

Aetiology of respiratory tract infections: clinical assessment versus serological tests

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SUMMARY

Two hundred and fifty ambulatory patients with febrile respiratory tract infections were included in a prospective study, aimed at determining the reliability of physicians' judgements relating to the aetiology of the infection. Compared with advanced serological testing, physicians' judgements for a bacterial/atypical, rather than viral, aetiology had a negative predictive value of 60% and a positive predictive value of only 50%. We conclude that physicians' ability to assess whether the infectious aetiology of RTI is viral or bacterial/atypical is low and no more reliable than tossing a coin.

Keywords: respiratory tract infection; aetiology; clinical skill; serological testing.

Introduction

RESPIRATORY tract infections (RTIs) are the most common acute illness in the industrialised world and are the most common cause of absenteeism from school or work.¹ Whether the infectious aetiology is viral or bacterial/atypical has immediate therapeutic ramifications, and the physician must reach a decision on this question immediately after taking a history and examining the patient.

In the framework of a comprehensive prospective study on infectious aetiologies in ambulatory, febrile, adult RTI patients, we created a database for a large number of patients and a broad range of serologically diagnosed infectious aetiologies. This database enabled us to evaluate the reliability of physicians' clinical assessment, relating to the aetiology of the RTI.

Method

The study included patients who consulted their primary care physician, or who attended the emergency room, during the course of three months between 1 January and 31 March 1999. Inclusion criteria were: (a) age above 21 years; (b) an acute febrile illness of less than one week's duration; (c) the patient having at least one of the following four complaints when he/she consulted the physician: cough, coryza, sore throat or hoarseness.

Patients who met the inclusion criteria were enrolled by 15 board-certified family medicine specialists, who work in three primary care clinics and also from the emergency room of the Soroka Medical Center, on the condition that they were discharged shortly after they came to the emergency room without being hospitalised. The study was approved by the Committee for Research on Human Beings (Helsinki Committee) of the Soroka Medical Center, and all participants gave informed consent.

Patients were interviewed and underwent physical examination by the family physician or the emergency room physician, using a detailed structured questionnaire. At the conclusion of the interview and physical examination, the physicians was asked to put into writing their response to the question: 'Is the infectious aetiology viral or bacterial/atypical?'. The responses were safeguarded by the investigators and the physicians did not have access to their judgements until the completion of the study.

Venous blood for serological tests (5 ml) was taken from all patients at entry into the study and the blood was separated and frozen at -20°C until serological tests were performed. A second blood sample was drawn from each patient, for convalescence phase serology three to four weeks later.

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HOW THIS FITS IN

What do we know?

The infectious aetiology of respiratory tract infections is viral or bacterial/atypical. Distinguishing between these two possibilities has important therapeutic implications. In routine clinical work, this distinction is based on the physician's clinical appraisal.

What does this paper add?

The results of the present study show that, compared with the results of serological tests, the value of such a clinical appraisal is much lower.



The aetiological work-up included 14 pathogens known to cause upper or lower RTIs that could be identified in serological tests and group A β -haemolytic streptococci. Serological tests for seven respiratory viruses, *Mycoplasma pneumoniae*, *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Moraxella catarrhalis* — were conducted using the enzyme immunoassay method. The microimmunofluorescence method was used to identify *Legionella*

Table 1. Frequency distribution of infectious aetiologies in 250 RTI patients.

Pathogen	n (%)
Viral agents	
Influenza virus type A	51 (20)
Influenza virus type B	42 (17)
Parainfluenza virus type 1	5 (2)
Parainfluenza virus type 2	6 (2)
Parainfluenza virus type 3	3 (1)
Adenovirus	12 (5)
Respiratory syncytial virus	11 (4)
One or more of the above	125 (50)
Bacterial agents	
<i>S. pneumoniae</i>	12 (5)
<i>H. influenzae</i>	6 (2)
<i>M. catarrhalis</i>	1 (1)
β -haemolytic streptococcus	11 (4)
One or more of the above	30 (12)
Atypical bacterial agents	
<i>Legionella</i> spp.	28 (11)
<i>M. pneumoniae</i>	19 (8)
<i>C. burnetii</i>	4 (2)
<i>C. pneumoniae</i>	2 (1)
One or more of the above	51 (20)
Unknown agent	83 (33)

Table 2. Viral versus bacterial/atypical aetiology: comparison of physicians' judgements with the results of serological tests in 167 patients in whom at least one infectious aetiology was identified. Patients in whom a combined viral and bacterial/atypical aetiology was identified were classified as bacterial/atypical aetiology.

	Serological tests		
	Viral	Bacterial/atypical	Total
Physicians' judgement^a			
Viral	46	31	77
Bacterial/atypical	45	45	90
Total	91	76	167

^aCharacteristics of physicians' judgements for a bacterial/atypical rather than viral aetiology: sensitivity — 59%; specificity — 51%; positive predictive value — 50%; negative predictive value — 60%.

spp., *Coxiella burnetii*, and *Chlamydia pneumoniae*. Only a significant change in the antibody titre, or of the levels for each specific pathogen between the acute and convalescence phase sera, were considered diagnostic of infection with that pathogen. The results were analysed using the statistical software Epi Info.

Results

Two hundred and fifty patients were included in the study population. The mean age (\pm SD) of the patients was 39.5 years (\pm 15.1 years; range = 21–78 years) and 117 (47%) patients were males. A convalescence serum sample was drawn from all of the 250 patients at a mean interval of 26.2 days (\pm 7.1 days; range = 19–47 days) after the acute phase sample. Table 1 shows the frequency distribution of the various infectious aetiologies in the study population. Table 2 details physicians' assessment of the infectious aetiology viral versus bacterial/atypical, compared with the results of serological tests in 167 patients in whom at least one aetiology was identified. Patients with a combination of a viral aetiology together with a bacterial/atypical aetiology were classified in this table as 'bacterial/atypical'. Physicians' judgements for a bacterial/atypical aetiology had a negative predictive value of only 60% and a positive predictive value of only 50%.

Discussion

The question as to whether primary care or emergency-room physicians can determine, on clinical grounds, if an RTI is caused by a viral or a bacterial/atypical aetiology has never been studied before to our knowledge, and our findings are unique and original for this topic. The significance of the positive predictive value of 50% and the negative predictive value of 60% that was found in this study is that the value of physicians' judgements in this matter is no more reliable than tossing a coin. The issue of aetiology is not academic or theoretical. The decision as to whether to prescribe or withhold antibiotic therapy in a given patient should be directly related to this judgement. The practical implication of the lack of ability to judge the aetiology on clinical grounds is that a large proportion of patients with viral disease receive antibiotics unnecessarily, while other patients in whom the aetiology is bacterial/atypical do not receive the treatment that they would have received, had the physician known the aetiology. We conclude that physicians' ability to assess whether the infectious aetiology of an

RTI is viral or bacterial/atypical is low and is no more reliable than tossing a coin.

Reference

1. Koster FT, Barker LR. Respiratory tract infections. In: Barker LR, Burton JR, Zieve PD (eds). *Principles of ambulatory medicine*. 5th edition. Baltimore: Williams & Wilkins, 1999: 342-362.