

# Acute Exacerbation of Asthma & Acute Exacerbation of COPD

Jo Congleton and Debbie Eaton

# Aims 1

- Be confident in managing acute exacerbation of asthma
- Be confident in knowing when it is safe to discharge a patient after an acute exacerbation of asthma
- Know how to reduce the risk of future exacerbations of asthma

## Aims 2

- Be confident in managing AECOPD
- Be confident in managing respiratory failure in AECOPD
- Know when acute NIV is indicated in AECOPD
- Understand the role of the COPD discharge bundle
- Understand the role of the community respiratory service



# Definition of Asthma

- Asthma is a chronic inflammatory condition characterised by variable and reversible airway obstruction
- Eosinophilic bronchitis

# National Review of Asthma Deaths

- During the final attack of asthma, 87 (45%) of the 195 people were known to have died without seeking medical assistance or before emergency medical care could be provided
- 47% had a history of previous hospital admission for asthma
- 10% of the 195 died within 28 days of discharge from hospital after treatment for asthma
- At least 21% of the 195 people who died had attended a hospital emergency department with asthma at least once in the previous year, 23 had attended twice or more
- In 25% the quality of care in the final attack was judged inadequate

# Severity

## ASSESSMENT OF SEVERE ASTHMA

**B** Healthcare professionals must be aware that patients with severe asthma and one or more adverse psychosocial factors are at risk of death.

## INITIAL ASSESSMENT

### MODERATE ACUTE ASTHMA

- increasing symptoms
- PEF >50–75% best or predicted
- no features of acute severe asthma

### ACUTE SEVERE ASTHMA

Any one of:

- PEF 33–50% best or predicted
- respiratory rate  $\geq 25/\text{min}$
- heart rate  $\geq 110/\text{min}$
- inability to complete sentences in one breath

### LIFE-THREATENING ASTHMA

In a patient with severe asthma any one of:

- PEF <33% best or predicted
- $\text{SpO}_2$  <92%
- $\text{PaO}_2$  <8 kPa
- normal  $\text{PaCO}_2$  (4.6–6.0 kPa)
- silent chest
- cyanosis
- poor respiratory effort
- arrhythmia
- exhaustion
- altered conscious level
- hypotension

### NEAR-FATAL ASTHMA

Raised  $\text{PaCO}_2$  and/or requiring mechanical ventilation with raised inflation pressures

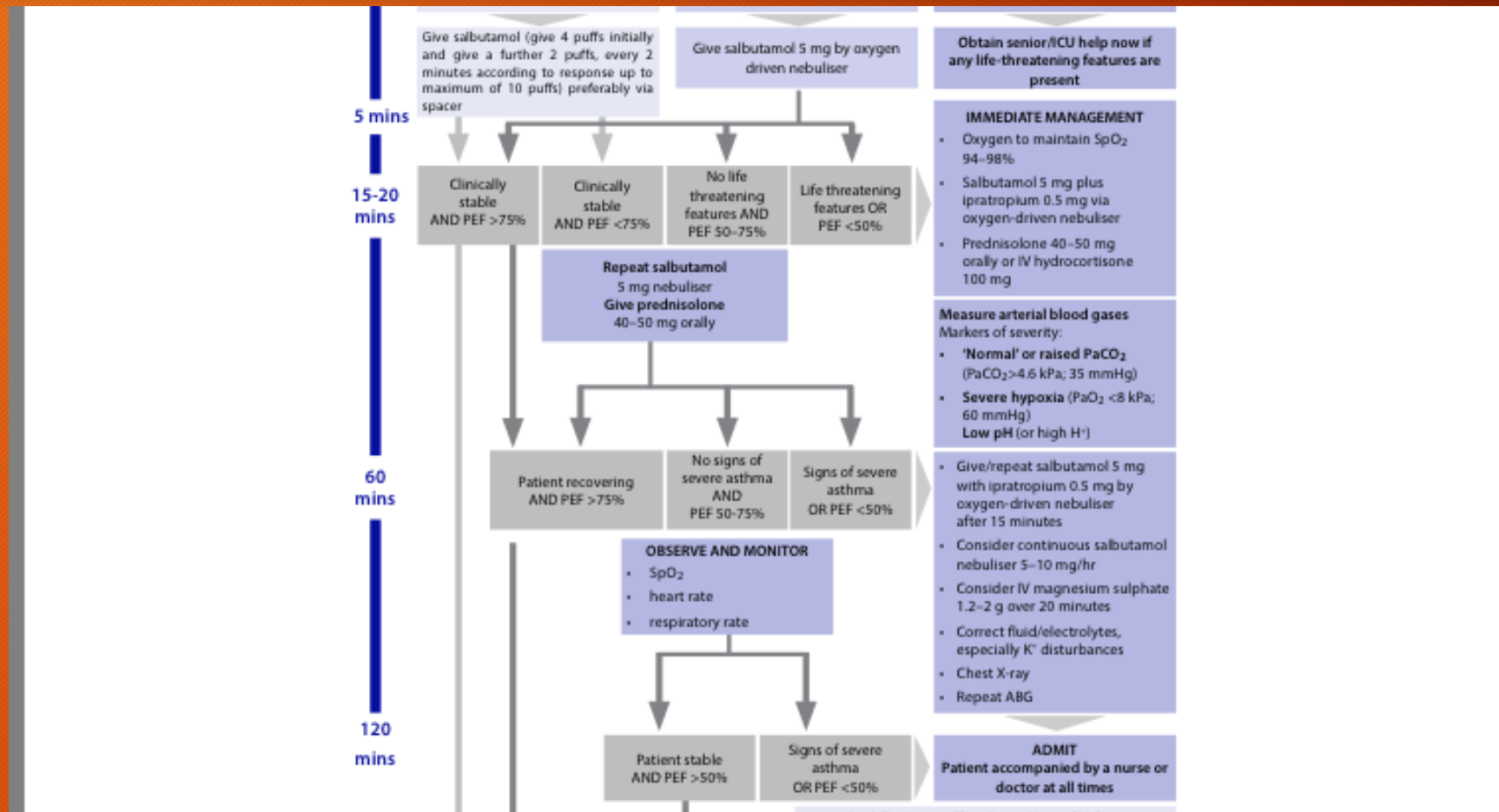


# Management

Moderate

Severe

Life-threatening



# ABGs

- Perform if:
  - Features of life threatening asthma
  - SpO<sub>2</sub> <92%



# Treatment

- Oxygen: to maintain  $\text{SpO}_2 > 94\%$
- Bronchodilators
  - Salbutamol nebulised, driven by high flow oxygen
  - Add ipratropium if acute severe
- Corticosteroids
  - Prednisolone 40-50mg po (only use iv hydrocortisone 100mg 6hrly if unable to swallow/on ICU)
  - Continue for at least 5 days

# If not responding

- Back to back or continuous nebulised salbutamol
- Magnesium 1.2-2g i.v. over 20 minutes one-off infusion if not responding to therapy
- Aminophylline - no trial data suggesting benefit
- 5mg/kg loading dose over 20 minutes if not on theophylline previously  
0.5mg/kg/hr infusion rate adjusted according to level
- Ask for help!

# CXR

- Perform if:
  - Suspicion of consolidation
  - Suspicion of pneumothorax
  - Features of life threatening asthma
  - Ventilation
  - Poor response to treatment

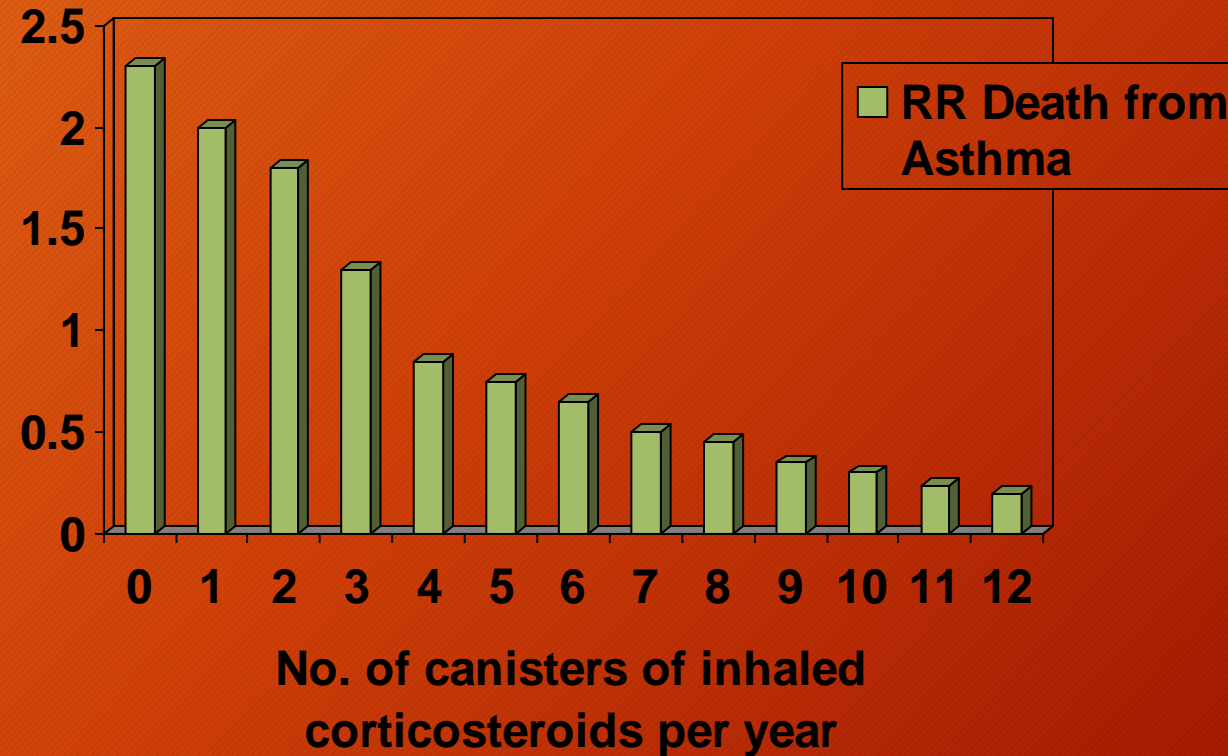


# Preventing the next admission

# Consider the cause of this one...

- Is the regular medication adequate?
- Inhaler technique
- Adherence
- Triggers
  - Drugs
  - Occupation
  - Allergens
- Self monitoring
- Asthma action plan

# Inhaled steroid use and Asthma Death





# Criteria for safe discharge

- On discharge medication for 12-24 hours
- Have had inhaler technique checked
- PEF > 75% or best or predicted
- PEF diurnal variability < 25%
- Treatment with oral and inhaled steroids
- Own PEF meter and written asthma management plan
- GP follow up within 2 working days
- Respiratory OPA within 4 weeks

- <https://youtu.be/zG2DVoRP86g>

## Aims 2

- Be confident in managing AECOPD
- Be confident in managing respiratory failure in AECOPD
- Know when acute NIV is indicated in AECOPD
- Understand the role of the COPD discharge bundle
- Understand the role of the community respiratory service



# Definition of COPD

COPD is predominantly caused by smoking and is characterised by airflow obstruction that is not fully reversible

The airflow obstruction does not change markedly over several months but is usually progressive in the long term

Exacerbations often occur, when there is a rapid and sustained worsening of the patient's symptoms beyond normal day-to-day variations

*NICE 2010*

Normal bronchi



Bronchitis



## Airways narrowing due to

Chronic irritation of the bronchi causing inflammation and changes to the mucociliary escalator; often results in chronic cough

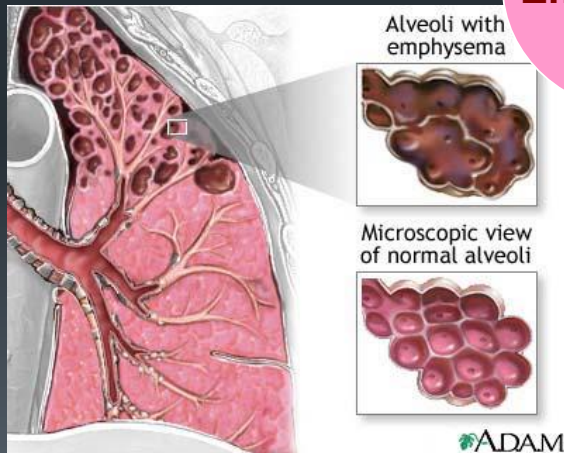
**Airways collapse** due to destruction of alveolar walls – may lead to bullae

**Large airway inflammation**

**Emphysema**

**Small airways**

**Airways narrowing** due to bronchoconstriction and inflammation; duration and severity are risk factors for development of airway remodelling and COPD



Normal bronchiole



**Fibrosis**

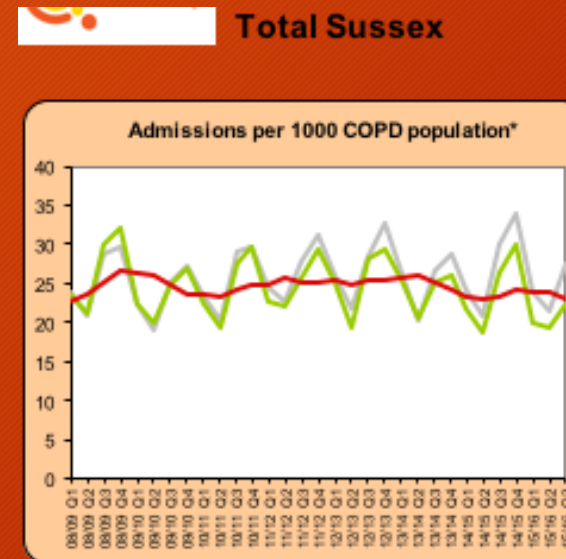
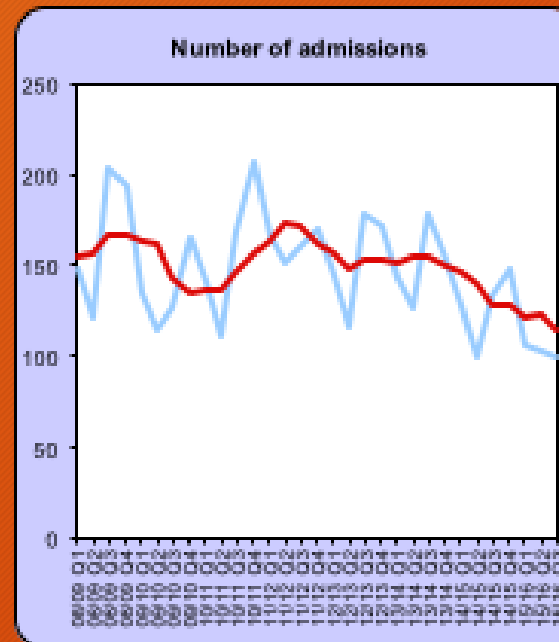




# The seasonal surge

20

RSCH





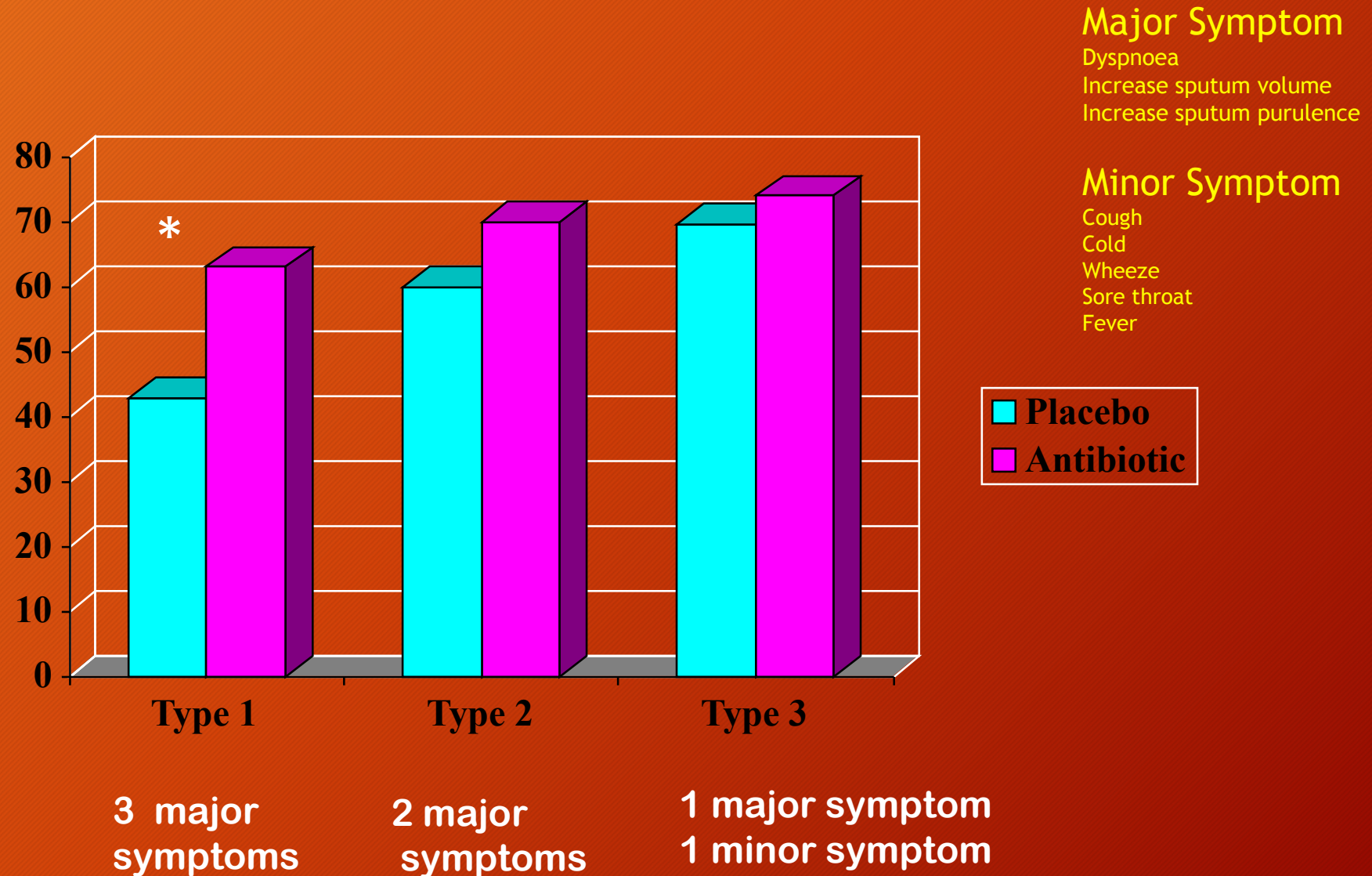
# Treatment of exacerbations

- Increased bronchodilators
- Corticosteroids
- Oral antibiotics if change in sputum
- Manage respiratory failure

**Early treatment**

# RCT of ANTIBIOTIC THERAPY

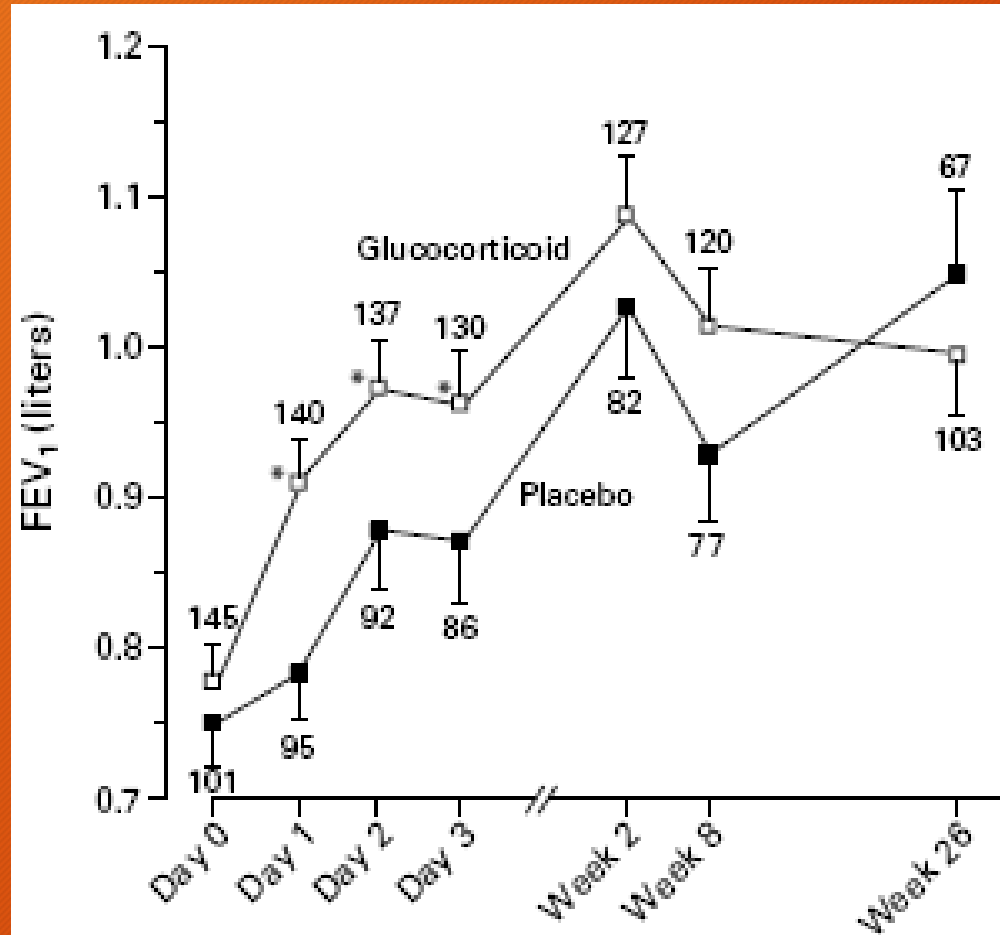
Anthonisen et al, Ann Intern Med 1987





# Corticosteroids at exacerbation

Niewoehner et al, NEJM 1999



- Improves FEV<sub>1</sub>
- Reduces length of stay
- Reduces relapse rate
- Increases time to next exacerbation
- Dose: 30mg/day
- Duration 7-14 days



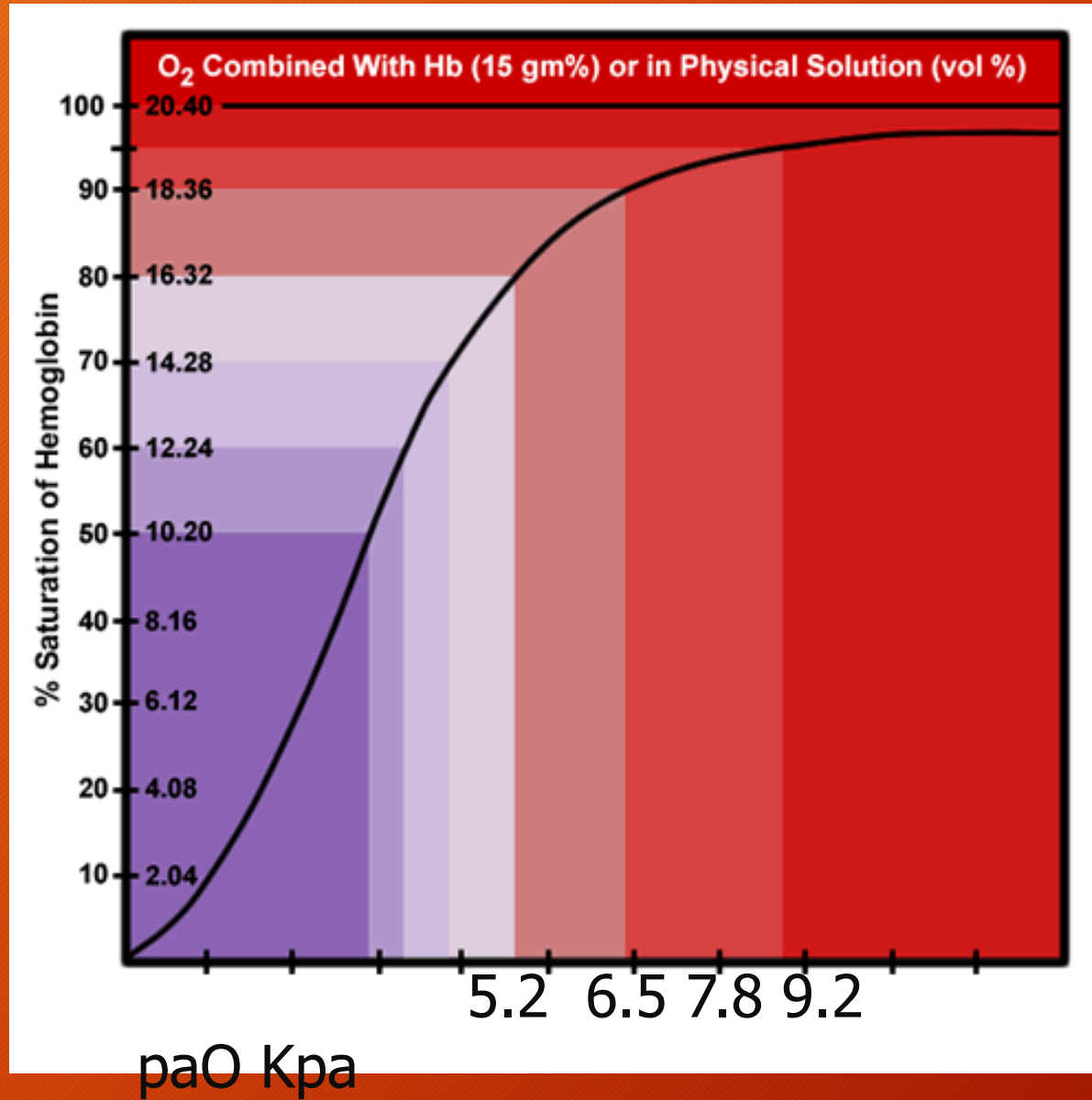
# Oxygen Toxicity

- Westlake EK, Simpson T, Kaye M. Carbon dioxide narcosis in emphysema. Q J Med 1955;24:155-73
- Campbell E. The J Burns Amberson lecture: the management of acute respiratory failure.  
Am Rev Respir Dis 1967;96:626-39.

Excess  $O_2$  can cause worsening of VQ matching



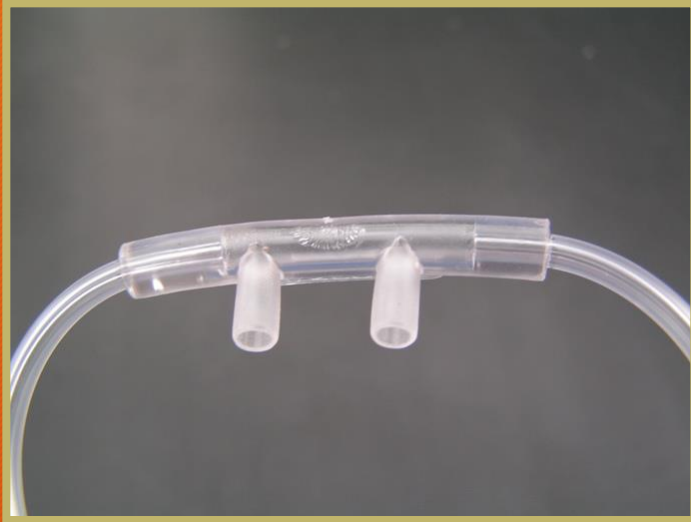






# Oxygen therapy - Nasal Cannulae (NC)

27



- 2-6L/min
- comfortable and easily tolerated
- Can deliver too little or too much oxygen!

# Oxygen therapy – Venturi Mask (VM)

28



- patients at risk of hypercapnia
- delivers controlled oxygen therapy
- delivers accurate high flow oxygen



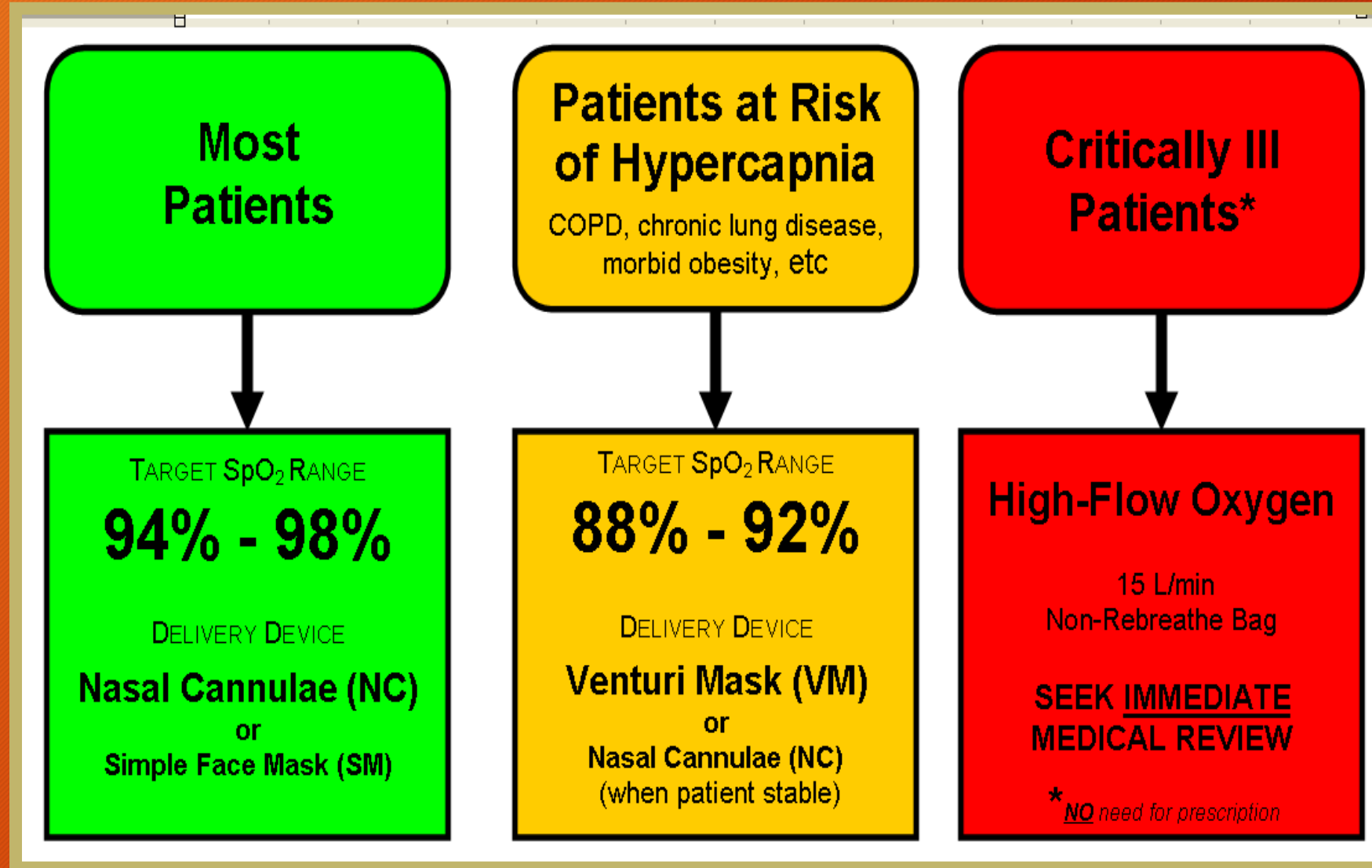
# Acute Oxygen Therapy in COPD

- Because of the risk of hypercapnia nearly always appropriate to use low concentration controlled oxygen therapy
- Aim  $pO_2 > 7.5$  kPa associated with improvement in pH
  - Approx  $O_2$  sat 90-92%



# Oxygen therapy

30



# Causes of Respiratory Failure

- Pneumonia
- Acute Severe Asthma
- ILD
- ARDS
- Pulmonary Oedema
- COPD
- Overdose (depressant)
- CNS catastrophe
- Neuromuscular Weakness
- Chest wall deformity
- COPD

# Causes of Respiratory Failure

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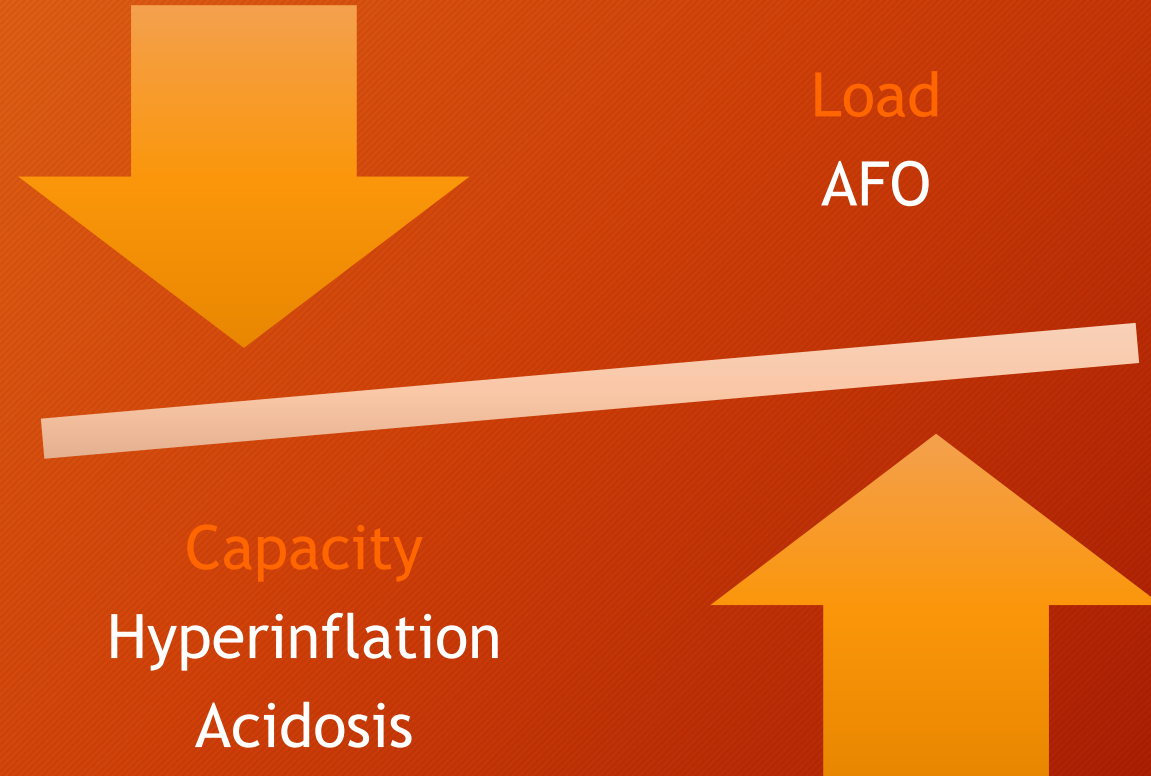
V/Q  
disturbance

- Overdose (depressant)
- CNS catastrophe
- Neuromuscular Weakness
- Chest wall deformity
- COPD

Pump failure



# Respiratory Failure in COPD



For Pump failure need to augment ventilation





# NIV Pivotal Study

- Plant et al YONIV trial Lancet 2000
  - RCT UK General Respiratory Ward setting
  - 236 patients
  - Primary end points: need for intubation, mortality, ABG, Breathlessness
- Results
  - Reduced need for intubation 15% vs 27% ( $P=0.02$ )
  - Reduced in hosp mortality 10% vs 20% ( $P=0.05$ )
  - Improved pH in 1<sup>st</sup> hr, reduced RR 4 hours, reduced breathlessness



# Guidelines 1

- Joint RCP/BTS guidelines 2008
- NIV should be considered in all patients with an acute exacerbation of COPD in whom a respiratory acidosis ( $\text{pH} < 7.35$ ,  $\text{PaCO}_2 > 6 \text{ kPa}$ ) persists despite immediate maximum standard medical treatment on controlled oxygen therapy for no more than one hour
- Also BTS standards of care committee 2002

# Guidelines 2

- NIV should be used as the treatment of choice for persistent hypercapnic ventilatory failure during exacerbations not responding to medical therapy.
- It should be delivered by staff trained in its application, experienced in its use and aware of its limitations.
- When patients are started on NIV, there should be a clear plan covering what to do in the event of deterioration and ceilings of therapy should be agreed. **Grade A NICE 2010**



# When to start NIV in AECOPD

- A short time after starting full usual medical management
- Use as an adjunct when unable to oxygenate without increasing acidosis
- Degree of acidosis is more important than the  $\text{PaCO}_2$

# NIV check list

Is the patient hypercapnic and acidotic?

Is the respiratory failure secondary to pump failure?

Is the airway safe?

Is this a reversible situation?

What are you going to do if NIV fails?

Always entrain O<sub>2</sub> to begin with

Put time in at the beginning

Monitor response by 1 repeat blood gas at 30min- 1 hr



# BSUH Acute Non Invasive Ventilation Pathway

- **Step 1** Initial assessment
- **Step 2** Management and escalation plan
- **Step 3** Communication
- **Step 4** Set up of NIV
- **Step 5** Monitoring and weaning of NIV

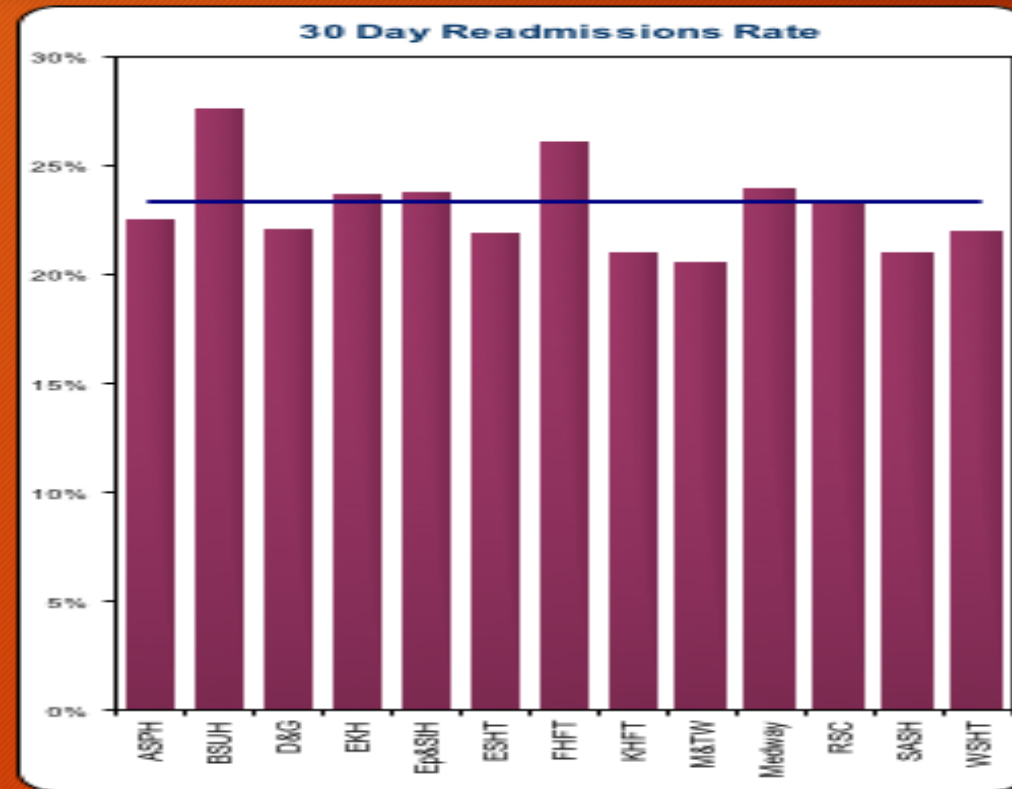
# Starting pressure

- EPAP 4 IPAP 10
- Aim to rapidly increase IPAP
- Big people need bigger pressures
- Entrain 1-2 litres oxygen

<http://www.e-lfh.org.uk/programmes/acute-niv/>

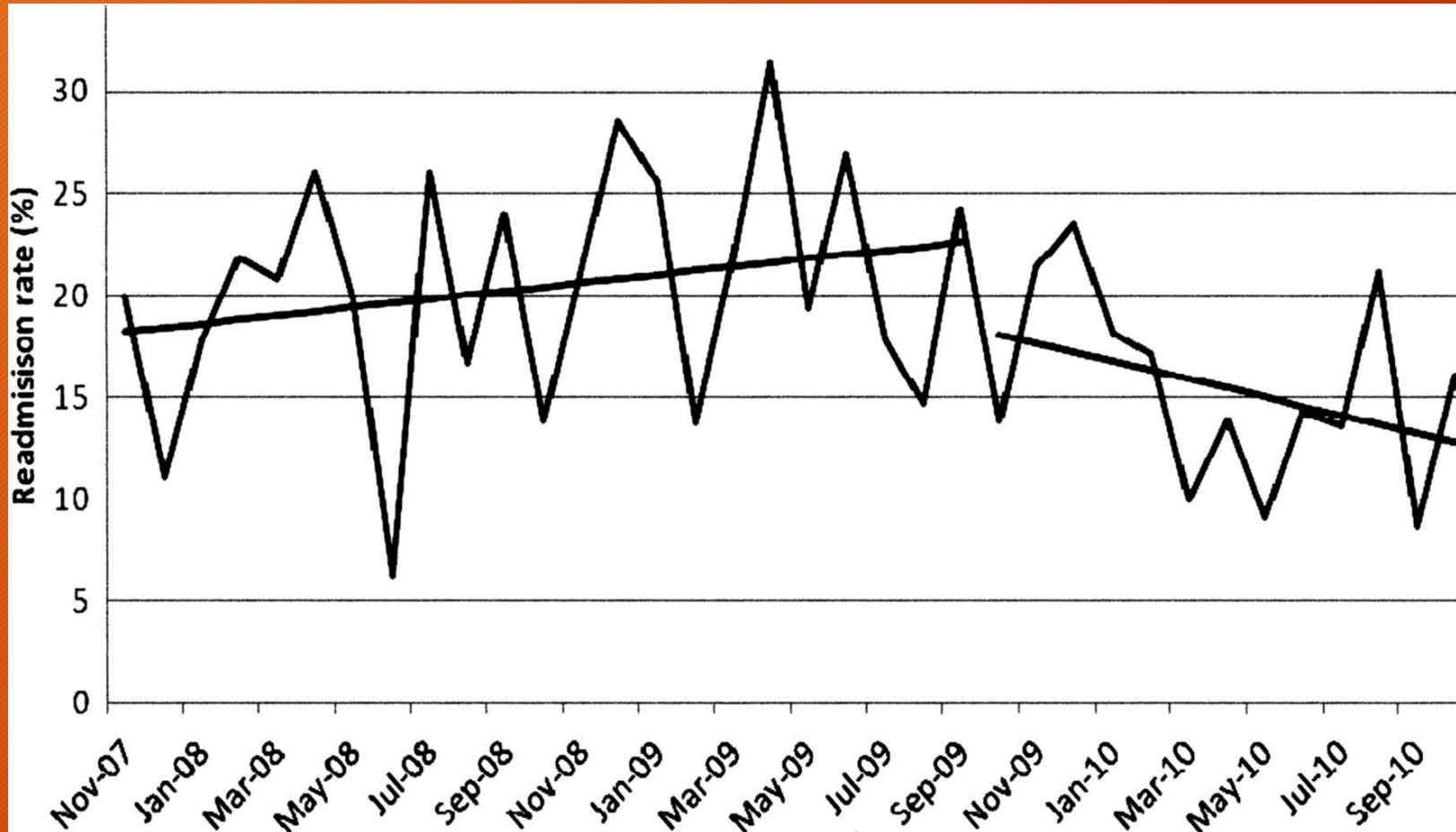
COPD 30 day re-admission rates  
RSCH 29%, KSS mean 23%, best 21%

43





## The 30-day readmission rates before and after the initiation of the chronic obstructive pulmonary disease discharge care bundle.



Hopkinson N S et al. Thorax 2012;67:90-92

# COPD Discharge Bundle Elements

- ⦿ Referral to smoking cessation service if a current smoker
- ⦿ An assessment of suitability for and enrolment into a pulmonary rehabilitation programme
- ⦿ Provision of written information and rescue packs for future exacerbations
- ⦿ Ensure that patient can demonstrate good inhaler technique whilst on the wards
- ⦿ Ensure that they have appropriate follow up once discharged from hospital



# ICS in COPD

- Only indicated if history or risk of exacerbations
- Small effect on exacerbation rate
- Associated with an increase in CAP
  - Review ICS medication if CAP and COPD prior to discharge
- Use 'moderate' dose



Relvar Ellipta ®▼ – (vilanterol & Fluticasone Furoate)

LABA + ICS  
in a combination  
inhaler

Long Acting  
Bronchodilators and  
Inhaled Corticosteroids



Seretide Accuhaler ®  
(Salmeterol & Fluticasone propionate)



Symbicort ® – Formoterol & Budesonide))

MDI

NEXThaler



Fostair ® – (Formoterol & Beclometasone)



Symbicort Turbohaler ®  
(Formoterol & Budesonide)

AirFluSal Forspiro ®  
(Salmeterol & Fluticasone propionate)



DuoResp Spiromax ®  
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# Community Respiratory Service (CRS)

- Whole patient assessment
  - Airway clearance
  - Anxiety management
  - COPD Action plan
- Pulmonary Rehabilitation
- Home Oxygen Service
- Rapid Response



Questions?

# Interpreting ABG's

	Acute hypoxic respiratory failure	Acute Hypercapnic Respiratory Failure / Acidosis	Chronic Respiratory Failure
O <sub>2</sub>	Low	Low	Low
CO <sub>2</sub>	Low / Normal	High	Normal/High
pH	Normal	Low	Normal



# Interpreting ABG's II

	Acute on Chronic Respiratory Failure	Metabolic acidosis	Respiratory Alkalosis
O <sub>2</sub>	Low	High	High
CO <sub>2</sub>	Normal/High	Low	Low
pH	Low	Low	High
Bicarb	High	Low	High

# Clinical Features COPD

- Onset 35- 55yrs
- Flat PEFr chart
- Constant symptoms
- Progressive SOB
- Little / no reversibility
- Significant smoking history

**ATOPICS CAN HAVE COPD**

# Asthma

- Wheezy Child
- DV PEFr chart
- Day to day variation
- $\beta$ 2 reversibility
- Steroid reversibility
- Atopy, Family History

**SMOKERS CAN HAVE  
ASTHMA**