Primary and secondary prevention of recurrent respiratory tract infections

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SUMMARY

The approach to prevention of recurrent respiratory tract infections depends largely on the underlying immunological, structural or microbiological drivers of the recurrent infections. Prevention is better than cure, and identification and correction of the underlying disorder is preferable to prophylactic treatment where this is possible.

Where the underlying disorder cannot be corrected or reversed, the objective of treatment must be to prevent the development of respiratory tract infections and the resulting impact of such infections on lung function decline and quality of life. Disorders like cystic fibrosis (CF) and non-CF bronchiectasis (NCFB) provide a useful framework for preventative strategies because there is some evidence to guide treatment pathways in these diseases.

Key components of management are therefore to treat the underlying defect (enhancing mucus clearance in the case of CF or NCFB), controlling bacterial infection (with prophylactic antibiotics which may be oral or inhaled), reducing symptoms and maintaining lung function, and prevention of serious bacterial or viral infections by vaccination (Pneumococcal and influenza vaccination as standard in NCFB, but others are required in other disorders).

The evidence and practical considerations for these approaches will be discussed and expanded upon in this session. As an adult physician, I will base the discussions primarily on prevention of respiratory tract infections in adults, but the general principles of prevention are applicable across a range of different disorders in adults and children.

Introduction

Respiratory tract infections are among the leading causes of death worldwide in both adults and children, and a leading cause of hospitalization in both the developed and developing world. Nevertheless, respiratory tract infections are a broad group of disorders incorporating respiratory viral infections (bronchiolitis/RSV, influenza, emerging viral infections), community-acquired pneumonia, exacerbations of airways disease (asthma, COPD, bronchiectasis) and upper airway infections. Each has a diverse presentation and cause.

Patients with recurrent respiratory tract infections represent a diagnostic dilemma, as will be discussed in the first lecture of this session, but establishing the underlying cause of driver of the recurrent infections is essential to guiding future preventative strategies.

It is clear that the approach to preventing recurrent exacerbations of COPD is entirely different to the approach to preventing recurrent episodes of bronchiolitis in a child, although as will be discussed in the following sections the general principles underpinning the approach can be said to be similar.

With a few exceptions, the approach to preventing recurrent respiratory tract infections in adults and children are not supported by high quality evidence from randomized controlled trials and in some cases clinical approach and recommendations are based almost entirely on expert opinion and clinical experience.
**General approach to prevention of respiratory tract infections**

The heterogeneity of recurrent respiratory tract infections are illustrated by the following 3 cases, which we will consider the preventative approach in sequence

1) A 16 year old man is referred because of a third respiratory tract infections in the course of a year. There has been one admission to hospital with a community-acquired pneumonia, and *Streptococcus pneumoniae* was isolated from blood cultures during that admission. He is a non-smoker, has no prior history of chronic respiratory disease and had an uncomplicated birth with no respiratory tract infections as a neonate/young child. There is no foreign travel and no apparent risk factors for HIV. Clinical examination is normal.

2) A 68 year old lady presents with recurrent respiratory tract infections. She has had 5 courses of antibiotics in the past year with episodes of cough and sputum production. In between these episodes she feels well, but has a persistent cough. She has no history prior to the last 2 years. She has never smoked, and was diagnosed with asthma in her teens but “grew out of it”. There is no history of foreign travel, no risk factors for HIV and clinical examination is normal.

3) A 72 year old man with COPD, presents with 5 chest infections in the past year and one admission to hospital with community-acquired pneumonia. He has an FEV1 on 71% predicted, and a daily cough productive of green sputum. He has multiple positive sputum cultures of *Haemophilus Influenzae* and can walk approximately 100 years on the flat. He is obese and has a large hiatus hernia on chest x-ray but no evidence of interstitial lung disease or other abnormalities. He has not lost weight and has no haemoptysis.

The general approach to primary and secondary prevention of recurrent respiratory tract infections begins with determining the underlying diagnosis, since in some cases correcting the underlying disorder is the most effective way of preventing respiratory tract infections.

1- **Why is the patient have recurrent respiratory tract infections?**
   a. Are the episodes actually infections? Consider alternative diagnoses e.g poorly controlled asthma, heart failure, other co-morbidities
   b. Is there an underlying disorders, including immunological, microbiological and structural defects
   c. Are there any modifiable risk factors? E.g lifestyle/smoking, iatrogenic immunosuppression, aspiration,
   d. Is the patient compliant with current preventative therapies?

2- **Is there an established therapy to modify the underlying defect?** Examples below:
   a. Immunoglobulin replacement for some immunodeficiencies
   b. Highly active anti-retroviral therapy for HIV
   c. Bronchoscopic treatment for bronchial obstruction/foreign body
   d. Corticosteroid treatment for asthma/Allergic bronchopulmonary aspergillosis

3- **Is the patient at higher risk of pneumococcal disease or complications**
   a. See list of risk factors below
   b. Vaccinate
4- Is the patient at higher risk of influenza or influenza related complications
   a. See list of risk factors below
   b. Vaccinate

5- Consider if the patients underlying disorder places them at higher risk of non-respiratory infections
   a. Consider vaccination/prophylaxis (e.g encapsulated organisms, meningococcus)

6- Is there an established pathway for prevention of respiratory tract infections for the patients underlying disease?
   a. Frequent exacerbations of COPD: bronchodilators, inhaled corticosteroids, pulmonary rehabilitation, vaccination, antibiotic prophylaxis in selected patients
   b. Frequent exacerbations of asthma: inhaled corticosteroids, bronchodilators, add-on therapies, biologic therapies
   c. Frequent exacerbations of bronchiectasis: chest physiotherapy, prophylactic antibiotics including macrolides and inhaled antibiotics, bronchodilators, pulmonary rehabilitation.
   d. Common variable immunodeficiency patients would typically receive subcutaneous immunoglobulin replacement.

During the course of the presentation we will discuss a series of cases and consider this general approach to the prevention of recurrent respiratory tract infections

REFERENCES