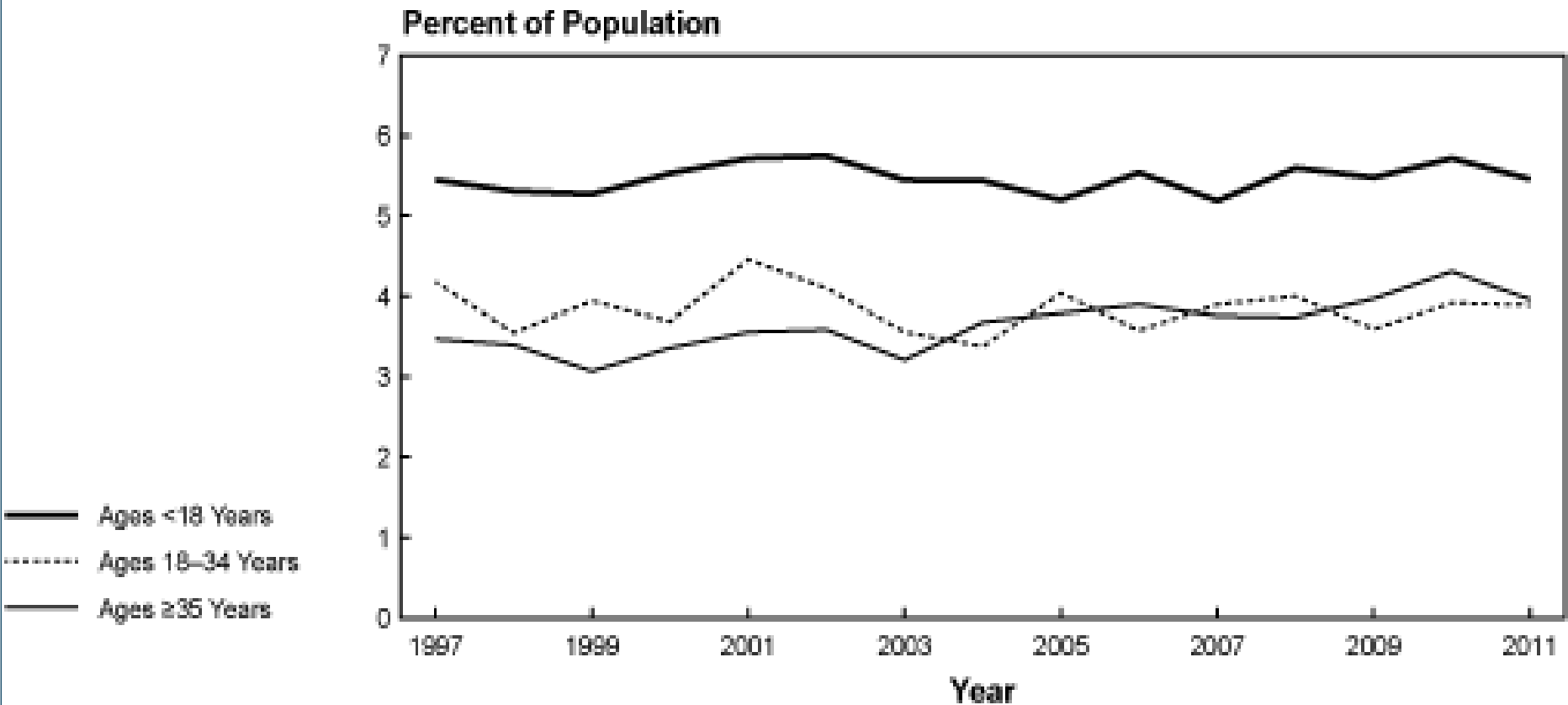


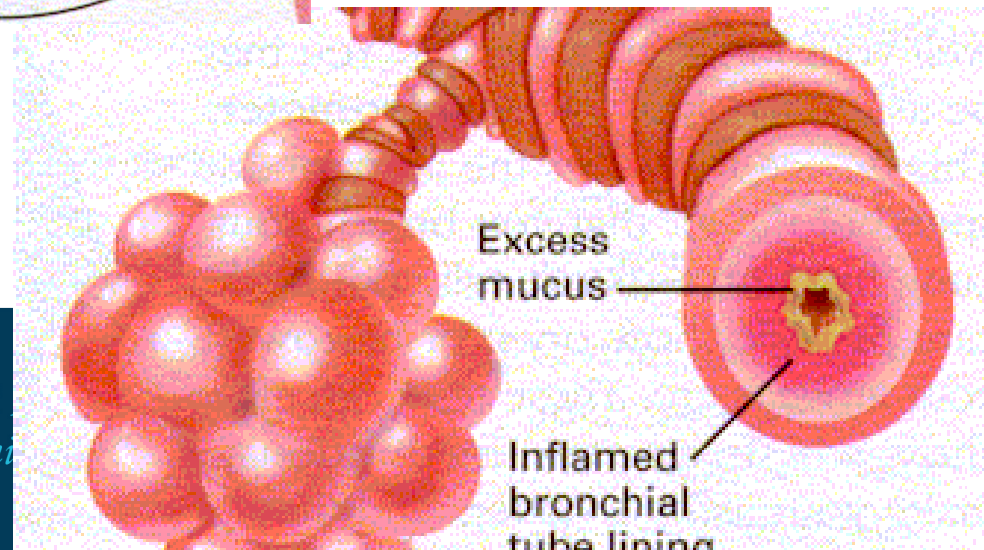
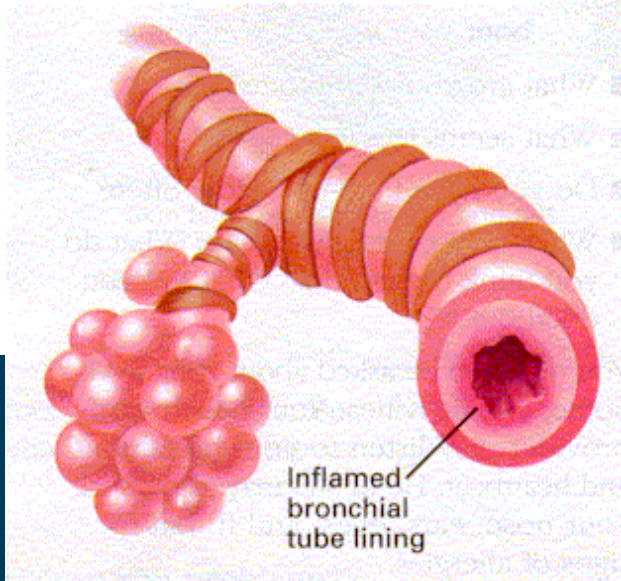
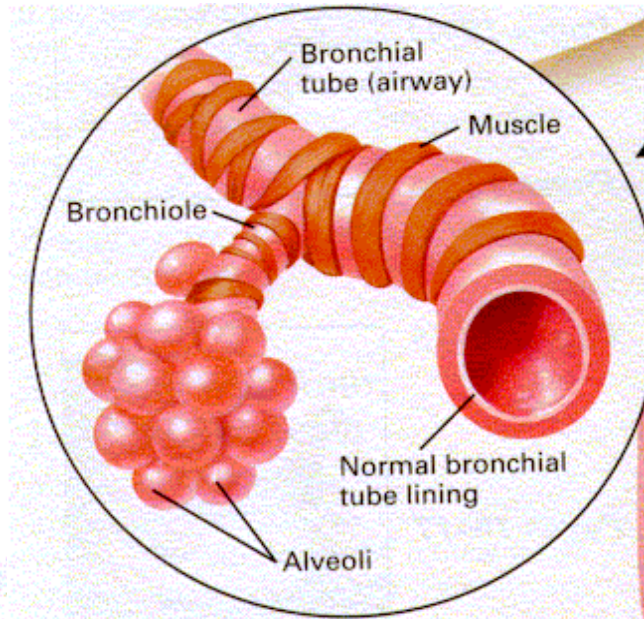
Figure 6: The things my asthma stops me doing



Rates of Asthma



Asthma Airway Changes



*Travisnewid
Transform*

Lung Changes During an Asthma Attack

- In response to a trigger (something that makes asthma worse):
 - Airways swell and become narrowed
 - Bronchial muscles tighten
 - Mucus further obstructs airways
 - Breathing becomes difficult

Types of Asthma

- Intrinsic – generally occurs in adult life and is a chronic inflammatory response of the upper respiratory tract.
- Extrinsic – occurring in children and young adults as a result of hypersensitivity to a or several foreign particles.

Triggers

- A variety of stimuli or “triggers” can cause airway inflammation (swelling) and bring on an asthma flare.
- Eliminating or reducing exposure to these triggers will decrease the need for asthma medications and reduce symptoms

Common Triggers

- Allergens: pollen, mold, animal dander, dust mites, foods, cockroaches
- Irritants: perfume, paints, strong smells, smoke
- Viral infections
- *Exercise*
- Emotional anxiety or stress
- Weather changes

Early Warning Signs

- Cough
- Chest tightness
- Nose rubbing
- Dark circles under eyes (allergic shiners)
- Itchy chin
- Scratchy throat
- Stomach or headache
- Change in face color (pale or flushed)
- Change in mood or activity level
- Throat clearing
- Thirst
- Signs may develop 24-48 hours before attack

Asthma Danger Signs

- Unable to talk in full sentences
- Sucking in skin above breastbone or in between ribs
- Difficulty walking due to shortness of breath
- Lips or fingernails become blue/gray
- Agitation
- Wheezing stops
- Rescue medicines are not helping
- Peak flow (if used) is indicating red zone

Diagnosis of Asthma

- Can be diagnosed by spirometry (pulmonary function studies)
- Peak flow meter can be used before and after exercise - measures how well the airways are working during physical activity

Asthma Medications

Quick-relief:

- ❑ Used in pre-treating before exercise or exposure to trigger
- ❑ Used to prevent or stop an asthma attack
- ❑ "Rescue medication"
- ❑ Should last 4 – 6 hours
- ❑ Often over-used
- ❑ Ex: salbuterol

Long-term control:

- ❑ Used daily as preventive medication
- ❑ Used for control of asthma instead of relieving it
- ❑ Needs to be taken daily or not effective
- ❑ Often under-used
- ❑ Ex: inhaled steroids

ASTHMA MANAGEMENT PLAN

Name _____ Drug Allergies _____ Weight _____

Green Zone: Go

- No symptoms of an asthma episode (no coughing, no wheezing, no shortness of breath, no nighttime awakenings)
- Able to do usual activities, run, play, attend school. Usual medications control asthma
- Peak Flow 80% of personal best
- PFM _____ to _____

Plan A: Take these preventative medicines all the time:

Controller/Preventative Medicine How delivered How much How often

15-20 minutes before sports/exercising take:

Yellow Zone: Caution

- Increased asthma symptoms, increased coughing, wheezing, work of breathing, shortness of breath, retractions, awakening at night
- Usual activities somewhat limited, unable to run, play, attend school as can normally
- Increased need for asthma medication
- Peak Flow 50-80% of personal best
- PFM _____ to _____

Plan B: Continue Plan A and add these quick relief medicines:

Short-Acting ?₂ Medicine How delivered How much How often

If you feel better after taking this medication: **Go back** to your **Green Zone** medications and **recheck every 4 hours** for continued improvement or worsening of asthma symptoms. If you **DO NOT** feel better in 20 to 60 minutes or if you need **Albuterol every 4 hours** then **Follow the RED ZONE Plan**.

Red Zone: DANGER

- Very short of breath, coughing and wheezing that won't stop
- Usual activities severely limited, can't walk, run, play, sleep or need to sleep upright
- Asthma symptoms have not gone away or return quickly (less than 4 hours) despite using asthma medications
- Can't talk in complete sentences, ribs show with each breath
- Peak Flow less than 50% of personal best
- PFM less than _____

Plan C: This is a Danger Zone! Take these medicines immediately!

Short-Acting ?₂ Medicine How delivered How much How often

Oral steroid dose

Next, call your own physician for further instructions.

BUT, see the doctor **RIGHT AWAY** or go to the hospital if **ANY** of these things are happening:

- Lips or fingernails are blue or gray, or
- You are struggling to breathe, or
- You do not feel any better 20 to 30 minutes after taking the extra medicine.

Known Asthma Symptoms

- ☐ coughing
- ☐ wheezing
- ☐ shortness of breath
- ☐ tightness in chest
- ☐ other _____

Known Asthma Triggers

- ☐ respiratory infection
- ☐ animals (specify) _____
- ☐ foods (specify) _____
- ☐ cigarette smoke
- ☐ pollens/mold
- ☐ temperature changes
- ☐ strong odors or fumes
- ☐ exercise
- ☐ wood smoke
- ☐ dust/chalk dust
- ☐ other _____

Asthma Management Plan

ASTHMA DISEASE MANAGEMENT PROGRAM

PARENT SIGNATURE _____

Date signed _____

FOR SCHOOL AND CHILD CARE MEDICATION PERMISSION: This patient has been instructed in the proper way to take his/her medications. He/she is capable of self-administering medications: ____Yes ____No
He/she can reliably report asthma symptoms: ____Yes ____No

Health Care Provider's Signature _____ Date _____

Exercise Induced Asthma (EIA)

- Approximately 90% of asthmatics have exercise as a trigger.
- Caused by loss of heat and water from the airways during exercise

Exercise Induced Asthma (EIA)

- Early phase:
 - Usually begins during exercise and peaks 5 - 10 minutes after stopping the activity
- Refractory period ("grace period"):
 - After the initial bout of EIA, there may be less bronchospasm for up to 2 hours
- Late phase:
 - Symptoms may occur again, beginning 3 to 10 hours after exercise

Factors that Influence EIA

- Cold air, temperature extremes, air pollution
- Duration, type and intensity of exercise
- Poor physical conditioning
- Inhaled allergens (in sensitive individuals)
- Respiratory infections
- Time since last episode of EIA
- Emotional stress/fatigue

Factors that Influence EIA

- Type of exercise - aerobic sports
(continuous and long-lasting exercise that results in deep and rapid breathing)
- Intensity - the more intense the sport, the more severe the bronchospasm
- Duration of exercise - can sometimes induce refractory period by warming up adequately prior to exercise

Ways to Reduce EIA

- Avoid exercise if symptoms are present
- Pre-medicate per doctor's instructions
- Adequate warm-up - at least 10 - 15 minutes
- Modified exercise
- Avoid triggers that may cause or worsen EIA, i.e., cold air, high pollen count
- Adequate cool down - at least 10 minutes
- Breathe through nose, if possible, to warm air

Value of Exercise

- Increased exercise tolerance
- Improved self esteem
- Increased confidence
- Improved psychological and physical well-being
- Prevents “vicious cycle of inactivity:”
 - Children may avoid activity to avoid symptoms, this leads to deconditioning which increases symptoms at even lower levels of activity

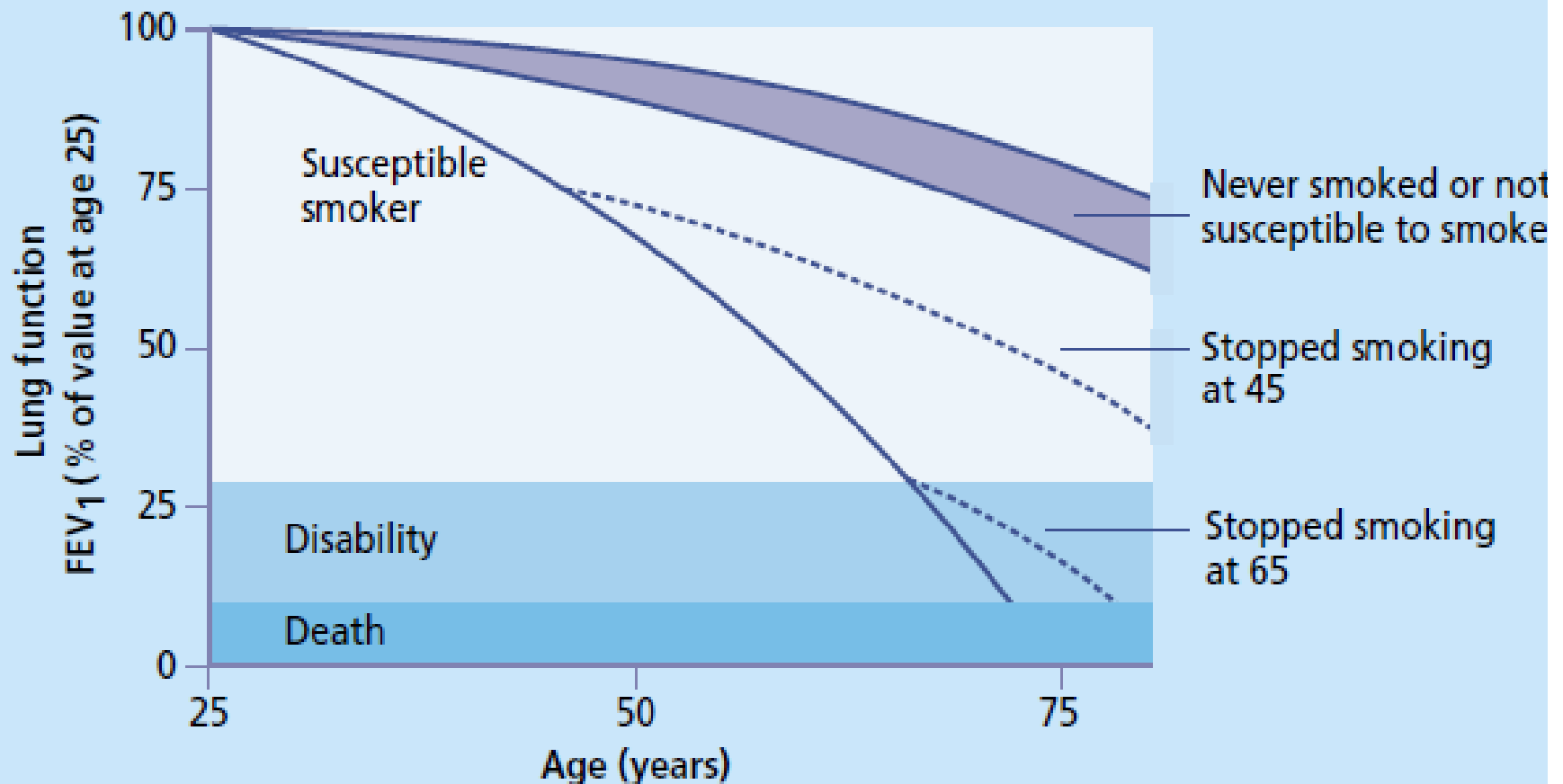
Asthma First Aid

- STOP any activity
- Assume RESTING POSITION
- Offer REASSURANCE - don't panic
- Follow the AMP - administer (rescue) MEDICATIONS
- NOTIFY proper persons if medication is ineffective
- Never let a student who is experiencing breathing problems leave the gym or field alone

Smoking and Asthma

- Even second-hand smoke can cause asthma in adults and children.
- Smoking during pregnancy increases the risk of respiratory problems by 35%.
- Children whose parents smoke face a 50% increased risk of asthma.
- Adults who are exposed to second-hand smoke at home are five times as likely to develop adult onset asthma.

Smoking accelerates the normal age-related decline in lung function



In susceptible individuals, smoking accelerates the age-related decline in lung function, but this returns to the normal rate if the patient stops smoking (Adapted from Fletcher C. & Peto R. *BMJ* 1977; 1: 1645–1648).

Dietary Management of COPD

Malnutrition

- People with COPD expend up to 50% more energy for breathing.
- As COPD progresses symptoms such as shortness of breath, taste alterations due to dry mouth, fatigue, early feelings of fullness, etc. can contribute to decreased food intake.
- A prolonged decrease in food intake can lead to significant weight loss and malnutrition.

Dietary Goals

- To prevent or reverse malnutrition
- To improve or maintain respiratory function
- Maintain muscle mass

Incidence of Malnutrition in COPD

- More common in severe COPD patients and patients with emphysema
 - Under recognised –
 - High / Normal BMI with muscle wasting or unintentional wt loss
 - Nutritional status of patient not reviewed
- Around 21 % found to have nutritional depletion
- Around 25 % patients will develop cachexia
- Between 25-40% with advanced COPD are malnourished ³

Causes of Malnutrition

- INCREASED REQUIREMENTS
 - Increased Energy Expenditure
 - resting energy expenditure
 - total energy expenditure
 - Described as hyper catabolic (over burning calories)
 - Underlying energy turnover increased, systemic inflammation
 - Increased requirements energy used during breathing
 - Inefficient muscle use move from type I to type II

Body weight

- Chronic bronchitis – tendency for obesity
- Emphysema – tendency to be underweight

Basic Dietary Recommendations

1. Low fat, high protein foods
2. Limit salt.
3. Avoid fruits & vegetables that cause bloating (trial & error).
4. Some people find milk and cheese make phlegm thicker.
5. Avoid fried foods – bloating and indigestion.
6. Drink plenty of non-caffeinated beverages
7. Eat little and often (6 meals / day)
8. Eat high energy food / main meal early

Outcomes

- No cure at present? But
- Stop smoking
- Flu and pneumonia vaccines
- Short acting bronchodilators
- Good Nutrition
- Exercise

****Can slow or halt progression***