

Electrocardiograph interpretation by junior doctors

W. G. MORRISON & I. J. SWANN

Department of Accident and Emergency Medicine, Glasgow Royal Infirmary, Glasgow, Scotland

SUMMARY

The object of this study was to assess the ability of junior doctors in the accident and emergency department to detect electrocardiographic (ECG) abnormalities. The ECG's performed in this department were monitored over a 4 week period. The initial diagnosis by the accident and emergency doctor was compared with the report from the cardiologist on 126 ECG's which showed abnormalities. The error rate was 19.8%. Of those abnormalities which were graded as clinically significant only 2 (4.4%) were missed. The danger of missing acute changes is emphasized and proposals discussed which may reduce their frequency.

INTRODUCTION

In the United Kingdom, electrocardiography (ECG) has become one of the most frequently performed investigations in the accident and emergency (A&E) department. The initial assessment of these ECG's is made by the accident and emergency senior house officer (SHO) whose experience in ECG interpretation may be very limited. There have been several reported studies investigating the ability of A&E staff in making radiographic diagnoses (Carew-McColl, 1983; Vincent *et al.*, 1988), but only one published ECG audit (Redmond, 1981).

This study was undertaken to discover how efficient the accident and emergency SHO's are in ECG interpretation, whether significant abnormalities are being missed and if so the extent of the problem.

METHODS

The A&E Department at Glasgow Royal Infirmary has over 76,000 new attendances annually, and junior staffing includes 12 SHO's. All ECG's performed in this department are sent to the Department of Cardiology where they are reported by a registrar. These are returned, to the A&E Department, with a typewritten report approximately 1 week later.

A record was kept of all ECG's performed in the A&E department over a 4 week period. When an ECG was reported as anything other than 'within normal limits', the official report was compared with the SHO's initial report which had been noted in the A&E record card. The abnormal ECG's were further divided into those which were clinically significant or not. An abnormality was regarded as clinically significant if its recognition would have led to the referral of that patient to the coronary care registrar or the medical registrar.

RESULTS

In the 4 week period of the study, a total of 558 patients had ECG's recorded. Of these, 136 had been referred direct to the on call medical registrar by the patient's general practitioner and these were excluded from the study. Of the remaining 422, which represented 6.2% of all new accident and emergency attendances, 126 had ECG abnormalities, and of these, 25 were missed by the junior A&E staff. Of the 126 abnormal traces, 45 were placed in the clinically significant category. Only 2 of these were missed. One was a recent septal infarct in a patient who gave a history of chest pain the day before he was seen in the department. The second was reported as showing 'inferior T wave inversion, consistent with ischaemia or non Q wave infarction', in a patient who had presented due to a collapse at home. Both were referred to the medical registrar on the basis of the history and examination, the first patient being admitted and the second discharged home. Follow up revealed that both recovered from the acute episode.

The results are summarized in Table 1.

Table 1 Accuracy of detection of ECG abnormalities

	Total	Missed	Error as percentage of abnormal	Error as percentage of total
Abnormal ECG's	126	25	19.8	5.9
Clinically significant abnormal ECG's	45	2	4.4	0.5

DISCUSSION

The results show that 19.8% of all abnormal ECG's are missed by accident and emergency SHO's. This compares closely with the figure of 18.5% found by Redmond. However, when clinically significant abnormalities are considered, this study showed an error rate of 0.5% of the total number of ECG's compared with the 3.4% in Redmond's audit. Junior staff would appear to be better at recognizing significant abnormalities and this may in part reflect the way that ECG interpretation is taught.

The accident and emergency SHO bears a heavy responsibility as onward referral depends on the junior doctor recognizing an abnormality in the first place. A structured system for examining the ECG, such as that described by Schamroth (1982) is to be recommended. A standardized pro forma on the ECG request form or an ink stamp to go on the patient's card when an ECG is performed may help remind staff to go through a set routine and to pay attention to particular areas of the trace.

Junior staff must be encouraged to use the electrocardiograph not in isolation but in association with a full history and examination. The importance of using all the evidence available cannot be overemphasized. There should be a low threshold for onward referral and a second opinion should be readily available. A computer link to the coronary care unit is available in some hospitals which provides an immediate ECG diagnosis by specialist staff. Mention should be made of the new generation of ECG recorders which have a built in computerized diagnostic facility (McFarlane & Lawrie, 1989). These should be regarded as providing assistance in interpretation, rather than as a substitute for the attending doctor.

Finally, attention must be focused on how the teaching of ECG interpretation could be improved within the A&E department. Proposals put forward for improving X-ray interpretation (Vincent *et al.*, 1988) are equally applicable to ECG interpretation. The importance of feedback on performance is emphasized.

Half the deaths that occur from a 'heart attack' do so within 2 h of the onset of symptoms (Hampton, 1985). The accident and emergency SHO may be the only medical contact that a patient has within this critical period. We suggest that improved education, adequate supervision and ready access to a specialist opinion may assist in reducing mortality. Computer aided diagnostics may provide a valuable back up service.

REFERENCES

- Carew-McColl M. (1983) Radiological interpretation in an Accident and Emergency department. *British Journal of Clinical Practice* 37, 375-7.
- Hampton J. (1985) Prognosis in Ischaemic Heart Disease. *Medicine International* 20, 832-7.
- McFarlane P. W., Lawrie T. D. V. (1989) *Comprehensive Electrocardiography. Theory and Practice in Health and Disease*. Pergamon, London.
- Redmond A. D. (1981) Electrocardiography Audit in the Accident and Emergency Department. *Accident and Emergency News* Feb/Mar.
- Schamroth L. (1982) *An Introduction to electrocardiography*. 6th Edn. Blackwell, London.
- Vincent C., Driscoll P., Audley R., Grant D. (1988) Accuracy of detection of radiographic abnormalities by junior doctors. *Archives of Emergency Medicine* 5, 101-9.