

Ordering chest X-rays in Australian general practice

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Data from the BEACH program between 2012–14 were used to examine general practice encounters where chest X-rays were ordered. This included the most common problems associated with chest X-ray ordering and patient characteristics. Changes in ordering between 2004–05 and 2013–14 were also investigated. The rate of chest X-ray ordering between 2004–05 and 2013–14 decreased significantly. In 2012–14, chest X-rays were most often ordered in the management of acute bronchitis/bronchiolitis, cough and pneumonia. Pleurisy/pleural effusion had the highest likelihood of resulting in a chest X-ray order, followed by shortness of breath/dyspnoea and pneumonia.

Chest X-rays are the most frequently ordered imaging test in Australian general practice. They accounted for 8.3% of all imaging tests ordered by general practitioners (GPs) in 2013–14 at a rate of 0.6 orders per 100 problems managed.¹

Little guidance is available regarding the ordering of chest X-rays, despite their relatively high frequency. Published guidelines relating to chest X-rays often focus on specific uses that are not relevant to GPs (eg for patients in intensive care units,² pre-operative chest X-rays or chest trauma).³ Guidelines relating to particular medical conditions, including chronic dyspnoea and acute respiratory illnesses,³ may be of some use to GPs.

The aim of this study was to identify age and sex distributions of patients for whom chest X-rays were ordered, the most common problems for which chest X-rays were ordered and changes in the ordering rate of chest X-rays over the past decade.

Methods

This is a secondary analysis of data from the Bettering the Evaluation and Care of Health (BEACH) program. BEACH methods are described in detail elsewhere.⁴ Approximately 1000

randomly sampled, currently active, recognised GPs participate in BEACH every year. Each participant records the details of 100 encounters with consenting, unidentified patients on structured paper forms. It has been running continuously since 1998. The BEACH encounters analysed in this study were recorded between April 2012 and March 2014. Encounters were restricted to those that included a chest X-ray order. Additional analyses were performed on data collected between April 2004 and March 2014 to examine changes over time. Results were extrapolated to provide national estimates using the total number of Medicare GP consultation items claimed in the selected year. The method is detailed in the BEACH annual report.¹

Results

There were 1872 chest X-rays ordered between April 2012 and March 2014 during BEACH encounters, at a rate of 0.60 per 100 problems managed (95% confidence interval [CI] = 0.56–0.64). Of these, 56.1% were ordered for female patients and 43.9% for males. More than two-thirds of chest X-rays were ordered for patients 45 years and older (70.8%), with 38.6% ordered for patients 65 years and older. Very few were ordered for children under the age of 15 years (6.0%).

Ordering rates for chest X-rays decreased significantly over the decade from 0.72 orders per 100 problems managed in 2004–05 (95% CI = 0.67–0.78) to 0.59 in 2013–14 (95% CI = 0.53–0.64).

There were 1922 problems associated with a chest X-ray order. Acute bronchitis/bronchiolitis (10.8%) was the problem for which chest X-rays were ordered most often (Table 1). This was followed by pneumonia (6.9%), asthma (4.5%) and chronic obstructive

pulmonary disease (COPD; 4.2%). Symptoms, including cough (8.2%), chest pain (5.4%) and shortness of breath/dyspnoea (4.5%) were also common problems for which chest X-rays were ordered. Two percent of chest X-rays were ordered during general check-ups.

There was a high likelihood of chest X-rays being ordered during GP encounters at which pleurisy/pleural effusion was managed.

Table 1. Most common problems associated with an order for a chest X-ray between 2012–14

Problem managed	Percent of total problems – chest X-ray combinations (95% CI)	Percent of specified problems with a chest X-ray order† (95% CI)	Extrapolated average annual national estimate of encounters involving chest X-rays
Acute bronchitis/bronchiolitis	10.8 (9.3–12.4)	5.3 (4.3–6.1)	140,000
Cough	8.2 (7.0–9.4)	14.2 (12.2–16.3)	106,000
Pneumonia	6.9 (5.7–8.1)	26.1 (22.2–30.1)	89,000
Chest pain, NOS	5.3 (4.2–6.3)	14.9 (12.2–17.7)	68,000
Asthma	4.5 (3.5–5.6)	2.2 (1.6–2.7)	58,000
Shortness of breath/dyspnoea	4.4 (3.5–5.4)	29.7 (24.2–35.2)	57,000
Chronic obstructive pulmonary disease	4.2 (3.2–5.1)	4.4 (3.4–5.4)	54,000
Chest symptom/complaint	4.0 (3.1–4.9)	19.0 (15.2–22.8)	52,000
Heart failure	2.9 (2.1–3.7)	4.7 (3.4–6.0)	37,000
Upper respiratory tract infection	2.5 (1.7–3.4)	0.5 (0.3–0.7)	33,000
Fracture*	2.2 (1.6–2.9)	2.3 (1.6–2.9)	29,000
General check-up*	2.0 (1.3–2.8)	0.6 (0.4–0.9)	26,000
Respiratory disease, other	1.8 (1.2–2.4)	7.2 (4.9–9.5)	23,000
Pleurisy/pleural effusion	1.7 (1.1–2.3)	34.4 (24.2–44.5)	22,000
Respiratory infection, other	1.7 (1.0–2.3)	3.4 (2.2–4.7)	21,000
Subtotal	63.1	—	815,000
TOTAL	100.0	—	1,257,000

*Includes multiple ICP-2 and/or ICP-2 PLUS codes

†The percentage of total contacts with the problem that generated an order for a chest X-ray

n = 1922; CI, confidence interval; NOS, not otherwise specified; ICP-2, International Classification for Primary Care

More than one-third (34.4%) of these problems resulted in an order for a chest X-ray, whereas chest X-rays were ordered for 29.7% of all shortness of breath/dyspnoea problems. In contrast, The likelihood of a chest X-ray being ordered for acute bronchitis/bronchiolitis, in contrast, was low (5.3%).

Extrapolation of these estimates to all general practice encounters in Australia suggests there were 1,257,000 chest X-rays ordered each year between 2012–14. There were 140,000 ordered for the management of acute bronchitis/bronchiolitis and 106,000 in the management of cough. Ordering chest X-rays for pneumonia occurred at an estimated 89,000 encounters annually during that same period (*Table 1*).

Discussion

This study shows that one in 10 chest X-rays were ordered for the management of acute bronchitis/bronchiolitis, although only 5% of acute bronchitis/bronchiolitis problems resulted in a chest X-ray order. Similarly, chest X-ray orders for upper respiratory tract infections accounted for 2.5% of all chest X-ray orders, but chest X-rays were ordered for only 0.5% of upper respiratory tract infections managed. There are numerous factors to consider when ordering a chest X-ray for patients with acute respiratory illnesses. These include patient age and presence of physical signs (eg crackles or decreased breath sounds).³

Chest X-rays were ordered for one in eight cough problems. However, the *Australian cough guidelines*⁵ do not provide clear indications for ordering chest X-rays. The high likelihood of chest X-ray orders associated with dyspnoea was unsurprising as this is recommended in guidelines.^{3,6}

Guidelines such as the Royal Australian College of General Practitioners' *Guidelines for preventive activities in general practice*, 8th edition (the Red book)⁷ do not include chest X-rays in their recommendations for preventive activities. The relatively low rate of chest X-rays ordered as part of a general check-up suggests GPs are generally compliant with these guidelines.

A recent report from the BEACH program found a significant decrease in ordering of diagnostic radiology tests despite increased ordering of computed tomography (CT) scans, ultrasounds and magnetic resonance imaging (MRI).⁸ The decline in the number of chest X-rays ordered over the past decade reflects the overall decrease in diagnostic radiology ordering. However, the decrease in chest X-ray orders was not accompanied by an increase in chest CT scans (data not shown).

This paper provides an overview of chest X-ray ordering in general practice, and may provide background for other papers in this edition of *Australian Family Physician*.

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Competing interests: None.

Provenance and peer review: Commissioned, externally peer reviewed.

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Acknowledgements

We wish to thank the general practitioners who participated for their generosity. During the data collection period of this study, the BEACH program was funded by the Australian Government Department of Health, AstraZeneca Pty Ltd (Australia), Novartis Pharmaceuticals Australia Pty Ltd, bioCSL (Australia) Pty Ltd, Merck Sharp & Dohme (Australia) Pty Ltd, Pfizer Australia Pty Ltd, Sanofi-Aventis Australia Pty Ltd, GlaxoSmithKline Australia Pty Ltd, National Prescribing Service Ltd, Janssen-Cilag Pty Ltd, Abbott Australasia Pty Ltd, Roche Products Pty Ltd, Bayer Australia Ltd, Wyeth Australia Pty Ltd; and the Australian Government Department of Veterans' Affairs.

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