Chest pain in the accident and emergency department: is chest radiography worthwhile?

P. A. TEMPLETON, W. A. McCALLION, L. A. McKINNEY, H. K. WILSON

Accident and Emergency Department, The Ulster Hospital, Dundonald, Belfast

ABSTRACT SUMMARY

Four per cent of patients attend the Accident and Emergency Department (A&E) present with chest pain. In this prospective study of 297 patients the value of chest radiography is assessed. Overall, 23% of chest X-rays (CXRs) had an abnormality which influenced management of the patient, rising to 40% in those patients admitted to Coronary Care.

Twenty-nine per cent of CXRs were misinterpreted by Casualty Officers but resulted in the mismanagement of only six patients (3.3%). Potentially serious errors were averted by early CXR audit by a Radiologist.

INTRODUCTION

One of the most common symptoms in patients presenting to A&E is anterior chest pain. Junior doctors working in A&E often lack experience in dealing with these patients, yet there is an obvious need to manage them correctly. Whilst electro-cardiography is a fundamental investigation in such circumstances (McCallion *et al.*), chest radiography is often performed, but there are conflicting views as to its efficacy (Buenger, 1988; Russell *et al.* 1988). In this prospective survey the value of routine chest radiography in patients presenting to A&E with chest pain is assessed and the accuracy with which Casualty Officers interpret CXRs evaluated.

METHODS

In a prospective double blind study, 327 consecutive patients attended A&E in the Ulster Hospital, Dundonald, with chest pain during a 2-month period. Two hundred

Correspondence: L. A. McKinney FRCS, Accident and Emergency Department, The Ulster Hospital, Dundonald, Belfast BT16 ORH, Northern Ireland.

and ninety seven had chest radiography. Of the remaining 30 patients, five were transferred to other hospitals and were not followed up, and 25 patients did not have a CXR performed in A&E. The Casualty Officers (three G.P. Trainees and five Surgical S.H.Os) were asked to interpret the CXRs as 'normal' or 'abnormal' and, if 'abnormal', to state accurately the abnormality found. All CXRs were then validated by a Consultant or Registrar in Radiology who had access to the patients' clinical details. Their opinion was then compared with that of the Casualty Officer. The clinical relevance of the CXR findings was assessed by a Senior Registrar in A&E Medicine.

RESULTS

The total number of new patients attending A&E during the 2-month study period was 7738. The number of patients presenting with chest pain was 327 (4%). There were 191 males and 136 females with an average age of 53 years (SD 15.4). A total of 103/327 patients were admitted: 65 males and 38 females, with an average age of 62 years (SD 13.6). The remaining 224 patients were discharged from A&E.

Of the 297 CXRs performed, 183 were interpreted by the Casualty Officers. The remaining 114 CXRs were not commented upon in A&E. In this group, 98 patients admitted to the Cardiac Unit had CXRs taken en route or immediately after admission to the ward to minimize the length of stay in A&E, and 16 patients were discharged from A&E without the Casualty Officer commenting on the CXR.

Of the 297 CXRs validated, 166 (56%) were normal and 131 (44%) abnormal. The number of abnormalities and their clinical significance are shown in Table 1. In 131 abnormal CXRs there were 72 anomalies found in 68 X-rays which contributed to the patient's diagnosis or treatment. Of patients admitted to the Cardiac Unit, 39/98 (40%) had a clinically relevant CXR abnormality.

Casualty Officers correctly interpreted 130/183 (71%) CXRs: 97/108 (90%) of normal CXRs and 35/75 (47%) of abnormal CXRs were correctly read. Errors made by Casualty Officers and their clinical significance are shown in Tables 1 and 2. There were 20 clinically relevant errors in CXR interpretation resulting in the mismanagement of six patients (3.3%): four major false negative and two minor false positive errors. Of the false negative errors, one patient diagnosed as having 'pleurisy' and discharged from A&E, had radiological evidence of right lower lobe collapse and would have warranted further investigation; one patient with radiological evidence of pulmonary oedema was discharged but recalled on the basis of ECG and CXR abnormalities; and two patients with pneumothoraces were misdiagnosed and discharged but recalled following CXR validation. Two CXRs were overdiagnosed as showing acute inflammatory changes where none existed and both patients were treated inappropriately with antibiotics.

DISCUSSION

Chest pain is common, accounting for 4% of A&E attenders in this study. Chest

Table 1 CXR abnormalities and their clinical significance.

CXR abnormality	Number of CXRs with abnormality	Number of CXRs in which abnormality missed	Number of CXRs in which abnormality was relevant	Clinically relevant false negative errors
Chronic inflammation	48	17	1	0
Pulmonary vascular congestion	27	2	21	2
Cardiomegaly	26	4	14	3
Emphysema	14	4	2	1
Acute inflammation	9	2	8	2
Diaphragmatic anomaly (including hiatus hernia)	8	4	4	4
Pulmonary oedema	7	1	7	1
Previous cardiothoracic surgery	7	1	1	0
Atelectasis	6	4	3	3
Pneumothorax	5	2	5	2
Pleural effusion	5	0	5	0
Old TB	3	0	0	0
Breast anomalies	2	0	0	0
Old rib fracture	2	0	0	0
O.A. thoracic spine	2	1	0	0
Old G.S.W.	1	1	0	0
Mitral calcification	1	0	1	0
Pleural calcification/thickening	3	1	0	0
Pulmonary fibrosis	1	1	0	0
Totals	177	46	72	18

Table 2 False positive errors made in CXR interpretation and their significance.

CXR 'abnormality' misdiagnosed by Casualty Officer	Number of CXRs with this false positive error	False positive errors resulting in mismanagement
Acute inflammation	6	2
Chronic inflammation	5	0
Pulmonary vascular congestion	3	0
Atelectasis	1	0
Cardiomegally	1	0
Total	16	2

radiography is often used routinely to evaluate these patients. To minimize mismanagement of patients and misuse of resources, it is important that investigations are appropriate and correctly interpreted. In one series of 5000 patients with chest symptoms, 35% had radiological evidence of 'serious disease' (Buenger, 1988), but in a smaller series only 14% of patients with chest pain had a clinically relevant CXR abnormality (Russell *et al.*, 1988). In this study 131/297 (44%) CXRs were abnormal. Of these, 68 contained a clinically relevant abnormality which influenced management of the patient, i.e. a clinically relevant pick-up rate of 23%. This figure rose to 40% in those patients admitted to the Cardiac Unit.

If patient mismanagement is to be minimized, it is essential that Casualty Officers interpret CXRs accurately. Overall, 71% of CXRs were correctly interpreted, whereas only 47% of abnormal CXRs were correctly read. However, many of these errors were in relation to subtle and insignificant radiographic findings such as 'chronic inflammatory changes'. Twenty-eight per cent (20/72) of all clinically relevant CXR abnormalities were missed, but resulted in the mismanagement of only six patients. However, due to regular audit of A&E CXRs within 24 h, and due to the fact that a Consultant Radiologist was available during normal working hours if a second opinion was requested, all major false negative mismanagement errors were corrected.

CONCLUSION

In A&E 96.7% of patients presenting with chest pain are managed correctly. A CXR is a useful investigation, particularly if a cardiac cause is suspected. Audit of all A&E CXRs by a Radiologist within 24 hours, and continuing education of Casualty Officers in CXR interpretation, will further reduce patient mismanagement.

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