

Managing potentially ischaemic chest pain and coronary care beds effectively

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Abstract

One of the most common reasons why patients attend emergency departments in Australia is chest pain that is potentially due to coronary artery disease (myocardial infarction, unstable or stable angina pectoris). A number of models for the investigation and treatment of these patients have been employed over the last five to ten years. This paper describes the evolution of a model for managing ischaemic chest pain that aims to avoid potentially preventable deaths from undiagnosed myocardial infarction, to admit to hospital patients who could benefit from inpatient treatment, to admit to a coronary care unit patients at significant risk of complications, and to avoid inter-hospital transfer of patients. Introduction of the model has led to an increase in the appropriate hospital admission of patients with ischaemic chest pain, a marked reduction in inter-hospital transfers, and better utilisation of coronary care beds. Unmonitored, general ward management of low risk patients with clinical unstable angina has not resulted in compromised outcomes.

Introduction

Chest pain associated with ischaemic heart disease (myocardial infarction, stable or unstable angina pectoris) is a common reason for patient presentation to emergency departments. Over recent years the approach to the investigation and management of these patients has been changing, particularly as evidence has shown that intensive management of patients with ischaemic chest pain improves outcomes (Lee et al. 1987; Villanueva et al. 1992; McCarthy et al. 1993).

Hospital policies, in particular emergency department and coronary care unit policies, have not always kept pace with these changes. The management of chest pain at Western Hospital Footscray highlights a number of the issues.

The setting

Western Hospital Footscray is a 350-bed adult teaching hospital serving a population of approximately 200 000. It has a busy emergency department with an annual census of 35 000 patients and an admission rate of 30 per cent. The emergency department assesses approximately 2500 patients per year with a presenting symptom of chest pain. The coronary care unit at Western Hospital Footscray has six acute and four 'step down' beds with an annual throughput of approximately 1200 patients, approximately 35 per cent of whom are acute myocardial infarctions. At the time of the study the hospital did not have angiogram facilities. All specialty and sub-specialty services, with the exception of cardiothoracic surgery, are available on site.

Before 1996: The problem

Before early 1996 the emphasis was on detection of myocardial infarction. Patients who presented to the emergency department of Western Hospital Footscray with a history of potentially ischaemic chest pain were often investigated in the emergency department. They received continuous cardiac monitoring, and had serial cardiac enzyme measurements taken and a series of electrocardiograph recordings (ECGs). In the absence of a rise in cardiac enzymes or acute ECG changes during the subsequent 12–18 hour time frame, patients were discharged from the emergency department. Follow-up with their local doctor or through the outpatient department was arranged. This approach was applied to both patients with strong histories of ischaemic chest pain and those with 'atypical' pain.

An audit of the records of all patients with a final emergency department diagnosis of myocardial infarction, unstable angina or chest pain was conducted for the month of December 1995 (Table 1). Patients were identified from ICD-9 codes, with the help of the Medical Records Department. Data collected included whether the patient was admitted to an inpatient unit or managed solely in the emergency department, whether those admitted went to a general ward or coronary care unit, and the number of acute inter-hospital transfers due to the lack of availability of a coronary care unit bed.

The data show that 45 per cent of all patients who presented with potentially ischaemic chest pain received their total management in the emergency department. Only 16 per cent of total presentations were admitted to the coronary care unit, the remainder to a general ward. Many patients with a clinical diagnosis of unstable angina were discharged from the emergency department for investigation and management as outpatients.

Critical appraisal of the medical literature in late 1995 suggested that this approach was deficient. In particular, it suggested that this process would not reliably detect acute myocardial infarction (especially in difficult cases) and that patients with unstable angina had better outcomes if treated in hospital (Lee et al. 1987; The RICS Group 1990; Villanueva et al. 1992; McCarthy et al. 1993).

The failure to detect acute myocardial infarction has significant potential consequences in terms of both morbidity and mortality. Lee et al. (1987) found that cardiac enzyme determination at 12 hours detected 77 per cent of acute myocardial infarctions. With an untreated mortality for acute myocardial infarction in the order of 13 per cent (ISIS-2 Collaborative Group 1988), an annual chest pain attendance of approximately 2500, and assumptions that 20 per cent of chest pain presentations will have acute myocardial infarction without ECG evidence (Karlson et al. 1991) and 80 per cent of acute myocardial infarction will be detected by serial enzymes in the emergency department, it was estimated that as many as 13 patients per year could be dying because of undiagnosed acute myocardial infarction. Untreated, unstable angina carries a risk of acute myocardial infarction or death in 17 per cent of cases in the next three months (The RICS Group 1990). This risk is significantly reduced by intensive medical therapy (The RICS Group 1990). It is not possible to accurately quantify the number of patients who had unstable angina and were discharged for outpatient management, nor is it possible to quantify the impact of the discharge therapy compared with no therapy or intensive inpatient therapy. However, if 10 per cent of patients had unstable angina (a conservative estimate) and the risk of acute myocardial infarction or death following discharge was 8 per cent, this represented approximately 20 patients with potentially preventable acute myocardial infarction or death.

Evidence to action

The direct result of this evidence was a change in hospital policy. The key feature of this policy was that patients considered to be suffering ischaemic chest pain, irrespective of ECG and enzyme findings, would be admitted to an inpatient bed for a period of rest, treatment and investigation. The net result was a marked

increase in the number of patients admitted with this diagnosis. An audit of the month of July 1996 (using the same methodology as above, with the addition of patient identification using a new emergency department data management system) showed that 76 per cent of patients presenting with chest pain were admitted to hospital – 32 per cent to the coronary care unit, 33 per cent to a general ward bed and 11 per cent were transferred to coronary care units in other hospitals (Table 1). Only 24 per cent were treated in the emergency department.

New problems

The new policy had clearly resulted in hospital admission for more patients. However, two problems became evident. Firstly, the coronary care unit could not cope with the increased workload. A number of patients (17 patients, 11 per cent) required transfer to coronary care units in other hospitals because beds were not available at Western Hospital Footscray (Table 1). This is often inconvenient for the patient and the family. Also, the time required to organise the transfer is not insignificant and the cost of transfer by ambulance must also be met. Secondly, it was found that patients admitted to the coronary care unit for assessment of suspicious chest pain had a low requirement for coronary care unit interventions. Conversely, patients with proven ischaemic heart disease were being transferred to other hospitals due to a lack of coronary care unit beds. It was decided that coronary care unit beds were being inappropriately utilised. At the time, there was no defined coronary care unit admission policy. Decisions to admit were being made on an ad hoc basis by the cardiology medical officer or the duty medical registrar.

Table 1: Audit data on the management of patients with potentially ischaemic chest pain

	Emergency department management		Ward management		Coronary care unit management		Acute inter-hospital transfer		Total
	No.	(%)	No.	(%)	No.	(%)	No.	(%)	
December 1995	46	45	36	35	17	16	4	4	103
July 1996	36	24	50	33	48	32	17	11	151
December 1996	25	21	63	53	30	25	1	1	119

Evidence and refinement of policy

A review of the relevant medical literature suggested that a sub-group of patients could be safely managed in general wards rather than in coronary care units. Research suggested that patients without changes on their initial ECG were at low risk of complications requiring coronary care unit intervention (Brush et al. 1985; Zalenski et al. 1988). It was decided, however, to take a conservative approach. A policy was adopted that coronary care unit admission was indicated for patients with:

- a history and ECG changes consistent with myocardial infarction
- new ECG changes such as ST depression, T wave inversion, left bundle branch block
- ongoing pain who required glyceryl trinitrate (GTN) infusion for control of chest pain
- a history of ischaemic chest pain and a rise on the initial set of cardiac enzymes taken in the emergency department
- any life-threatening arrhythmia requiring continuous cardiac monitoring and ongoing treatment.

Patients with the following features were to be managed in a general medical bed:

- a history of chest pain with normal ECG and no rise on initial set of cardiac enzymes
- a history of chest pain with no new changes on ECG and no rise on initial set of cardiac enzymes
- a stable arrhythmia not requiring continuous cardiac monitoring
- an uncomplicated acute myocardial infarction, aged over 80 years and for whom thrombolysis is not indicated.

Any patient in the latter sub-group who developed pain requiring intravenous glyceryl trinitrate for pain control, or who developed a complication requiring coronary care unit management, would be admitted/transferred to the coronary care unit.

The policy was introduced in October 1996 and an audit for the month of December 1996 (using the previously described methodology) indicated that only 25 per cent of patients with potentially ischaemic chest pain were admitted to the coronary care unit compared with 53 per cent admitted to general wards. The requirement for transfer to a coronary care unit at another hospital was

much reduced, with only one patient (0.8 per cent) requiring transfer because a coronary care unit bed was not available at Western Hospital Footscray.

Twenty-one per cent of patients were receiving the whole of their assessment and treatment in the emergency department, which would be consistent with figures published elsewhere about the proportion of patients for whom ischaemia can be accurately ruled out in the emergency department (Karlson et al. 1991). Unfortunately, data to confirm the accuracy of this assessment for Western Hospital Footscray are not available.

Patient outcome

It might be suggested that patients admitted to general ward beds may demonstrate an increase in adverse outcomes as a result of the new coronary care unit admission criteria. Audits were conducted for the months of July and December 1996, searching specifically for patients admitted to general medical beds who either died or required transfer to the coronary care unit because of ongoing chest pain or delayed diagnosis of myocardial infarction. In addition to the methodology described above, coronary care unit admission records were examined in order to identify transfers or complications. As a control, an audit was conducted for the month of December 1995, before the implementation of changes in the management of chest pain or the coronary care unit admission policy.

In July 1996 and December 1996 no patients were transferred from a general medical bed to the coronary care unit for increased pain or complications. This compares with one such patient for December 1995.

In December 1996 an elderly male (81 years) died 18 hours after admission to a general ward as the result of a cardiac arrest complicating a known myocardial infarction. A review of the medical record confirmed that the patient met the criteria for admission to a general ward, that is, 'an uncomplicated acute myocardial infarction, aged over 80 years and for whom thrombolysis is not indicated'. Given the expected mortality of this age group for acute myocardial infarctions (19 per cent, Paul et al. 1996), this death, though regrettable, is within expectations. There is some doubt whether this patient would have been admitted to the coronary care unit even before the establishment of the coronary care unit admission policy.

Discussion

One of the most common reasons why patients attend emergency departments in Australia is chest pain that is potentially due to coronary artery disease (myocardial infarction, unstable or stable angina pectoris). Models for the investigation and treatment of these patients have been changing over the last five to ten years. Key issues have been identification of acute myocardial infarction and prevention of the morbidity and mortality associated with ischaemic chest pain. Unfortunately, the models have not always been based on scientific evidence, resulting in ineffective use of resources.

There is no argument about the benefits of managing patients with acute myocardial infarction in coronary care units. The issue here is the identification of myocardial infarction from other causes of chest pain when initial emergency department testing is normal. A review of practice before 1996 suggested that a significant number of patients could be suffering preventable myocardial infarction or death because of inadequate investigation and therapy. In part, this was due to ill-informed application of a hospital policy aimed at avoiding hospital admission whenever possible. The change in policy such that these patients are admitted to hospital for investigation and therapy has addressed this issue and, as a consequence, it is expected that the preventable poor outcomes will be reduced greatly.

Out of the first policy change arose another issue – how to deal with the group of patients suffering unstable angina or potentially ischaemic chest pain without compromising the care of patients with proven ischaemic heart disease. In most Australian hospitals it would be usual practice to admit patients suffering unstable angina or potentially ischaemic chest pain to a coronary care unit. The rationale for this would seem to be an assumption that the benefits afforded to patients with myocardial infarction by a coronary care unit also apply to those with unstable angina. This assumption has not been confirmed by research. Additionally, the resources thus consumed are considerable.

Recent studies from the United States have shown that a sub-group of these patients can be safely managed in telemetry areas and have raised the question of the need for monitored beds for these patients (Hollander et al. 1997). Based on the available evidence in the medical literature, it was decided to identify a group of patients at Western Hospital Footscray who were at low risk of serious complications and to manage them in a general ward area without cardiac monitoring. Pilot audits in this study failed to identify any serious complications in the group managed in this manner, suggesting that the approach is safe. Safety will need to be further confirmed by a larger study. This is in progress.

Chest pain centres have been proposed for rapid evaluation of patients with chest pain of potentially cardiac origin (Gaspoz et al. 1994; Gibler et al. 1995). Closer evaluation of reports of this practice reveal that it is aimed at that group of patients with suspicious chest pain (very low risk of myocardial infarction) rather than the unstable angina group. Nonetheless, the advocated approach of measuring serial cardiac enzymes and recording ECGs, followed by immediate stress testing, may have merit for a small group of patients presenting to Australian emergency departments.

Conclusion

The utilisation of evidence to derive new policies in the management of potentially ischaemic chest pain and coronary care unit bed admissions in this project has been safe and effective. Patients suffering chest pain are receiving more appropriate evaluation, reducing the likelihood of missed myocardial infarction and preventable death. Patients with myocardial infarction are more readily able to access coronary care unit beds. There has been an increase in appropriate hospital admissions, more effective use of coronary care unit beds, and a marked reduction in acute inter-hospital transfers.

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