TITLE: Screening and Post-Treatment Follow-Up Chest X-Rays for Chest Infections: Clinical and Cost-Effectiveness and Guidelines

DATE: 26 October 2015

RESEARCH QUESTIONS

1. What is the clinical effectiveness of chest X-ray use for preliminary screening of pediatric and adult patients suspected of having pneumonia or for post-treatment follow-up assessment?

2. What is the cost-effectiveness of chest X-ray use for preliminary screening of pediatric and adult patients suspected of having pneumonia or for post-treatment follow-up assessment?

3. What are the evidence-based guidelines regarding chest X-ray use for preliminary screening of pediatric and adult patients suspected of having pneumonia or for post-treatment follow-up assessment?

KEY FINDINGS

Two systematic reviews, seven non-randomized studies, one economic evaluation, and four evidence-based guidelines were identified regarding the use of chest X-ray use for preliminary screening of pediatric and adult patients suspected of having pneumonia or for post-treatment follow-up assessment.

METHODS

A limited literature search was conducted on key resources including Ovid Medline, PubMed, The Cochrane Library, University of York Centre for Reviews and Dissemination (CRD) databases, ECRI, Canadian and major international health technology agencies, as well as a focused Internet search. No filters were applied to limit the retrieval by study type. Where possible, retrieval was limited to the human population. The search was also limited to English.
language documents published between January 1, 2005 and October 9, 2015. Internet links were provided, where available.

The summary of findings was prepared from the abstracts of the relevant information. Please note that data contained in abstracts may not always be an accurate reflection of the data contained within the full article.

**SELECTION CRITERIA**

One reviewer screened citations and selected studies based on the inclusion criteria presented in Table 1.

<table>
<thead>
<tr>
<th>Table 1: Selection Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Population</strong></td>
</tr>
<tr>
<td><strong>Intervention</strong></td>
</tr>
<tr>
<td><strong>Comparator</strong></td>
</tr>
<tr>
<td><strong>Outcomes</strong></td>
</tr>
<tr>
<td><strong>Study Designs</strong></td>
</tr>
</tbody>
</table>

**RESULTS**

Rapid Response reports are organized so that the higher quality evidence is presented first. Therefore, health technology assessment reports, systematic reviews, and meta-analyses are presented first. These are followed by randomized controlled trials, non-randomized studies, economic evaluations, and evidence-based guidelines.

Two systematic reviews, seven non-randomized studies, one economic evaluation, and four evidence-based guidelines were identified regarding the use of chest X-ray use for preliminary screening of pediatric and adult patients suspected of having pneumonia or for post-treatment follow-up assessment. No relevant health technology assessments or randomized controlled trials were identified.

Additional references of potential interest are provided in the appendix.

**OVERALL SUMMARY OF FINDINGS**

**Screening/Diagnosis**

**Mixed Population**

One systematic review identified two randomized controlled trials examining the use of chest x-ray for the management of acute lower respiratory tract infections in adults and children. Both of the included studies concluded that the use of chest x-rays did not result in a significant
reduction in the duration of symptoms or illness. The adult study reported no change in the ordering of return visits or provision of antibiotics. This study also reported that a subgroup of adults with infiltrate on their radiograph had a significant reduction in the duration of symptoms and illness with the use of chest x-ray. The study on children reported numerically higher hospitalization rates in the chest x-ray group but this difference was not statistically significant.

**Adults**

One non-randomized study evaluated the impact of ordering chest x-rays automatically for patients with symptoms of pneumonia in the emergency department on time to antibiotics and time to chest x-ray. Both outcomes were lowered during the study period, but the protocol had limited sensitivity in regards to identifying patients with pneumonia. One non-randomized study examined the impact of chest x-ray on primary care patients with suspected pneumonia. Chest x-ray results influenced diagnosis by the general practitioner in 53% of cases and patient management changed following x-ray in 69% of patients.

**Children**

One systematic review examined the impact of chest x-ray in the diagnosis of community-acquired pneumonia in children and found no evidence of improved clinical outcomes related to acute lower respiratory tract infection. One non-randomized study reported that routine chest x-rays were only justified for febrile neutropenic oncology patients, based on identification of clinical abnormalities, when respiratory symptoms were also present.

**Follow-Up Assessment**

**Adults**

One non-randomized study examined the yield of suspected or diagnosed lung cancer identified through follow-up chest x-ray after hospital admission for community-acquired pneumonia. Chest x-ray taken six to 12 weeks after admission had low yield and sensitivity, identifying six cases of lung cancer but missing five cases of lung malignancy that were eventually diagnosed. A second non-randomized study determined that newly diagnosed malignancy or alternative nonmalignant disease was identified in 5.2% (32/618) of patients undergoing follow-up chest x-ray for suspected community-acquired pneumonia.

**Children**

In one non-randomized study, previously healthy children with community-acquired pneumonia received follow-up chest x-ray. Further clinical problems related to the pneumonia were identified in only three of the 27 patients with abnormal findings. A second study determined that the findings of follow-up chest x-ray three to seven weeks after hospital admission did not impact treatment of hospitalized children with community-acquired pneumonia. The authors concluded that routine follow-up chest x-ray was not necessary for children with an uncomplicated recovery from pneumonia.

**Economic Evaluations**

One economic evaluation was identified that evaluated the cost-effectiveness of 33 diagnosis methods (including clinical diagnosis with chest x-ray) for pneumocystis pneumonia. Chest x-ray
resulted in successful treatment in 77% of patients and was less cost-effective than several (e.g., polymerase chain reaction and Toluidine Blue O staining methods) but not all (e.g., bronchoalveolar lavage) diagnostic options.

Guidelines

Four evidence-based guidelines\textsuperscript{11-14} were identified regarding the diagnosis and management of pneumonia. The recommendations related to the use of chest x-ray include:

- Children presenting to hospital with symptoms suggesting pneumonia, who are not admitted to hospital, should not routinely undergo chest X-ray as part of their diagnosis.\textsuperscript{11,13}
- “Children with severe pneumonia, empyema and lung abscesses should be followed up after discharge until they have recovered completely and their chest x-ray has returned to near normal.”\textsuperscript{13} (p. ii2)
- “A chest x-ray is recommended for all patients presenting to the emergency department with symptoms of community-acquired pneumonia to confirm the diagnosis.”\textsuperscript{12} (p. 53)
- Regarding post-discharge follow-up: “Visit primary care provider or appropriate specialist within 1 week of discharge (recommend against chest x-ray examination at this time; If symptoms persist or there are other risk factors (e.g., smoking, chronic obstructive pulmonary disease, or other comorbid conditions), consider follow-up visit with consultant physician within 6-12 weeks of discharge. Chest x-ray examination may be considered at this time.”\textsuperscript{12} (p. 59)
- “In addition to a constellation of suggestive clinical features, a demonstrable infiltrate by chest radiograph or other imaging technique, with or without supporting microbiological data, is required for the diagnosis of pneumonia.”\textsuperscript{14} (p. S28)
REFERENCES SUMMARIZED

Health Technology Assessments
No literature identified.

Systematic Reviews and Meta-analyses


Randomized Controlled Trials
No literature identified.

Non-Randomized Studies


Economic Evaluations


Guidelines and Recommendations


APPENDIX – FURTHER INFORMATION:

Clinical Practice Guidelines


See 8.1, p. 11, and 9.4, p. 19

See: Patient Education and follow-up, page 2


See: L43, page 11

See: F13, page 2

See: CH-13-Pneumonia, page 17

See: Follow-Up, page 4
Review Articles