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Audit on myocardial infarction in a district general hospital: Is there room for improvement in diagnostic accuracy?

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Abstract

The proportion of patients with an acute myocardial infarction (MI) whose diagnosis was missed on admission was assessed. The admitting consultants were then tested to see if they could diagnose the patients correctly when they were shown the admission histories and electrocardiograms (ECGs). Twenty-six per cent of patients with a final diagnosis of MI were not correctly diagnosed on admission. Fifty-one per cent of all patients did not receive thrombolytic therapy (TT) mainly because the diagnosis was not made on admission. A smaller proportion of these patients were admitted to the coronary care unit (CCU). The consultants only correctly diagnosed an average of 7.3 of the 20 patients who were misdiagnosed on admission and would have prescribed TT to an average of 4.3 of these 20 patients. A significant proportion of patients had a diagnosis of MI missed on admission and therefore did not receive TT. Therefore, another aid to diagnosis such as serum creatinine phosphokinase (CPK) measurement should be available as an emergency test.

Keywords

audit, infarction, district, general, hospital, there, room, improvement, diagnostic, accuracy, myocardial

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Audit on myocardial infarction in a district general hospital: is there room for improvement in diagnostic accuracy?

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Keywords: audit; myocardial infarction; diagnostic accuracy

Summary

The proportion of patients with an acute myocardial infarction (MI) whose diagnosis was missed on admission was assessed. The admitting consultants were then tested to see if they could diagnose the patients correctly when they were shown the admission histories and electrocardiograms (ECGs).

Twenty-six per cent of patients with a final diagnosis of MI were not correctly diagnosed on admission. Fifty-one per cent of all patients did not receive thrombolytic therapy (TT) mainly because the diagnosis was not made on admission. A smaller proportion of these patients were admitted to the coronary care unit (CCU).

The consultants only correctly diagnosed an average of 7.3 of the 20 patients who were mis-diagnosed on admission and would have prescribed TT to an average of 4.3 of these 20 patients.

A significant proportion of patients had a diagnosis of MI missed on admission and therefore did not receive TT. Therefore, another aid to diagnosis such as serum creatinine phosphokinase (CPK) measurement should be available as an emergency test.

Introduction

Thrombolytic therapy is an accepted treatment for acute MI^{1,2}. It limits the size of the infarction if coronary arteries are re-canalized before full thickness infarction occurs^{3,4} and reduces mortality if given within 24 h after the onset of symptoms. ECG changes are the quickest and most reliable method of diagnosing acute MI with over 80% of patients already having an abnormal ECG on presentation^{5,6}. By contrast, biochemical markers of infarction take longer to manifest. The MB isoenzyme of creatinine phosphokinase (CPK) starts to rise 4 to 8 h post infarction⁷. Other biochemical assays are now available notably a rapid latex agglutination assay for cardiac myoglobin which is elevated within 90 min of an acute MI⁸.

The diagnosis of acute MI remains difficult with only 64% to 73% of patients correctly diagnosed on admission⁹⁻¹¹. To prescribe TT, the diagnosis of acute MI must be made with certainty within 24 h of onset of symptoms. Substantial evidence supports the efficacy of a dedicated ward with cardiac monitoring and resuscitative capabilities in lowering mortality especially in the first 6 to 12 h¹²⁻¹⁵. We examined the proportion of patients whose diagnosis was not made on admission and how this affected their subsequent management. We then set out to see

whether consultant physicians would have done any better.

Methods

Data was collected from all patients who were discharged or died at Mount Vernon Hospital between 1 August 1991 and 31 January 1992 with a diagnosis of acute MI. Information from the notes was entered into a form for each patient which included basic information on age, sex, ward and duration of stay. We also recorded whether the diagnosis was made on admission and the comments made by the admitting junior physician on presenting histories and ECGs. The use of TT was also documented.

We then selected all the patients whose diagnosis was missed on admission and selected randomly: five patients who were correctly diagnosed and received TT; five patients who were correctly diagnosed but did not receive TT; and five patients discharged during our audit period with a diagnosis of angina. The admission histories were typed out word for word so that individual hand writing could not be recognized. These were shown to the three consultants responsible for all the acute medical admissions together with the corresponding admission ECGs (with the patient's name deleted). The consultants were asked to comment on the ECGs, to make a diagnosis and whether they would have prescribed TT. They were told that some of these patients had a final diagnosis of acute MI and some had other diagnoses. They were not told how the patients were selected.

Chi-square test was used to test for statistical significance.

Results

Eighty-two of 1035 (7.9%) medical admissions during the study period had a final diagnosis of acute MI. All but five case notes and admission ECGs were traced. The average age was 68.2 years with 59% being male. The mortality rate was 9/77 (11.7%).

Twenty of 77 (26%) with a final diagnosis of acute MI did not have the diagnosis made on admission. The main reason for this was non-diagnostic ECGs (55%) and non-diagnostic ECGs in combination with non-diagnostic histories (40%). No patient with the diagnosis missed was thought to have a normal ECG by the admitting clinician.

Thirty-eight of 57 (67%) patients with the admission diagnosis of acute MI received TT. None of the patients with the diagnosis missed received TT. Overall, 39/77 (51%) did not receive TT, the reason being: diagnosis not made on admission (51%); contra-indications (28%); and history longer than 24 h (10.3%). The reason was not recorded in

Table 1. Performance of consultants. Vertical columns represent admission diagnoses and horizontal rows represent diagnoses made by the consultants. Number in brackets represent number of patients for whom the consultant would have prescribed thrombolytic therapy (TT)

		Admission diagnosis			
		MI not made	MI made but not given TT	MI made and given TT	Angina
Diagnosis by consultant (A)	MI	10 (4)	5 (1)	5 (5)	2 (1)
	Angina	3	0	0	1
	*Others	7	0	0	2
Diagnosis by consultant (B)	MI	3 (3)	5 (3)	4 (4)	1 (1)
	Angina	8	0	0	2
	*Others	9	0	1	2
Diagnosis by consultant (C)	MI	9 (6)	5 (3)	5 (3)	3 (1)
	Angina	6	0	0	1
	*Others	5	0	0	1

*Other diagnoses include aortic aneurysm, pleurisy, vaso vagal attack, left ventricular failure, paroxysmal arrhythmia, musculo-skeletal pain, oesophagitis, non-specific pain, pericarditis, vertebral collapse, pneumonia, syncope, tender sternum, pulmonary embolus and atrial fibrillation

MI=Myocardial infarction

three patients and one patient died before TT could be started.

Fifty-four of 57 (95%) who were correctly diagnosed on admission went to CCU compared with 14/20 (70%) whose diagnosis was missed ($P < 0.01$). The overall duration of stay of those who survived was longer although not significant (9.1 versus 7.9 days) if the diagnosis was missed on admission.

The performance of the three consultants are summarized in Table 1. An average of 12.7/20 patients with the diagnosis missed were also mis-diagnosed by the consultants. They would have prescribed TT to an average of 4.3 of these 20 patients. However, they also misdiagnosed 40% of patients with angina and no eventual evidence of acute MI as having an MI and to half of these they would have prescribed TT.

Discussion

Our results show that 74% of patients had the diagnosis of acute MI correctly made on admission. This compares well with 73.3%¹⁰ and 67%¹¹ in two other studies. In the second study, this was increased from 67% to 77% when a computer derived protocol was used to aid diagnosis.

In the 20 patients where the diagnosis was initially missed, none were thought to have a normal ECG on admission by the admitting clinicians who were normally of registrar status. The most common reason for not making the diagnosis of acute MI in our study was non-diagnostic ECG (55%) suggesting that the admitting clinicians depend heavily on classical changes on the ECG to aid diagnosis.

The overall prescription rate for TT was 49% compared with two other recent studies in the UK of 58% and 12% before audit and 46% after audit in patients aged 65 or over⁹. The main reason in our study for not prescribing TT was missed diagnosis on admission. Therefore, improving diagnostic accuracy on admission will greatly increase TT prescription rate.

Our results showed that patients were less likely to be admitted to CCU if the diagnosis was not correctly made on admission (70% versus 95%) suggesting that correct diagnosis on admission is important if the patient was to be admitted to the appropriate ward to receive optimum monitoring and care.

The duration of stay in patients who were not correctly diagnosed on admission was longer by an average of 1.2 days. Although not statistically significant, it may represent a large financial saving for the hospital.

We chose to test our three consultants in charge rather than a specialist cardiologist with the admission histories and ECGs because they would be consulted by the admitting registrars in the first instance. We accept that reading the histories typed out and interpreting the ECGs retrospectively did not reproduce the same situations as in the accident and emergency department but out of hours when the consultants were at home, all the information they would have over the telephone would be the histories told to them by their juniors and description of the ECGs rather than the actual ECGs themselves. Therefore, our consultants were at an advantage in this respect when they were tested.

They correctly diagnosed an average of 7.3 of those 20 patients whose diagnosis was missed on admission. However, they also diagnosed an average of 40% of patients from our angina group as having an acute MI and would have prescribed TT to an average of one of five patients. This suggested that they had a lower diagnostic threshold. Whether it is better to have a lower diagnostic threshold and accept that inevitably some patients without an MI would be prescribed TT than to have a higher threshold and miss some patients is controversial. Thrombolytic therapy is not without risk, notably excessive haemorrhage¹ and anaphylactic reactions. In one recent study during which the intervention was to publicize the use of TT in the elderly, no patients with a subsequent diagnosis of angina received TT before intervention but this rose to 16% after intervention with two patients having to have their TT interrupted and one terminated due to complications⁹.

Various biochemical markers for diagnosing acute MI are available^{7,8}. In one study¹⁰, only 23 of 38 eligible patients (73.7%) with an eventual diagnosis of acute MI were given TT due to uncertainty in diagnosis in the remaining 10 patients. This was increased to 91.2% after emergency serum CPK was made available. There were no false positives and no

patients were given TT inappropriately. Another study¹⁷ showed that 67% of patients who had a final diagnosis of MI had a raised CPK on admission and 100% by 4 h. Again, there were no false positives.

We showed that a large proportion of patients were not correctly diagnosed on admission and even with more consultant input, a significant proportion would be missed. At present, biochemical markers for acute MI are not available in our hospital. We propose that emergency CPK measurement should be available at our hospital, especially for patients whose diagnosis is not certain and the ECGs are not normal but do not confirm the diagnosis of MI. Earlier diagnosis and more appropriate management should almost certainly outweigh the financial implications of setting up such an emergency service.

We hope that our results will help other hospitals in their campaign for an emergency CPK service. We are hoping to establish an emergency CPK service at our hospital and will be auditing our performance prospectively.

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