of the most disturbing times for many parents was after discharge, when they were again faced with repeated coughing and vomiting after the relief afforded by the child's admission to hospital.

Parents had little prior knowledge of whooping cough, and 81% found it more serious than they had imagined. Television programmes about the disease had given little idea of its potential severity. Almost all mothers had been worried that their child might die, though later the major fear was the possibility of permanent chest trouble. These worries need to be explored with parents during the child's admission, and one function of follow up should be to reassure parents about the likely outcome. Parental opinion about vaccination underlines both the power and the weakness of the media.²⁰ Almost all knew about the "brain damage scare," yet only one was able to give a reasonably accurate estimate of the incidence of brain damage.

Finally, the experiences of parents in contact with health services ranged from very satisfactory to execrable. Problems arose both in general practice and in hospitals from doctors' ignorance about the illness; their comments, such as "too young to have whooping cough"; their unwillingness to accept the mother's account of the child's illness or consider the diagnosis; and sometimes their apparent ignorance of the availability of medical skill. Whooping cough may certainly be difficult to diagnose. The child often appears deceptively well between spasms, but in this study mothers' clearcut histories were often disregarded. Two thirds of mothers had been sure that their child had whooping cough, often despite medical denials, and there was often great relief when the diagnosis was finally confirmed, a reaction noted previously in the context of other childhood illnesses.^{21 22}

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For Debate . . .

Should all casualty radiographs be reviewed?

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Abstract

The effect on the management of patients of routine reporting of casualty radiographs by radiologists was reviewed. The overall prevalence of error by casualty doctors was 6.2%. Many of these errors, however, were trivial and did not alter treatment. In only 1.1% of the cases reviewed did the report of x ray films appreciably alter the management of the patient. A severity score was introduced to highlight those anatomical areas in which important lesions were overlooked most often. Radiologists'

reports on radiographs of the chest, face, skull, and wrist had the greatest effect on management of patients, while reports on radiographs of fingers, hands, shoulders, long bones, and toes seldom altered treatment.

Introduction

Casualty officers interpret casualty radiographs reasonably accurately.^{1,2} Some errors have little influence on the management of patients as the treatment is based on clinical assessment. Other errors, however, may have serious consequences, and it has been recommended that all casualty radiographs be reported by a radiologist.¹ The increasing workload presented to the accident department imposes a large burden on the radiologist, who may have to report many radiographs to identify one important error.

We undertook a survey to identify which errors had the greatest effect on management of patients and to ascertain whether any anatomical areas could be excluded from routine reporting.

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Methods

The accident department at this hospital deals with over 65 000 new patients a year. A radiologist of consultant or senior registrar status attended the accident department daily to report the radiographs of patients managed within the department during the preceding 24 hours. The radiologist had access to the clinical notes at the time of reporting. Patients admitted or referred to other departments were not included in this scheme. When the radiologist disagreed with the casualty officer's report the case was discussed with one of the senior members of the staff in the department and a decision made on the need for further action. For the past year all such cases of

officer's report was false negative in 832 cases (5.0%) and false positive in 199 (1.2%). In only 190 cases (1.1%) did the radiologist's report alter the management of the patient (that is, an important error had been made).

The table lists the details of the important errors and the severity score given to each one. Some categories had more than one value for each error. This arose because the management of each case depended on factors other than the radiograph—for example, 10 patients with lobar collapse were missed by the casualty officers. Six of these were recalled and given treatment as outpatients (severity score of three); in three cases the general practitioner was asked to follow up the patient (score of two); and one patient was admitted for inpatient treatment (score of four).

Details of important errors (those that altered management) and severity scores

Area of body	No of radiographs	Total No of errors	Important errors	No of important errors	Severity score per error*	Total severity score for area of body
Chest	2056	148	Lobar collapse Pneumothorax Mass lesion Fractured ribs Other	10 4 8 5 5	3(6), 2(3), 4(1) 3(3), 4(1) 3 2 2	85
Wrist	1276	126	No bony injury (plaster of Paris removed) Undisplaced greenstick fracture Fractured scaphoid Colles' fracture Avulsion fractures Other	16 10 11 2 2 3	0.5 3(7), 1(3) 3 3 2 2	81
Face	1345	70	Zygoma fracture Blow out of orbit Conjunctival foreign body Foreign body wound	8 7 2 1	3(6), 2(2) 3 3 3	52
Skull	1359	35	Linear fractures Depressed fracture Pineal shift Other	8 2 1 3	4(4), 2(4) 5 3 2	43
Abdomen	994	36	Small bowel obstruction ? subacute obstruction Renal stones Gall stones Other	3 2 5 2 2	4(2), 1(1) 2 2 2 2	31
Foot	852	83	Navicular fracture Calcaneal fracture Stress fracture Other	5 5 2 3	1 3 1 2	30
Knee	667	36	Fibular head fracture Tibial plateau fracture Tibial spine fracture Osteochondritis dissecans Greenstick femur	3 2 1 3 1	3 3 3 3 3	30
Spine	592	56	Fracture (C7) Wedge fracture Spondylolisthesis Malalignment (C5)	1 4 2 1	5 2 2 3	20
Elbow	695	62	Fractured radial head Supracondylar fracture Other	7 1 2	1(4), 3(3) 3 2	20
Ankle	1595	85	Lateral malleolus fracture Posterior malleolus fracture No bony injury	4 3 4	2 3 0.5	19
Hip	202	11	Fractured neck of femur Effusion Fractured greater trochanter	3 2 1	4 3 1	19
Pelvis	71	16	Fractured pubic ramus Fractured sacrum	3 1	3 1	10
Shoulder	795	34	Fractured neck of humerus Fractured glenoid	1 1	3 3	6
Hand	1002	65	Fractured metacarpal Enchondroma	1 1	3 2	5
Fingers	1661	90	Fractured proximal phalanx No bony injury	1 2	3 0.5	4
Toes	588	58	None			
Long bones	965	22	None			

*Figures in parentheses are numbers of errors with that severity score.

disagreement were recorded. The records were reviewed in those cases in which further action was necessary and the effect of the report of the x ray film on the patient's management assessed.

A severity score was assigned to each case in which there was disagreement. This score was based on decisions on management made by the senior member of the accident unit staff at the time the error was brought to their attention. Thus if no action was taken a score of 0 was given; if the current treatment was unnecessary and stopped (false positive), 0.5; if symptomatic treatment might be needed, 1; if treatment by a general practitioner was needed, 2; if outpatient treatment or follow up was needed, 3; if inpatient treatment or follow up was needed, as in a case of failure to notice a fractured neck of femur, 4; and for errors that were potentially life threatening, 5.

Results

A total of 16 713 x ray films were reviewed. In 1031 cases (6.2%) the reports of the radiologist and the casualty officer disagreed; the casualty

The highest number of important errors was made in interpreting radiographs of the chest, wrist, face, skull, and abdomen. In the chest lobar collapse, especially of the right upper and left lower lobes, was the abnormality most often missed. Fracture in the region of the inferior orbital margin proved the most difficult problem in the face. As in other studies casualty officers missed a small but appreciable number of fractures of the skull.^{1,4}

Most of the important errors were made by the senior house officers or doctors doing occasional sessional work. The consultants, registrars, and general practitioner clinical assistants seldom made important errors. The senior house officers, however, saw most of the new patients in our department.

No effort was made to audit the accuracy of the radiologist. A few cases in which important fractures were missed by both the radiologist and the casualty officer were discovered when the patient returned because of persistent symptoms. The radiologist's report on radiographs of toes, fingers, hands (excluding wrists), and shoulders had little effect on the care of patients in our department during the year of the survey.

Discussion

Out of hours radiographic reporting by junior radiologists in their first, second, and third years of training was examined by Seltzer *et al.*⁵ In their study 6.3% of the junior radiologists' reports were altered by their senior colleagues. Two thirds of the alterations were clinically important. De Lacey *et al.* compared the reporting of radiographs by casualty officers with that by consultant radiologists: 83% of the reports by casualty officers were correct and 7% incorrect, and they were unsure of the diagnosis in 10%. There was a 4% error in the reports by consultant radiologists.¹

Carew-McColl reported an overall error of 3.9% and a prevalence of false negative reports of 4.4% in the reporting of x ray films by casualty officers.³ These figures compare with an overall error of 6.2% in our study.

The number of serious injuries missed by the casualty officers was small but important. By using the severity score we highlighted those areas in which important radiological abnormality was misinterpreted—that is, areas where the score totalled 10 or more (table).

Radiographs of fingers, hands, toes, shoulders, and long bones in which the severity scores totalled less than 10 were obtained in about 30% of the total number of examinations (5000 patients). Only four patients in this category had their management altered as a result of the radiologist's report: two women, one with a fracture of the surgical neck of the humerus and one with a fracture of the glenoid, were recalled, given a broad arm sling, and kept under review in the fracture clinic. One patient with a fracture of the proximal phalanx was recalled and had the fracture fixed internally, and one patient with a fracture of the second metacarpal was recalled and had the hand immobilised in plaster of Paris.

The answer to our question "Should all casualty radiographs be reviewed?" is yes, but only if the review is carried out by experienced radiologists as the prevalence of errors made by junior radiologists is probably similar to that of errors made by casualty officers.⁵

The yield of important errors in some areas was very low—for example, 1000 radiographs of the hand were reviewed but only one case was found in which management was changed. In no case did the radiologist's report of radiographs of the toes alter a patient's treatment.

Radiologists may also miss important errors. In the study by

De Lacey *et al.*¹ 4% of the reports of consultant radiologists were in error and 1% equivocal; about half these errors were clinically important. We did not attempt to audit the radiologists' reports, but we know that a few important errors were made by the radiologists. It could be argued that the reporting on large numbers of radiographs from fairly unimportant areas might increase the likelihood of a more serious abnormality being overlooked.

The cost of reporting casualty radiographs in this department is small in relation to the total expenditure on casualty radiology. Six half sessions a week were performed by a consultant or senior registrar in radiology at a current cost of roughly £4500 a year.

We are not in a position to comment on the medicolegal aspects of the errors found. It is unlikely that litigation would follow if the patient was treated adequately despite an incorrect radiological diagnosis. The same might not apply, however, if the incorrect radiographic diagnosis resulted in inadequate or inappropriate treatment.

This study highlights certain lesions that are missed repeatedly by casualty officers, notably collapse of the left lower and right upper lobes, fractured mala and blow out fracture of the orbit, fractured scaphoid, and fractures of the navicula and calcaneum. Casualty officers should be taught how to interpret radiographs early in their attachment to an accident and emergency department. Each department should keep a library of the commonly missed lesions to highlight the difficulties in diagnosis in those areas.

We thank Mr D H Wilson and Mr M Flowers for permission to report on their patients and the registrars, senior registrars, and consultants in the departments of accident and emergency and diagnostic radiology for their help in recording the errors in interpretation of the radiographs.

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For how long is it safe to administer loperamide for diarrhoea?

Diarrhoea is a symptom and not a disease and it should not be treated without a diagnosis. Functional diarrhoea is common^{1,2} but should be diagnosed only after careful consideration of organic causes. Some patients with chronic diarrhoea cannot be cured—for example, those who have had a large amount of intestine resected. Sometimes dietary advice is helpful. Nevertheless, when antidiarrhoeal drugs are necessary loperamide is often a good choice. It is more effective than diphenoxylate and less prone to cause side effects than codeine. Tolerance does not develop, nor does physical dependence occur. Thus there seems to be no contraindication to taking loperamide indefinitely. There must be one caveat. The drug has been in use for only 14 years.—K W HEATON, reader in medicine, Bristol.

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What are the cardiovascular hazards of pipe and cigar smoking?

In many epidemiological studies the risks of mortality from various cardiovascular diseases in pipe and cigar smokers have been calculated to be slightly but not significantly greater than those in non-smokers. One study reports a risk for pipe smokers below that of non-smokers.¹ The only major prospective British study has, at each subsequent update, shown risks for pipe and cigar smokers close to those for non-smokers (relative risk ranging

from 0.99 to 1.03).² The 1983 United States Surgeon General's Report concluded, "Smokers who have used only pipes or cigars do not appear to experience substantially greater coronary heart disease risks than non-smokers."³ The Royal College of Physicians in its 1983 report, quoting from the results of a published study, concluded with regard to pipe and cigar smokers, "Their position on the continuum of risk is not entirely clear. Risk is definitely below that of men who smoke a pack or more of cigarettes a day."⁴ In relation to specific sites, Auerbach and Garfinkel reported a higher incidence of atherosclerotic lesions of the aorta in pipe and cigar smokers than in non-smokers.⁵ According to Feinleib and Williams, the risk of peripheral vascular disease is not raised in pipe or cigar smokers, although it is so in cigarette smokers.⁶ Finally, it has been suggested that the tendency for pipe and cigar smokers not to inhale smoke into the lungs may protect them from cardiovascular risk.^{1,3} If so cigarette smokers who switch to pipes or cigars but continue to inhale may not avoid the risk.—FRANCIS J C ROE, independent consultant in toxicology and cancer research, London.

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