Diagnosis of ambulatory community-acquired pneumonia

Comparison of clinical assessment versus chest X-ray

David Lieberman1,2, Pesach Shvartzman3, Igor Korsonsky2 and Devora Lieberman2

1Pulmonary Unit and 2Division of Internal Medicine, Soroka University Medical Center and the 3Department of Family Medicine, Faculty of Health Sciences, Ben-Gurion University of the Negev, Beer-Sheva, Israel.

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Objectives - When evaluating patients with respiratory tract infections (RTI), physicians have to judge and decide whether the patient has pneumonia or not. This decision is usually made by clinical assessment alone and/or by performing a chest X-ray. The aim of this study was to determine the reliability of physicians' judgements relating to the presence of pneumonia in RTI patients by clinical assessment alone compared with chest X-ray.

Design - A prospective, clinical study.

Setting - Primary care clinics and a university hospital in southern Israel.

Subjects - Two-hundred-and-fifty ambulatory patients with febrile RTI were included in a prospective study. On the basis of a medical interview and physical examination alone physicians were asked to make judgements relating to the study question, and these judgements were compared with the results of chest X-rays.

Results - Physicians' judgements of pneumonia had a sensitivity of 74% (49-90%), a specificity of 84% (78-88%), a negative predictive value of 97% (94-99%) and a positive predictive value of only 27% (16-42%), compared to the results of chest X-ray.

Conclusion - We conclude that the ability of physicians to negate X-ray confirmed pneumonia by clinical assessment in febrile adult RTI patients is good, but that their ability to successfully predict this condition is poor.

Key words: chest X-ray, community, pneumonia, respiratory infections.

MATERIAL AND METHODS

Patients

The study included patients who turned to their primary care physician or to the emergency room during the course of 3 months between 1 January and 31 March 1999, who met the inclusion criteria for the study and who agreed to participate. Inclusion criteria were: 1) age above 21 years; 2) an acute febrile illness of less than 1 week's duration (by patient's report of at least one temperature measurement at home, or at the neighbourhood clinic, or at the emergency room reaching at least 37.8°C (PO)); 3) the patient had at least one of the following four com-

GPs often have to reach the diagnosis of pneumonia without the benefit of a chest X-ray.

- The physician's ability to rule out pneumonia on clinical grounds alone when X-rays are negative is good.
- In contrast, in most cases in which physicians diagnose pneumonia on clinical grounds alone, X-rays do not confirm the same diagnosis.
plaints when he/she turned to the physician: cough, coryza, sore throat or hoarseness. Women who might be or were definitely pregnant were excluded, as were patients known to be positive for HIV.

Three primary care clinics of Klalit Health Services, in three different neighbourhoods in the southern Israel city of Beer-Sheva, participated in the study. Fifteen board certified specialists in family medicine who work in those clinics participated in the study. A second source of patient enrolment was the emergency room of the Soroka Medical Center. Patients were enrolled in the study from this source on the condition that they met the inclusion criteria and 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.

**Study protocol**

Patients who were identified as meeting the study inclusion criteria and gave informed consent were interviewed by the family physician or the emergency room physician using a detailed structured questionnaire. The physical examination focused on the patient's complaints and findings associated with respiratory tract infections. At the conclusion of the interview and physical examination the physician was asked to put down in writing his/her response to the question: does the patient have pneumonia? The responses were safeguarded by the investigators and the physicians did not have access to their judgements until completion of the study. At this stage, each of the patients underwent a chest X-ray (P-A and lateral). Three to 4 weeks after entering the study the patients were invited for a follow-up visit, when those suspected with pneumonia in the acute phase of their illness underwent repeat chest X-ray.

**Chest X-ray interpretation**

Each chest X-ray was interpreted by the radiologist on call immediately after it was taken. The results were given to the treating physician, but were not included in the study database. For study purposes, each week all X-rays were analysed separately by a senior pulmonologist and a senior radiologist who knew only that the patients were participating in the study. They were otherwise blinded to clinical data and assessments of the treating physician. All X-rays interpreted by at least one of the experts as pneumonia were classified, at this stage, as "suspected pneumonia", and only those patients underwent repeat X-rays. The paired X-rays of these patients (acute and convalescence) were again interpreted separately by the same experts. Pneumonia was diagnosed only if both experts independently reported a pulmonary infiltrate in the acute phase X-ray that disappeared or had retreated significantly in the follow-up X-ray. Cases in which the two experts did not agree were not considered pneumonia for the purpose of the study.

**Data analysis**

The results were analysed using the statistical software Epi Info.

**RESULTS**

Three-hundred-and-seventy-four patients met the inclusion criteria of the study and were asked by the investigators to participate. Two-hundred-and-fifty patients agreed to participate and were included in the study population. One-hundred-and-fifty patients (60%) were enrolled in the study from the primary care setting and 100 others (40%) from the emergency room. Mean age (± SD) of the patients was 39.5 ± 15.1 years (range 21–78) and 117 (47%) were males. Sixty-one patients (24%) were current smokers, 22 (9%) were hypertensive, 20 (8%) suffered from COPD, 13 (5%) from ischaemic heart disease, 6 (2%) from diabetes mellitus, and 199 (80%) had no significant chronic co-morbidity. In accordance with the accepted classification (4), 175 patients (70%) were diagnosed as lower (LRTI) and 75 (30%) as upper (URT).

Of the 100 patients that were recruited from the emergency room, 32 went there on their own accord (a feasible alternative in Israel if an emergency room fee is paid), 34 were referred by a physician who was not their regular physician, and 34 were referred to the emergency room by their regular primary care physician. A comparison of the various clinical characteristics of the patients in the primary care clinics with those who were discharged from the emergency room in general, and those who were referred to the emergency room by their regular physician in particular, showed that there were no significant differences between these groups in any of the clinical parameters of RTI. This analysis focused particularly on chronic co-morbidity, the rates of the various infection-related complaints and symptoms, the maximum temperature recorded, the length of time between the first appearance of symptoms to referral to the doctor and then to full recovery, and the rate and type of antibiotic treatment before referral to the doctor and afterwards.

Thirty-one patients (12%) were classified by acute phase X-ray as “suspected pneumonia”, but only 23 (9%) of them were diagnosed as “pneumonia” by one of the experts on the basis of the paired X-rays (acute
Table I presents physicians' judgements of pneumonia compared with the results of chest X-rays in the study population. Physicians' judgements of pneumonia had a sensitivity of 74%, a specificity of 84%, a negative predictive value of 97% and a positive predictive value of only 27%, compared to the chest X-ray; In a corresponding analysis to that shown in Table I, conducted separately on all 150 patients who were recruited from primary care and 100 patients who were recruited from the emergency room, no significant difference was found in clinical assessment between primary care and emergency room doctors relating to the diagnosis of pneumonia.

DISCUSSION

RTI is a broad diagnosis that includes two principal sub-diagnoses, LRTI and URTI, each of which can be divided into several specific diagnoses or syndromes (1). This orderly and clear-cut textbook classification is far from reflecting the reality faced by primary care physicians who treat individual patients with RTI. Indeed, in a small proportion of cases the clinical expression of the disease is more or less consistent with one of the specific diagnoses or syndromes in this classification, but a large proportion of patients present with signs and complaints of infection from several sites in the respiratory tract. This dilemma of definition and classification in the RTI group is reflected in the large number of proposals for a definition of LRTI that were recently reviewed (3). Even if the criteria for LRTI as proposed in that review are adopted, many patients classified as LRTI also have clear clinical signs of URTI, like 5 of the 11 patients in our study with strept throat who were defined as LRTI. In addition, CAP is sometimes diagnosed by chest X-ray in patients with a dry cough and no pulmonary auscultatory findings in the presence of manifestations of URTI. In terms of the definition that we used, these patients would not be defined as LRTI without performing a chest X-ray. This situation convinced us that for purposes of the present study it was possible, even justified, to unite and analyse the patients in these two diagnostic subgroups into one category of RTI.

The issue of whether chest X-rays are indicated for RTI patients in the community in general, and for LRTI patients in particular, is controversial. In actuality, chest X-rays are performed in Europe for 22% of LRTI patients, but this rate ranges from 31% in Spain to 13% in the United Kingdom (2). A recent British review recommended that chest X-rays be performed in LRTI only when there are focal chest signs and only when the symptoms worsen under antibiotic therapy or when recovery is slower than expected (3). This recommendation is different from actual practice, as reported in another recent British study which found that the most common reason given by general practitioners for chest X-rays in patients suspected of CAP is to confirm the diagnosis and that in half of the cases the GP felt that a normal chest X-ray influenced therapy by eliminating the need for antibiotics (4). These differences in approach appear to be related to antibiotic therapy policy in LRTI. Physicians who often prescribe antibiotics in these patients do not refer them for chest X-rays because the radiologic diagnosis of CAP does not have therapeutic implications (5). In contrast, physicians who act in accordance with recommendations that there is no indication for antibiotic therapy in LRTI unless CAP or exacerbation of chronic bronchitis are diagnosed, are more likely to refer for chest X-rays in order to be certain that CAP is not missed and that all CAP patients receive antibiotics. The results of the present study as to the reliability of physicians' assessment of CAP compared to chest X-rays demonstrates a high negative predictive value, indicating that physicians are good at ruling out CAP on clinical grounds. In contrast, physicians' ability to assess CAP on clinical grounds is low and cannot replace chest X-rays. This was found even though (or perhaps because) all the participating physicians were
aware that “focal chest signs are a clinical equivalent of CAP with good correlation with radiologic evidence of it” (6). Physicians who insist on giving antibiotics to LRTI patients only if CAP is proved, can conclude from these findings that any patient who they believe has CAP should be referred for a chest X-ray and that only about a quarter of these patients will have radiologic confirmation of the diagnosis.

We conclude that physicians’ ability to negate X-ray confirmed pneumonia by clinical assessment in febrile adult RTI patients is good, but that their ability to successfully predict this condition is poor.

REFERENCES