

Journal club

Low-dose computed tomography instead of radiography in suspected pneumonia

Commentary on:

Prendki V, *et al.* Low-dose computed tomography for the diagnosis of pneumonia in elderly patients: a prospective, interventional cohort study. *Eur Respir J* 2018; 51: 1702375.

interpretable by non-radiologists in the acute setting. However, there is interobserver variability among readers, both between unexperienced and experienced readers. Computed tomography (CT) of the lungs may offer a solution. Previous studies showed that CT was superior to chest radiography in detecting pulmonary consolidations [3, 4].

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Context

Pneumonia is a common disease worldwide and an important cause of morbidity and mortality in the elderly. However, if treated correctly and in a timely manner the prognosis is good. Therefore, a prompt diagnosis of pneumonia is imperative. It is known that chest radiograph interpretation has a high interobserver variability and both under- and overdiagnosis can occur [1]. Withholding antibiotics in a patient with a pneumonia increases the risk of morbidity and mortality. However, initiating antimicrobial treatment in a patient without a pneumonia is associated with potential adverse effects and can lead to antibiotic resistance. Hence, pneumonia is a straightforward diagnosis in the majority of cases, but there still is diagnostic uncertainty in a number of patients, especially among the elderly [2].

Chest radiography has certain advantages: it is readily available, relatively inexpensive compared to other radiological studies, has a low radiation burden, and in the majority of cases is also

Methods

The recent prospective interventional cohort study by PRENDKI *et al.* [5] in the *European Respiratory Journal* examined the role of chest CT for diagnosing pneumonia in elderly patients. They included 200 elderly patients (>65 years) with a suspicion of pneumonia (community or hospital acquired) based on clinical signs and symptoms. Chest radiographs were obtained in all patients and the probability of a pneumonia was assessed using a five-level Likert scale (excluded, low, intermediate, high and certain) by the treating clinician. The clinician could use all available clinical information and the findings of the chest radiograph. Subsequently, a low-dose unenhanced chest CT was performed within 72 h. An independent radiologist without any clinical information except that there was suspicion of a pneumonia assessed the CT and graded the likelihood of a pneumonia on the same five-level Likert scale (excluded, low, intermediate, high and certain). The treating clinician used the results from

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Overdiagnosis, as well as (to a lesser extent) underdiagnosis, of pneumonia on chest radiographs is common. Low-dose CT chest can potentially be helpful, especially in cases of intermediate probability of pneumonia on chest radiography. <http://ow.ly/265z30n1Mox>



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the CT to reassess the likelihood of a pneumonia on the same five-level Likert scale (excluded, low, intermediate, high and certain). The reference standard for the presence of a pneumonia was set after completion of the study by an adjudication committee using all the clinical information obtained from patient records without the results from the CT scan. The primary end-point was the number of patients who had a change in the Likert scale after chest CT and how many matched the adjudication committee reference standard.

Main results

Of the 200 patients, the outcome of the CT changed the likelihood in 90 (45%) patients. In 30 patients there was upgrading and in 60 patients there was downgrading. Comparing with the reference standard set by the adjudication committee 16 patients were correctly reclassified after CT. Interestingly, 81% of those with an intermediate likelihood changed in probability after CT. In those with a high likelihood of pneumonia the change in probability was much lower (23%). It could, therefore, be argued that a CT should be only reserved for those with an intermediate likelihood of pneumonia.

Commentary

Interestingly, the potential for overdiagnosis of pneumonia seems to be higher than the potential for underdiagnosis on chest radiography. This is probably because every density on the chest radiograph could be interpreted as an infectious infiltrate, while it also could be atelectasis combined for instance with pleural fluid. One of the difficulties of this study is the reference standard, *i.e.* an adjudication committee using clinical information and results from chest radiography, but not from the CT. Another study on the use of CT in the diagnosis of pneumonia allowed the adjudication committee to include the outcome of the CT in establishing the reference diagnosis [4]. In that study, 80% of patient reclassification after CT was correct, which is a higher than the 67.5% in the study by PRENDKI *et al.* [5]. This difficulty is especially apparent when looking at the percentage of participants adjudicated

as intermediate (29.5%), which is a lot higher than both the radiologist's and clinician's probability after the CT (11.5% and 14.5%, respectively). In addition, in patients without abnormalities on the chest radiograph, but with evident infectious abnormalities, the adjudication committee could adjudicate the patient to not having a pneumonia, but if the CT showed infectious abnormalities and these results had been available they would probably have adjudicated otherwise.

Implications for practice

PRENDKI *et al.* [5] show that the additional value of CT was in patients with an intermediate probability of pneumonia. Including the CT results decreased the number of patients in this category from 70 to 29. Correct reclassification was mainly present in those without a pneumonia, with a total net reclassification index of 8% indicating that CT mainly has a role in reducing overdiagnosis of pneumonia. This has implications for the use of antibiotics as a false-positive diagnosis leads to overuse, which may possibly lead to antibiotic resistance problems.

So, should we replace conventional chest radiography with low-dose CT? Radiation and costs need to be considered. Recent advances in CT scanning have led to dramatically lower radiation doses over the past decade. The radiation dose of a low-dose chest CT is ~1–1.5 mSv compared with 0.1 mSv for a chest x-ray. Costs remain an issue, as CT is more expensive than chest radiography. However, a correct diagnosis and avoiding the cost of antibiotics should also be taken in account.

In conclusion, the study by PRENDKI *et al.* [5] has shone some light on the question of whether CT has a role in the diagnosis of pneumonia. It could be argued that in patients with an intermediate probability low-dose CT might be of use. Overdiagnosis, as well as (to a lesser extent) underdiagnosis, of pneumonia on chest radiographs is common. Low-dose CT of the chest can potentially be helpful, especially in cases with an intermediate probability of pneumonia on chest radiography. However, currently there is no clear answer and at the moment there is no set role for CT. Future studies should further elucidate this important question.

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Conflict of interest

None declared.

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