Computer-unaided diagnosis of acute abdominal pain in an accident and emergency department

A. K. MAITRA, P. J. BRIGGS & D. McGEEHAN*

Accident and Emergency Department, Royal Victoria Infirmary, Newcastle-upon-Tyne, England

SUMMARY

The initial accident and emergency and final in-patient diagnoses of 200 patients with acute abdominal pain made without computer aid or structured data sheet were compared. Sixty-five per cent were correctly diagnosed and 5% had normal laparotomies. These results compare favourably with those obtained using computer aid and structured history-taking forms. It is suggested that the spotlight should be on the training and experience of doctors making the initial diagnosis rather than on computer aid.

INTRODUCTION

In recent years, computer-aided diagnosis of acute abdominal pain has been shown to be effective in increasing the diagnostic accuracy of junior clinicians and improving clinical practice (Adams *et al.*, 1986; Lawrence *et al.*, 1987; De Dombal, 1984). Nevertheless, in practice, most accident and emergency (A & E) departments in the UK do not use the available diagnostic software in spite of the implementation of a gradually increasing number of on-line computerized patient record systems (for example, CAER). A major factor in improving performance with a computer is the discipline of structured data collection (De Dombal, 1984; Gunn, 1976).

The present study aimed to reassess the 'computer unaided' performance of hospital doctors at the A & E department of a large urban teaching hospital in the diagnosis of acute abdominal pain.

Correspondence: Mr A. K. Maitra, Accident and Emergency Department, Royal Victoria Infirmary, Queen Victoria Road, Newcastle-upon-Tyne NE1 4LP, England

**Present address: Hull Royal Infirmary, Hull, England.*

METHODS

The A & E and in-patient records of all patients with acute abdominal pain of less than 7 days duration, who attended the A & E Department from (1) 1 January to 14 February 1984 and (2) 1 December to 14 January 1987, were studied and the initial and final diagnosis recorded. Some of these patients were referred by general practitioners; others attended without seeing their doctors. A total period of 12 weeks, divided into separate periods of 6 weeks each, was chosen to secure a large total sample (thereby reducing possible errors) and to compare performances between the two periods.

The initial diagnosis at the A & E Department was made by nine A & E doctors and six doctors from another specialty. All doctors were of senior house officer or registrar status with at least 6–12 months experience.

The final diagnosis was made by laparotomy, histology, diagnostic investigations, observation, follow up and by a process of exclusion. Each initial diagnosis was compared with the corresponding final diagnosis and the results recorded accordingly. The patients with abdominal pain not admitted for in-patient care were excluded because of the uncertainty of final diagnosis.

RESULTS

Table I compares the number and percentage of correct and incorrect diagnoses. One hundred and thirty (65%) patients were correctly diagnosed out of a total of 200. There was a slight difference between Group A (67.8%) and Group B (62.8%), but this is not statistically significant. Table 2 gives a detailed breakdown of the correct and incorrect diagnoses in different diagnostic categories presenting with acute abdominal pain. The highest rates of incorrect diagnosis occurred in peptic-ulcer-related conditions (53.3%) followed by gynaecological lesions (48.3%) and appendicitis (42.3%). Urological problems (78.5%), intestinal obstruction (76.9%), pancreato-biliary disease (76.2%) and pelvic colonic diverticulitis and non-obstructive gastro-intestinal conditions (71.4%) were more frequently diagnosed correctly. Seventy-seven out of 200 (38.5%) patients underwent laparotomy (see Table 3). In 18 out of 77 (23.3%) operations, the diagnosis was incorrect but in only 10 (12.9%) was no pathology demonstrated. Therefore, out of a total of 200 patients only 5% were operated upon unnecessarily.

Table 1 Distribution of correct and incorrect diagnosis

Number of patients			Number of correct diagnoses (%)			Number of incorrect diagnoses (%)		
Group A	Group B	Total	Group A	Group B	Total	Group A	Group B	Total
87	113	200	59 (67.8)	71 (62.8)	130 (65)	28 (32.2)	42 (37.2)	70 (35)

Table 2 Details of diagnostic accuracy of 200 patients in various categories of diagnosis

Diagnostic categories	No. of patients			No. and percentage of patients with correct diagnosis			No. and percentage of patients with incorrect diagnosis		
	Group A	Group B	Total	Group A	Group B	Total	Group A	Group B	Total
Appendicitis	30	15	45	16 53.6%	10 66.6%	27 57.7%	14 46.4%	5 33.4%	19 42.3%
Non-specific abdominal pain (NSAP)	16	13	29	12 75%	8 61.5%	20 68.9%	4 25%	5 38.5%	9 31.1%
Peptic perforation	1	14	15	1 100%	6 42.8%	7 46.7%	0	8 57.1%	8 53.3%
acute peptic ulcer with or without bleeding									
Pancreatitis, cholecystitis, biliary colic	10	11	21	9 90%	7 63.6%	16 76.2%	1 10%	4 36.4%	5 23.8%
Intestinal obstruction	13	13	26	11 84.6%	9 69.2%	20 76.9%	2 15.4%	4 30.8%	6 23.1%
Pelvic diverticular disease	3	4	7	1 33.6%	4 100%	5 71.4%	2 66.7%	0	2 28.6%
Non-obstructive gastro-intestinal disease	3	11	14	2 66.7%	8 72.7%	10 71.4%	1 33.3%	3 21.3%	4 28.6%
Gynaecological	7	22	29	4 57.1%	11 50%	15 51.7%	3 42.9%	11 50%	14 48.3%
Urological	4	10	14	3 75%	8 80%	11 78.5%	1 25%	2 20%	3 21.5%

Table 3 Number and distribution of 77 operations in 200 patients

Number of operations			Number of 'inappropriate' operations			*Remarks
Group A	Group B	Total	Group A	Group B	Total	
40	37	77	10 (25%)	8 (21.6%)	18 (23.3%)	10 (12.9%) laparotomies showed no abnormalities

* 'Inappropriate' means that operative findings were either different or normal.

DISCUSSION

One of the advantages of a retrospective study is that it is likely to record the true state of clinical practice without the risk of any possible influence of the protocol of a prospective study. The present study of a relatively small number of patients in one hospital demonstrates that clinical proficiency as measured by the rate of diagnostic accuracy for acute abdominal pain can be comparable to those obtained with computer aid. The overall diagnostic accuracy of 65% compares favourably with 69% achieved with a structured history sheet (Lawrence *et al.*, 1987) and 65.3% with computer aid (Adams *et al.*, 1986). There are some differences between the two periods of the present study and between different categories of diagnosis. Nevertheless, the improved overall performance is reflected in the small number of negative laparotomies (10.5%) and negligible (2.1%) number of 'bad diagnostic errors' (defined as where the initial diagnosis suggested non-surgical condition or following no diagnosis an urgent operation is undertaken [Adams *et al.*, 1986]).

The importance of correct diagnosis of acute abdominal pain in the A & E Department cannot be overstated because this condition forms 10% of all new attendances (Gunn, 1976). Under diagnosis may lead to preventable mortality and morbidity, for example, reluctance to diagnose appendicitis in the aged (Shepherd, 1975).

Diagnostic performance does not rest on 'computer assistance' but with the doctors themselves. The authors suggest that the spotlight should be directed to the training and experience of doctors responsible for making the initial diagnosis of acute abdominal pain, irrespective of the presence or absence of diagnostic computer software in the A & E department.

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