Cystic Fibrosis
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Canada

Guidelines for diagnosis and treatment of pulmonary exacerbations in patients with cystic fibrosis

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Guidelines for diagnosis and treatment of pulmonary exacerbations in patients with cystic fibrosis

This guideline was produced to help diagnose and treat pulmonary exacerbations in the average patient with cystic fibrosis (CF), and is intended for NON-CF SPECIALISTS such as emergency department physicians, pediatricians, general practitioners, etc.

The guideline was originally developed by**:** Dr. Patrick Daigneault and Dr. Annick Lavoie and published in 2023 after review and approval by Cystic Fibrosis Canada's Healthcare Advisory Committee.

1- Introduction to cystic fibrosis

Cystic fibrosis (CF) is an autosomal recessive genetic disorder affecting the CFTR (CF transmembrane conductance regulator) gene, leading to thickening of mucus on epithelial surfaces including the upper and lower respiratory system.

This causes obstruction of the airways, acute and chronic infection, leading to scarring of the bronchial tree into bronchiectasis.

Preventative respiratory treatments include exercise and respiratory physiotherapy but also some nebulized medications and early use of antibiotics. Newer treatments, called CFTR modulators are extremely promising to reduce morbidity and mortality in patients with CF but are not approved for all patients.

The most common respiratory pathogens found in patients with CF can vary but include: *Staphylococcus aureus*, *Haemophilus influenzae*, *Pseudomonas aeruginosa*, methicillin-resistant *Staphylococcus aureus* (MRSA), *Stenotrophomonas maltophilia*, *Achromobacter* sp., *Burkholderia cepacia* complex, Aspergillus sp. and also atypical mycobacteria such as *Mycobacterium abscessus* complex.

Patients with CF with atypical presentations or sicker patients, or patients with increasing hemoptysis, increasing oxygen needs, or any significant clinical deterioration warrant expert advice.

2- Infection control for patients with cystic fibrosis

All patients with CF should be considered to have respiratory pathogens that are potentially transmissible, even if prior sputum cultures did not demonstrate any pathogens.

As such, all healthcare personnel in all settings should implement **contact precautions** using gloves and gowns before entry and removal on exit when caring for patients with

CF. Whenever possible, health care personnel should also avoid cross-coverage for multiple patients with CF.

Routine use of respiratory masks is not recommended but appropriate respiratory precautions should be taken such as droplet precautions for suspected influenza, RSV, etc. Proper hand hygiene should be performed before and after direct contact with all patients with CF with either antimicrobial soap or alcohol-based hand sanitizer. Hand hygiene is also recommended for contact with equipment used near a patient with CF during assessment. Stethoscopes should be cleaned before and after each use.

3- Pulmonary exacerbations in patients with cystic fibrosis

No widely accepted clinical definition of a pulmonary exacerbation exists. However, practically speaking, it is a **significant and sustained change from baseline in respiratory symptoms, pulmonary function or chest radiograph**. It can include an increase in the amount, thickness or change in coloration of sputum, increased cough, increased dyspnea, lower oxygen saturation, fever, reduction in lung function (measured by forced expiratory volume in 1 second (FEV_1) by spirometry) and/or new infiltrates on a chest x-ray. Exacerbations do not all present alike and one must consider past history and results for each individual patient.

Some **additional risk factors** associated with poor outcome include : young age, diabetes, lower baseline FEV_1, multi-resistant pathogens on past cultures, a difficult psychosocial situation and poor adherence to the regular treatment plan.

4- Investigation of a pulmonary exacerbation in patients with CF

- Spirometry with comparison to previous results
- Chest X-Ray
- Sputum or induced sputum or throat swab processed for CF specific pathogens
- Nasal swab for viruses
- Complete blood count
- Blood cultures if fever is present
- Blood gases, electrolytes and renal function tests (if dehydrated and/or if intravenous (IV) antibiotics will be prescribed). It is to be noted that patients with CF are at higher risk for hypochloremic dehydration.

5- Treating a pulmonary exacerbation in patients with CF

a) Review regular treatments and adherence to treatments

- Nutrition, vitamins and pancreatic enzymes with attention to any weight loss

- Airway clearance therapy
- Nebulized mucolytics if any (dornase alfa, hypertonic saline)
- Nebulized antibiotics if any (tobramycin, colistin, aztreonam, other)
- Other treatments: (azithromycin, CFTR modulators, etc)

b) Use of antibiotics

Most pulmonary exacerbations in patients with CF are treated with antibiotics as bacterial pathogens can readily cause infections in this thick, inflamed mucus. Some very mild exacerbations thought to be caused solely by a viral infection can be observed with close follow-up.

c) Choice of administration route

i) **Mild exacerbations** can be treated with an appropriate oral antibiotic in the absence of additional risk factors mentioned in section 3 and if close follow-up can be guaranteed.

ii) **Moderate to severe exacerbations or exacerbations in patients with risk factors** should be treated with appropriate IV antibiotics

d) Choice of antibiotics

Should be guided by pathogens found on previous cultures

If results are unavailable or if no pathogens were previously identified, a combination of: IV **piperacillin/tazobactam or ceftazidime** with IV **tobramycin** will provide broad antimicrobial coverage for CF pathogens including *P. aeruginosa*

For oral antimicrobial treatment, it is suggested that the choice of oral antibiotic includes coverage of *Staphylococcus aureus*. Cephalexin or Cefprozil are thus appropriate choices.

Please refer to the accompanying **Antibiotic Dosing Guideline for Cystic Fibrosis** for further details of CF specific antibiotic dosing as patients with CF usually require higher doses of antibiotics.

e) In-hospital vs Home IV

Local practices need to be considered in choosing between hospital or home IV treatment. Most guidelines suggest that in-hospital treatment may lead to better short- and long-term outcomes. However, for some patients, especially adults, hospital stays can be detrimental to their social, family or work situation. The decision to hospitalize is individualized and is generally driven by the need for IV antibiotics along with other therapies including

modification and/or increasing the frequency of regular treatments such as airway clearance therapy. Factors favoring hospitalization include: increased severity of illness, concern regarding ability to tolerate proposed medications, severity of co-morbidities, and the ability of the individual (or caregiver) to adhere and take on the responsibility of these treatments at home. The current standard of care is to complete approximately 14 days of IV antibiotics. This recommendation can vary depending on individual patient specifics and the rate of improvement as early responders may not require the full 14 days of IV antibiotics (10 days may be sufficient).

6- When to call the specialist

High-risk patients with, for example, progressive hemoptysis, low FEV_1, multi-drug resistant pathogens or previous intolerance to antibiotics warrant early consultation with a CF specialist to determine a treatment plan.

7- Follow-up

The patient should be reevaluated regularly with a physical exam, spirometry and blood work depending on the choice of antibiotics. If the patient is not improving as expected after the first week of antibiotic treatment, the plan should be reevaluated and discussed with a CF specialist.