Routine Radiographic Follow-up of Community-Acquired Pneumonia Is Not Warranted

Bruns AH, Oosterheert JJ, El Moussaoui R, et al. Pneumonia recovery; discrepancies in perspectives of the radiologist, physician and patient. J Gen Intern Med 2009 Dec 5 [Epub ahead of print].

Study Overview

Objective. To compare radiographic resolution of community-acquired pneumonia (CAP) with resolution of clinical symptoms assessed by the physician or patient.

Design. Prospective cohort study nested within a randomized controlled noninferiority trial.

Setting and participants. The study cohort emerged from a placebo-controlled randomized noninferiority trial of 3 versus 8 days of amoxicillin for patients with CAP [1]. Investigators from 9 hospitals in the Netherlands between November 2000 and July 2003 randomized patients aged older than 18 years who had clinical signs of pneumonia, temperature above 38°C, radiologic evidence of a new infiltrate consistent with pneumonia, and a pneumonia severity index score < 110. Patients over age 65 years with a temperature below 38°C were eligible if they had evident clinical signs of pneumonia and abnormalities on a chest radiograph. Exclusion criteria [1] included pregnancy, life expectancy less than 1 month, recent hospital or nursing home admission, asplenia, neutropenia ($< 1.0 \times 10^9$/L), ICU admission, history of amoxicillin allergy, HIV infection with an need for prophylaxis against pneumocystis pneumonia, agammaglobulinemia, treatment with another effective antimicrobial agent for more than 24 hours before admission, another infection requiring treatment with systemic antibiotics, serious respiratory insufficiency (arterial partial pressure of oxygen < 6.67 kPa), empyema, and possible aspiration, atypical, Klebsiella, or staphylococcal pneumonia. A total of 121 patients were randomized, of which 2 were excluded due to protocol violations. The investigators followed the remaining 119 patients with visits at 10 and 28 days after admission, which included physical examination, laboratory measures, patient questionnaires, and repeat chest radiography.

Main outcome measures. The researchers assessed pneumonia-related symptoms using the CAP score, a brief patient-based validated questionnaire containing 8 items (low values suggest more severe symptoms). The patients were asked about their well-being 1 month prior to presentation (pre-pneumonia score). The radiologists on call at each hospital evaluated the chest radiographs according to standard criteria for the presence of opacities, pulmonary edema, pleural fluids, and other findings. The investigators defined complete radiographic resolution as the absence of any chest radiographic abnormality potentially related to infection. They defined clinical cure as physician assessment of continued resolution or symptom improvement related to pneumonia without need for additional antibiotic therapy. Numerically, they defined clinical cure from the patient's perspective as a CAP score equal to or greater than the pre-pneumonia score.

Main results. Mean age of the patients was 56.6 years and two-thirds had at least 1 comorbid illness. The clinicians established a bacterial source in 36% of patients, a majority of whom had *Streptococcus pneumoniae.* A total of 90% of patients had radiologic follow-up at 10 days, with 80% at 28 days. Overall, after 10 days of follow-up, the investigators observed clinical cure based on physician assessment in 106/114 (93%) patients, normalization of CAP score (patient assessment) in 33/103 (32%) patients, and radiographic resolution in 33/105 (31%) patients. By 28 days, they noted continued clinical cure based on physician assessment in 96/108 (89%) patients, normalization of CAP score (patient assessment) in 43/103 (42%) patients, and radiographic resolution in 65/95 (68%). The researchers found that patients with radiographic resolution of CAP at day 10 and day 28 had significantly higher CAP well-being scores at day 10 (62.5 vs. 50.1; $P = 0.02$) and day 28 (71.6 vs. 59.9; $P = 0.02$), when compared with patients without radiographic resolution of CAP. By day 10, 62 patients (57.9%) had an incomplete radiologic response and at day 28, 30 patients (31.6%) did. A total of 12/107 (11.2%) patients had deterioration of radiologic findings during follow-up. Notably, all patients with radiologic deterioration had 1 or more clinical or laboratory signs suggesting clinical failure such as fever, abnormal auscultatory signs, increased inflammatory markers, high respiration rate, or delayed normalization of the CAP score. None of the patients developed deterioration of chest radiography during the second part of

follow-up (between day 10–day 28). In multivariate analysis at day 28, only a high CAP severity score independently predicted delayed radiographic resolution (odds ratio, 4.7 [95% confidence interval, 1.3–16.9]; $P = 0.02$).

Conclusion. In mild to moderately severe CAP, clinical cure as assessed by physicians precedes resolution of radiographic abnormalities, and resolution of symptoms scored by the patient lag behind. Follow-up radiography at 10 and 28 days did not discern any cases of treatment failure that were not evident by physician evaluation or patient symptom reporting. Therefore, routine monitoring by follow-up chest radiographs does not seem to confer additional value for CAP beyond following a patient's clinical course.

Commentary

Many clinicians continue to use routine chest radiographs as a way to monitor resolution of CAP. While clinical guidelines recommend against this practice, they cite "grade D" (expert opinion) evidence in support of this view [2]. Little direct evidence exists regarding the utility of using follow-up chest radiography for monitoring. Thus, this study sought to evaluate whether routine monitoring by chest radiography conferred additional prognostic advantage over physician or patient assessment of status after hospitalization for CAP. The investigators found that routine radiographic monitoring did not offer benefit for picking up treatment failure above physician and patient assessment and, in fact, lagged behind both.

This study was embedded within a randomized controlled noninferiority trial of different treatment courses for amoxicillin that showed no advantage for longer treatment [1]. Thus, the investigators were able to prospectively identify and follow a cohort of patients with CAP. Response rates to the survey were high and the follow-up used standardized radiographic, physician, and patient assessment modalities. A few limitations deserve note. The study was relatively small and limited to 9 hospitals in the Netherlands. A total of 20% of patients did not have radiographic follow-up at 28 days. In addition, the exclusion criteria were rather rigid to discern a homogenous sample of fairly healthy adults with CAP. Finally, the radiologic definitions used were strict, thus potentially underestimating radiographic cure rates.

Application for Clinical Practice

We finally have evidence for a long-time adage in internal medicine. There is no apparent need to follow patients who have mild to moderate CAP with routine chest x-rays after discharge home since clinical assessment by physicians and patient report of symptoms appear earlier than radiographic improvement. Furthermore, routine radiographs do not appear to confer a detection benefit above physician assessment.

—Review by Asaf Bitton, MD

References

1. El Moussaoui R, de Borgie CA, van den Broek P, et al. Effectiveness of discontinuing antibiotic treatment after 3 days versus 8 days in mild to moderate-severe community acquired pneumonia: randomised, double blind study. BMJ 2006;332:1355.
2. Mandell LA, Wunderink RG, Anzueto A, et al. Infectious Diseases Society of America/American Thoracic Society consensus guidelines on the management of community-acquired pneumonia in adults. Clin Infect Dis 2007;44(Suppl 2):S27–72.