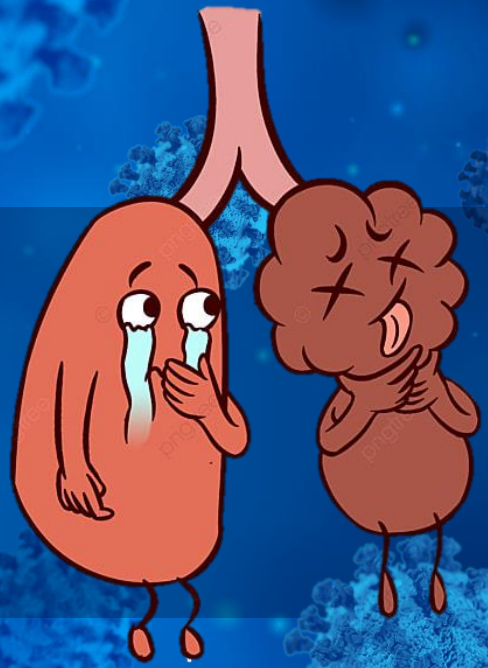
COPD Exacerbation



Introduced by : DR. RIMA IBRAHEEM

INTRODUCTION

acute event characterized by worsening of the patient’s respiratory symptoms that is beyond normal day-to-day

Patients with COPD exacerbation have the following three changes in their clinical condition:

- (1) worsening of ***dyspnea***
- (2) increase in ***sputum volume***
- (3) sputum ***purulence***

Acute Exacerbations of COPD
ATS

Cough increases in frequency and severity

Sputum production increases in volume and/or changes character

Dyspnea increases

These episodes vary in severity from:

- **Mild** exacerbations
- **only one** of the three cardinal symptoms

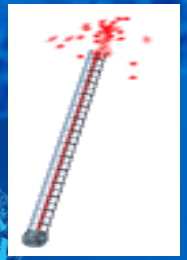
- **moderate** to **severe**

- **at least two of the three** cardinal symptoms

Causes of COPD Exacerbation

Infections
pneumothorax
Drugs
Pulmonary embolism
Pulmonary edema due to cardiac related conditions
Cardiac arrhythmias

Aetiology of acute exacerbations of COPD



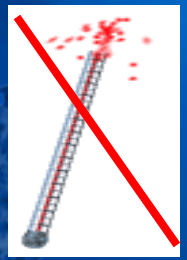
Infectious exacerbations
(approximately 60–80% of all exacerbations)

Frequent (70–85% of all infectious exacerbations)

Haemophilus influenzae	(22%)
Streptococcus pneumoniae	(10%)
Moraxella catarrhalis	(9%)
Viruses (influenza/parainfluenza, rhinoviruses, coronaviruses)	(40%)

Infrequent (15–30% of all infectious exacerbations)

Pseudomonas aeruginosa	(15%)
Opportunistic Gram negatives	
Staphylococcus aureus	
Chlamydia pneumoniae	(< 10%)
Mycoplasma pneumoniae	



Non-infectious exacerbations
(20–40% of all exacerbations)

Heart failure
Pulmonary embolism
Non-pulmonary infections
Pneumothorax

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NO GLYPH the most common virus isolated is human **rhinovirus** (the cause of the common cold)

NO GLYPH exacerbations are often more severe, last longer and precipitate more hospitalizations, as seen during winter.

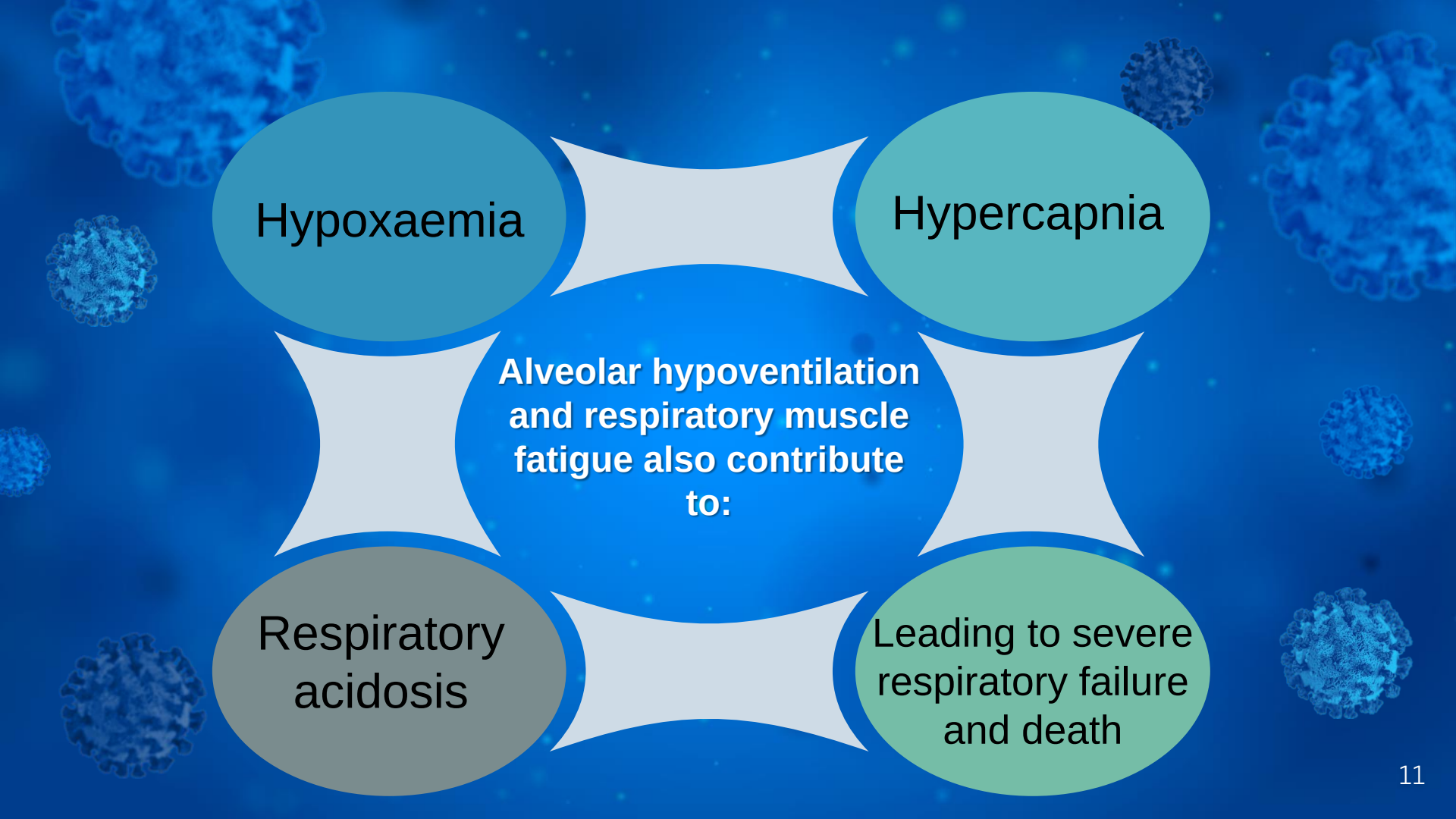
Pathology

- In general, exacerbations are associated with **bronchial inflammation.**
- increased **neutrophilic.**
- high levels of **IL-8** and leukotriene **B4.**

Pathophysiology:

- **Airflow obstruction** is **unchanged** during **mild** exacerbations.
- Slightly **reduced** during **severe** exacerbations.

- Severe exacerbations are accompanied by a significant **worsening of pulmonary gas exchange** due mostly to:
- **Increased ventilation-perfusion inequality**
- Potentially, by **respiratory muscle fatigue**


Hypoxaemia
Hypercapnia
Alveolar hypoventilation and respiratory muscle fatigue also contribute to:
Respiratory acidosis
Leading to severe respiratory failure and death

Diagnostic and Therapeutic Approaches

Diagnostic

CXR:

The chest roentgenogram may be positive in approximately 15% of cases

blood gas values

The best indicators for the need for admission and mechanical ventilation

Sputum cultures

NOT helpful in decision making for patients with an acute exacerbation of COPD

Spirometry

When to obtain sputum studies?

Patients with risk factors for Pseudomonas infection

include recent hospitalization (≥2 days' duration during the past 90 days), frequent administration of antibiotics (≥4 courses within the past year), advanced COPD (FEV1 <30 percent of predicted), isolation of P. aeruginosa during a previous exacerbation, Pseudomonas colonization during a stable period, and systemic glucocorticoid use

Patients with failure to improve on initial empiric antibiotics

Hospitalized patients, particularly those with impending or actual acute respiratory failure due to an exacerbation of COPD

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there is a small but significant decrease in lung function, including:

- peak flow rates
- FEV1
- FVC

Peak flow rate **recovery** to baseline values is **complete** in **75%** of patients by **1 month**

Approximately **7%** of patients with a COPD exacerbation do **NOT return** their peak flow rates to baseline by **3 months**

This finding suggests that **exacerbations of COPD** are associated with a permanent **loss of lung function**

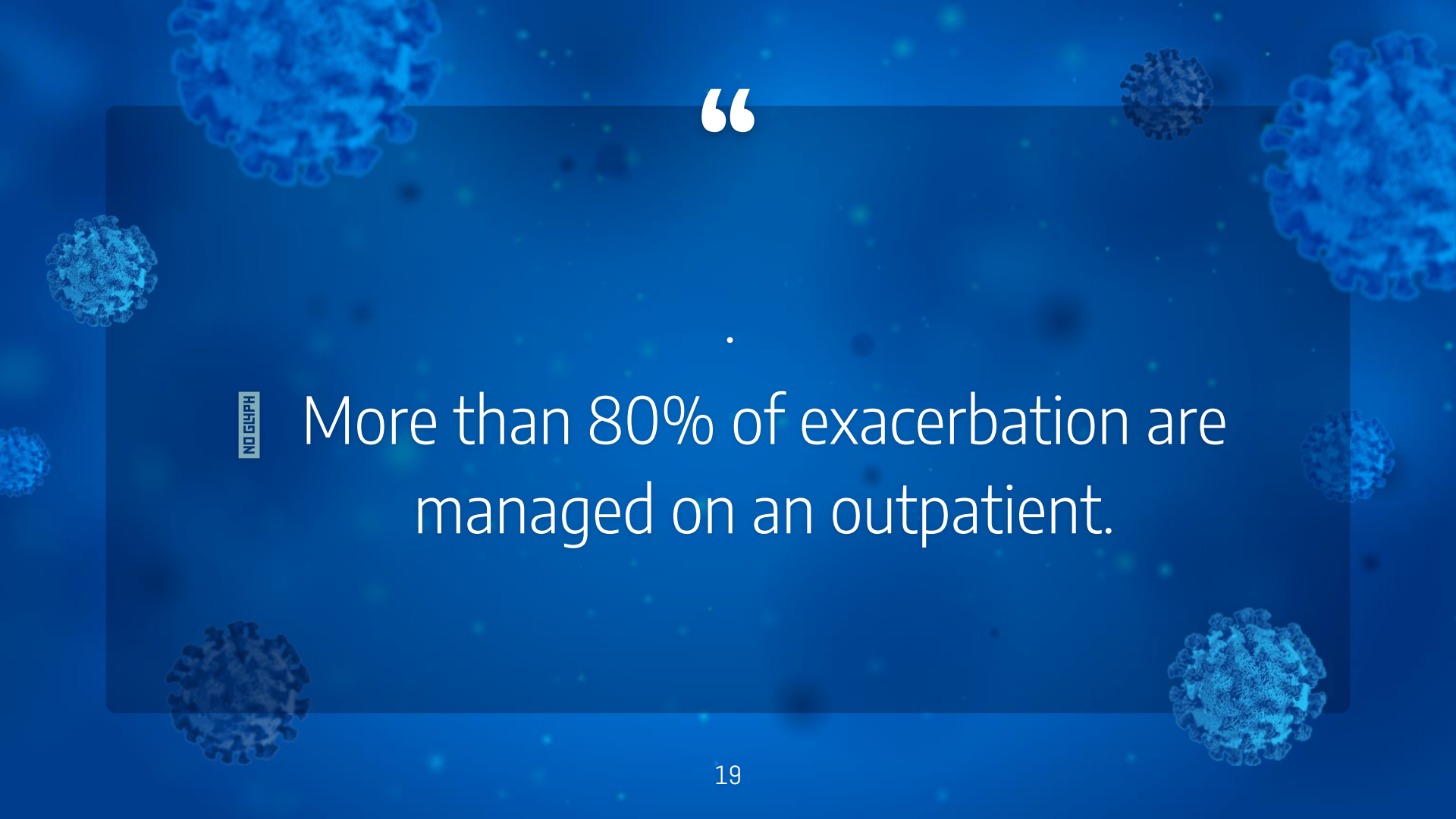
Management of Acute Exacerbation In COPD

MANAGEMENT OF SEVERE BUT NOT LIFE-THREATENING EXACERBATIONS*

- Assess severity of symptoms, blood gases, chest radiograph.
- Administer supplemental oxygen therapy, obtain serial arterial blood gas, venous blood gas and pulse oximetry measurements.
- Bronchodilators:
  - » Increase doses and/or frequency of short-acting bronchodilators.
  - » Combine short-acting beta 2-agonists and anticholinergics.
  - » Consider use of long-active bronchodilators when patient becomes stable.
  - » Use spacers or air-driven nebulizers when appropriate.
- Consider oral corticosteroids.
- Consider antibiotics (oral) when signs of bacterial infection are present.
- Consider noninvasive mechanical ventilation (NIV).
- At all times:
  - » Monitor fluid balance.
  - » Consider subcutaneous heparin or low molecular weight heparin for thromboembolism prophylaxis.
  - » Identify and treat associated conditions (e.g., heart failure, arrhythmias, pulmonary embolism etc.).

*Local resources need to be considered.

TABLE 5.3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More than 80% of exacerbation are managed on an outpatient.

The potential indication for hospitalization:

- Sever symptoms such as: **sudden worsening of resting dyspnea**, **high respiratory rate**, **decrease oxygen saturation**, **confusion**, **drowsiness**.
- Acute respiratory failure.
- Onset of new physical signs such as cyanosis or peripheral edema.
- Failure of an exacerbation to responding to initial medical management.
- Insufficient home support.

Classification of respiratory failure:

No respiratory failure:

Respiratory rate: 20-30 breaths per minute; no use of accessory respiratory muscles; no changes in mental status; hypoxemia improved with supplemental oxygen given via Venturi mask 28-35% inspired oxygen (FiO2); no increase in PaCO2.

Acute respiratory failure – non-life-threatening:

Respiratory rate: > 30 breaths per minute; using accessory respiratory muscles; no change in mental status; hypoxemia improved with supplemental oxygen via Venturi mask 24-35% FiO2; hypercapnia i.e., PaCO2 increased compared with baseline or elevated 50-60 mmHg

Acute respiratory failure – life-threatening:

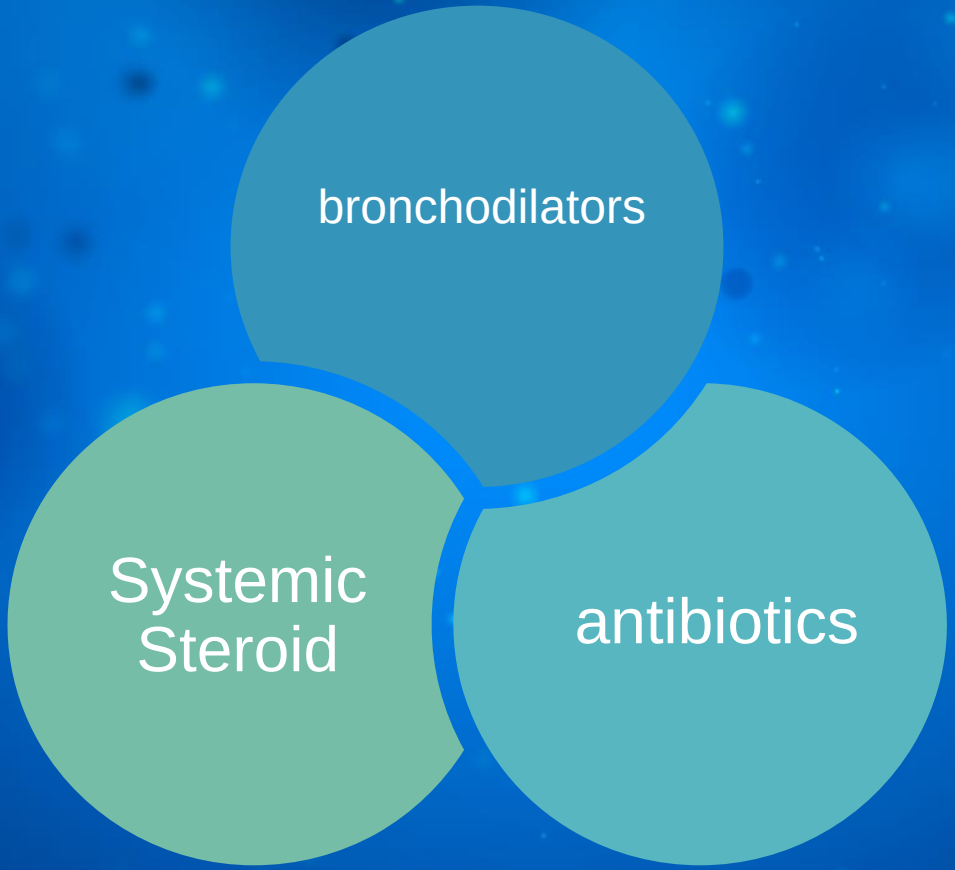
Respiratory rate: > 30 breaths per minute; using accessory respiratory muscles; acute changes in mental status; hypoxemia not improved with supplemental oxygen via Venturi mask or requiring FiO2 > 40%; hypercapnia i.e., PaCO2 increased compared with baseline or elevated > 60 mmHg or the presence of acidosis (pH ≤ 7.25)

Oxygen therapy

- Supplemental oxygen is a critical component of acute therapy. Administration of supplemental oxygen should target an SpO2 of 88 to 92 percent or an arterial oxygen tension (PaO2) of approximately 60 to 70 mmHg, to minimize the risk of worsening hypercapnia with excess supplemental oxygen

Pharmacological treatment

The three classes of medication must commonly used for COPD reservations are



Bronchodilators:

SABA → two inhalations every hour for two to three doses → then every two to four hours based on the patient's response

The same for nebulizer

SAMA

two inhalations by MDI every four to six hours

When administering by nebulizer we repeat the dose every 6 to 8 hours

We recommend that all patients having a COPD exacerbation receive both

an inhaled short-acting beta adrenergic agonist

And

an inhaled short-acting anticholinergic agent

rather than either medication alc

(Grade 1B)

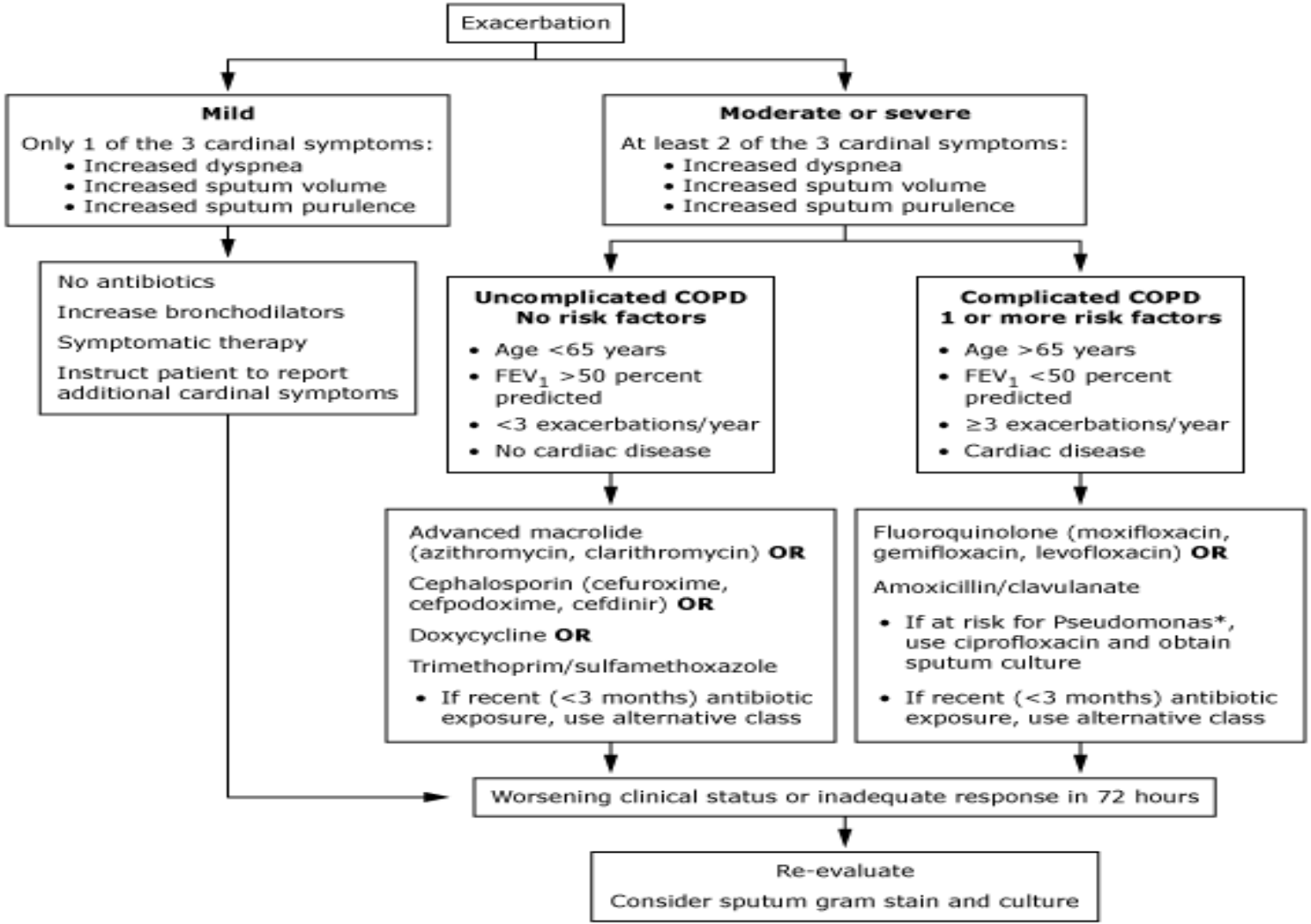
antibiotics

Antibiotic

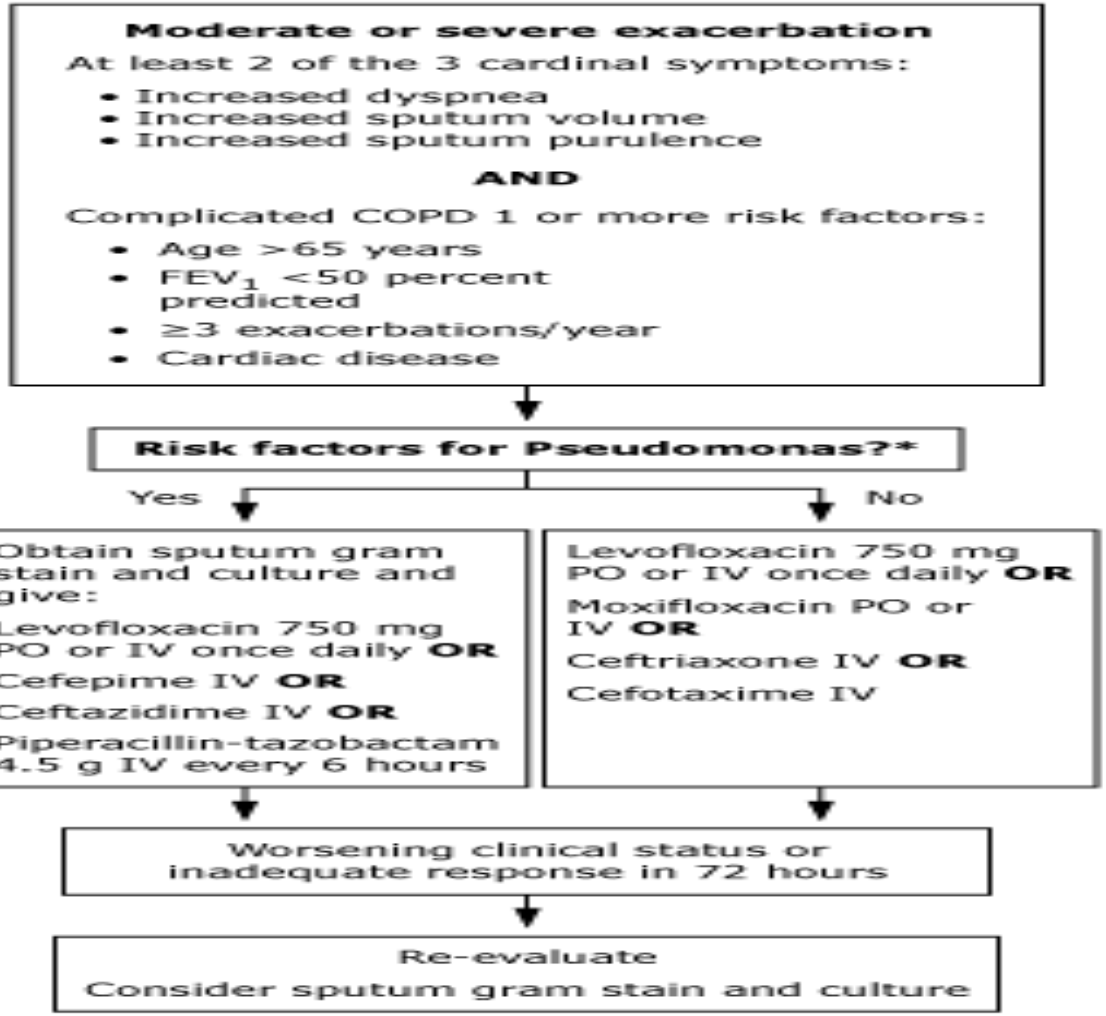
Infectious Exacerbation

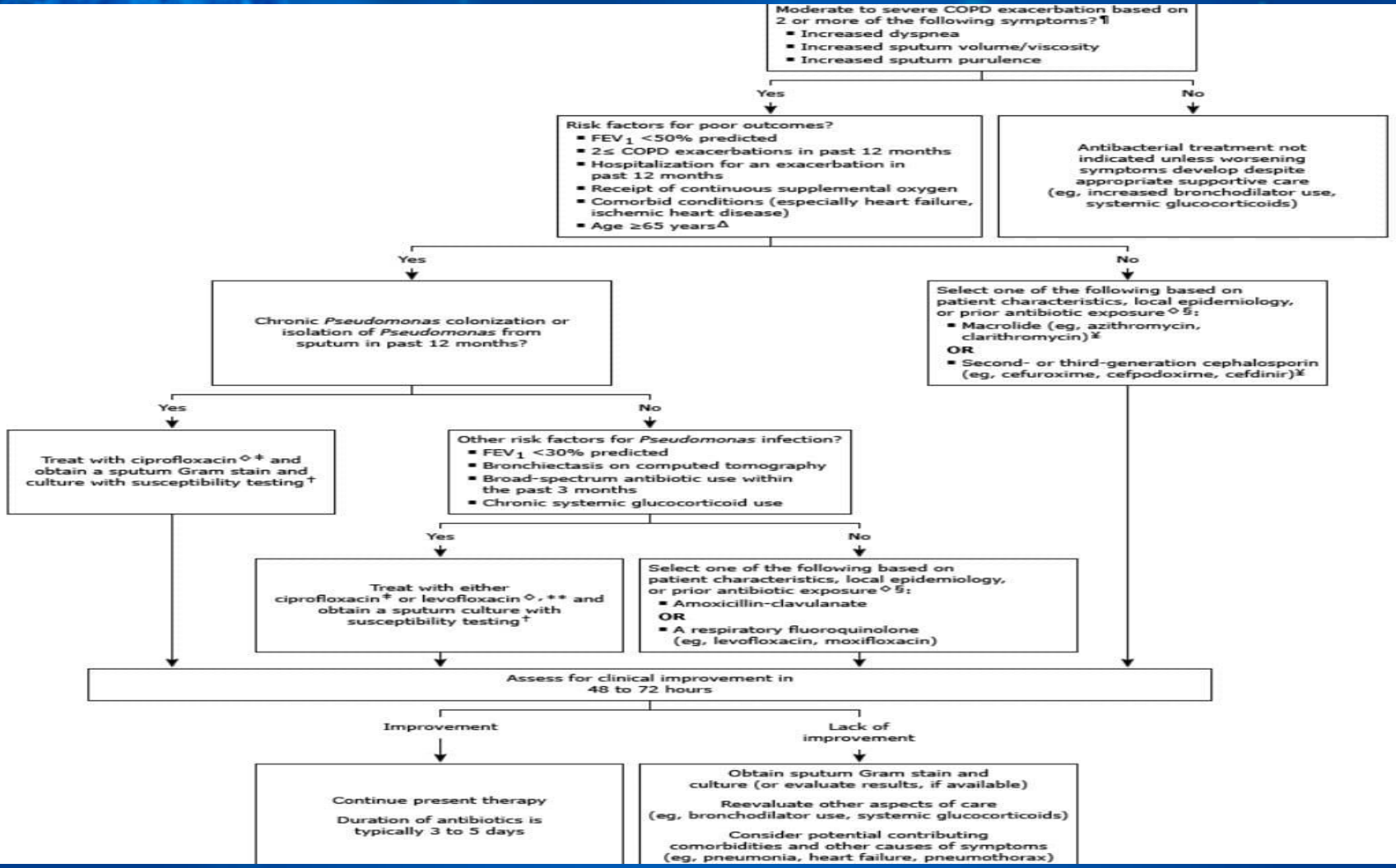
Very severe COPD

Cor pulmonale


Exacerbation
Mild
Only 1 of the 3 cardinal symptoms:
• Increased dyspnea
• Increased sputum volume
• Increased sputum purulence
Moderate or severe
At least 2 of the 3 cardinal symptoms:
• Increased dyspnea
• Increased sputum volume
• Increased sputum purulence
No antibiotics
Increase bronchodilators
Symptomatic therapy
Instruct patient to report additional cardinal symptoms
Uncomplicated COPD
No risk factors
• Age <65 years
• FEV1 >50 percent predicted
• <3 exacerbations/year
• No cardiac disease
Complicated COPD
1 or more risk factors
• Age >65 years
• FEV1 <50 percent predicted
• ≥3 exacerbations/year
• Cardiac disease
Advanced macrolide (azithromycin, clarithromycin) OR
Cephalosporin (cefuroxime, cefpodoxime, cefdinir) OR
Doxycycline OR
Trimethoprim/sulfamethoxazole
• If recent (<3 months) antibiotic exposure, use alternative class
Fluoroquinolone (moxifloxacin, gemifloxacin, levofloxacin) OR
Amoxicillin/clavulanate
• If at risk for Pseudomonas*, use ciprofloxacin and obtain sputum culture
• If recent (<3 months) antibiotic exposure, use alternative class
Worsening clinical status or inadequate response in 72 hours
Re-evaluate
Consider sputum gram stain and culture

Antibiotic treatment of acute exacerbations of COPD (hospitalized)


Moderate or severe exacerbation
At least 2 of the 3 cardinal symptoms:
• Increased dyspnea
• Increased sputum volume
• Increased sputum purulence
AND
Complicated COPD 1 or more risk factors:
• Age >65 years
• FEV1 <50 percent predicted
• ≥3 exacerbations/year
• Cardiac disease
Risk factors for Pseudomonas?*
Yes
No
Obtain sputum gram stain and culture and give:
Levofloxacin 750 mg PO or IV once daily OR
Cefepime IV OR
Ceftazidime IV OR
Piperacillin-tazobactam 4.5 g IV every 6 hours
Levofloxacin 750 mg PO or IV once daily OR
Moxifloxacin PO or IV OR
Ceftriaxone IV OR
Cefotaxime IV
Worsening clinical status or inadequate response in 72 hours
Re-evaluate
Consider sputum gram stain and culture


Moderate to severe COPD exacerbation based on 2 or more of the following symptoms?¶
Increased dyspnea
Increased sputum volume/viscosity
Increased sputum purulence
Yes
No
Risk factors for poor outcomes?
FEV1 <50% predicted
2≤ COPD exacerbations in past 12 months
Hospitalization for an exacerbation in past 12 months
Receipt of continuous supplemental oxygen
Comorbid conditions (especially heart failure, ischemic heart disease)
Age ≥65 years△
Antibacterial treatment not indicated unless worsening symptoms develop despite appropriate supportive care (eg, increased bronchodilator use, systemic glucocorticoids)
Yes
No
Chronic Pseudomonas colonization or isolation of Pseudomonas from sputum in past 12 months?
Select one of the following based on patient characteristics, local epidemiology, or prior antibiotic exposure◇§:
Macrolide (eg, azithromycin, clarithromycin)¥
OR
Second- or third-generation cephalosporin (eg, cefuroxime, cefpodoxime, cefdinir)¥
Yes
No
Treat with ciprofloxacin◇‡ and obtain a sputum Gram stain and culture with susceptibility testing†
Other risk factors for Pseudomonas infection?
FEV1 <30% predicted
Bronchiectasis on computed tomography
Broad-spectrum antibiotic use within the past 3 months
Chronic systemic glucocorticoid use
Yes
No
Treat with either ciprofloxacin‡ or levofloxacin◇,** and obtain a sputum culture with susceptibility testing†
Select one of the following based on patient characteristics, local epidemiology, or prior antibiotic exposure◇§:
Amoxicillin-clavulanate
OR
A respiratory fluoroquinolone (eg, levofloxacin, moxifloxacin)
Assess for clinical improvement in 48 to 72 hours
Improvement
Lack of improvement
Continue present therapy
Duration of antibiotics is typically 3 to 5 days
Obtain sputum Gram stain and culture (or evaluate results, if available)
Reevaluate other aspects of care (eg, bronchodilator use, systemic glucocorticoids)
Consider potential contributing comorbidities and other causes of symptoms (eg, pneumonia, heart failure, pneumothorax)

Systemic Steroid:

- For outpatients with a COPD exacerbation characterized by breathlessness that interferes with daily activities, systemic glucocorticoid therapy appears to have a small but beneficial effect with a reduction in rate of relapse.
- Using a dose that is the equivalent of prednisone 40 mg per day for 5 to 14 days. Occasional patients may benefit from a higher dose or a longer course depending on the severity of the exacerbation and response to prior courses of glucocorticoids.

Noninvasive ventilation

NO GRAPH

- NIV (also known as noninvasive positive pressure ventilation [NPPV]) refers to mechanical ventilation delivered through a noninvasive interface, such as a face mask, nasal mask, orofacial mask, or nasal prongs (nasal pillows). NIV reduces mortality and the intubation rate and is the preferred method of ventilatory support in many patients with an exacerbation of COPD

Criteria

- Moderate to severe acidosis **(pH 7.30-7.35)** and hypercapnia **($PaCO_2$ 45-60 mm Hg)**
- Respiratory frequency **> 25 breaths/min**

Contraindications for NPPV include the following :

- respiratory arrest
- cardiovascular instability
  - hypotension
  - arrhythmias
  - myocardial infarction
- impaired mental status causing an inability to cooperate
- copious and/or viscous secretions with high aspiration risk
- recent facial or gastroesophageal surgery
- craniofacial trauma
- fixed nasopharyngeal abnormality
- Burns
- extreme obesity

Invasive ventilation

- Invasive mechanical ventilation should be administered when patients fail NIV, do not tolerate NIV, or have contraindications to NIV.

Criteria

Unable tolerate NIV or NIV failure

statues post respiratory or cardiac arrest

diminished consciousness

massive aspiration or resistant vomiting

resistant and ability to remove respiratory secretion

severe hemodynamic instability without response to fluid and vasoactive drugs

Severe ventricular or supreventricular arrhythmia

life threatening hypoxemia in patients unable to tolerate NIV

Indication for Respiratory or medical ICU admission:

- Severe dyspnea that responds inadequately to initial emergency therapy
- changes in mental status or worsening hypoxemia (pao2 < 5.3 Kpa or 40mmHG) and/or severe/ worsening respiratory acidosis.
- need for invasive mechanical ventilation
- hemodynamic instability need for vasopressors

Discharge criteria and recommendation for follow-up:

- Inhaled beta2 Agonist therapy is required no more frequently than every 4 hours
- patient if is able to walk across the room
- patient is able to eat and sleep without the frequent awaking by dyspnea patient has been clinically stable for 12- 24 hours
- arterial blood gases have been stable for for 12 to 24 hours
- patient or home caregiver fully understands correct use of medication

Key point for the management of exacerbation

Short acting inhaled beta 2 Agonist with or without short acting anti-cholinergic are recommended as the initial bronchodilators to treat an acute exacerbation

systemic corticosteroids can improve lung function FEV1 oxygenation and shortened recovery time and hospitalization duration,
duration of therapy shouldn't be more than 5 to 7 days

Antibiotics when indicated can shorten recovery time reduce the risk of early relapse treatment failure and hospitalization duration
duration of therapy should be 5 to 7 days

Methylxanthines are not recommended due to increased side effect profile

None invasive mechanical ventilation should be the first mode of ventilation used in COPD patient with acute respiratory failure who have no absolute contraindication because it improves gas exchange reduces work of breathing and the need for intubation decreases hospitalization duration and improves survival

THANK YOU