

ORIGINAL ARTICLES

The Introduction of a Chest Pain Nurse and Fast-Track Troponin Service Reduces the Length of Stay of Patients Presenting with Chest Pain.

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ABSTRACT

Background

Troponin I (TnI) measurement is important in decision making and management of patients who present with chest pain. Undetectable levels of TnI in these patients are associated with a low risk of death or myocardial infarction at 30 days, and may allow early discharge from hospital.

Methods

An audit was performed tracking patients who presented with chest pain and had a TnI blood test requested. Routine clinical service was audited for three months. A "fast-track" troponin service and chest pain specialist nurse was then introduced to assist in the management of patients. This was continued for three months to assess the impact on length of stay.

Results

446 patients were admitted during the first three month period and 511 patients admitted during the second monitoring period when the new measures were introduced. The time from chest pain onset until the TnI blood test was taken reduced from 23.0 hours to 20.3 hours. The percentage of patients admitted to hospital wards from the Acute Medical Receiving Unit (AMRU) fell from 62% to 53% ($p < 0.001$). The new measures resulted in a reduction in admission time from 73.1 hours to 51.0 hours.

Conclusion

A fast-track troponin and specialist nurse achieved a reduction of nearly 24 hours in length of stay in patients presenting with chest pain. This would result in a saving of approximately 2000 bed-days per annum, releasing 5-6 acute beds per day.

Background

Acute medical admissions with chest pain are continuing to rise in Scotland, although the incidence of acute myocardial infarction is falling.¹ Many of these patients will be at low risk of subsequent myocardial infarction and death, and after assessment can be quickly discharged for out patient investigation if necessary. Patients who present with chest pain are subject to a clinical assessment, electrocardiograph and troponin blood test. Troponin becomes positive at approximately 6-12 hours after the onset of pain, therefore the timing of measurement is crucial to avoid false negative results. As there is often a waiting time before the troponin sample is taken, patients are routinely admitted to a medical ward unless a suitable observation area exists, and this can lead to a prolonged period in hospital.

We aimed to document the number, clinical profile, timing of events and duration of admission for patients presenting with acute chest pain of suspected cardiac origin, excluding ST elevation myocardial infarction. The main objective was to assess impact on length of stay of a specialist chest pain nurse and "fast-track" troponin measurement.

Methods

An audit was performed of patients who were admitted to the Acute Medical Receiving Unit (AMRU) of an inner city hospital, with chest pain and a troponin I (TnI) blood test requested. Patients with ST elevation myocardial infarction were excluded.

The service was audited using a form which detailed patients' past history and time-course through the hospital noting times of onset of chest pain, presentation to accident and emergency, arrival on the AMRU, venepuncture, troponin result available on the AMRU, consultant review, intervention and discharge. By protocol, blood for TnI was taken at least 12 hours after the onset of chest pain, as recommended in the draft SIGN coronary artery disease guidelines.²

Patients were seen in the Accident and Emergency department (A and E) by the on-call senior house officer, who performed an assessment before arranging transfer to the AMRU. Ward rounds were performed by a general physician twice a day (08.30 and 16.30), and a consultant cardiologist reviewed any cardiology referrals after the morning ward round. At other times patients could be seen by the cardiology registrar if requiring urgent review, but otherwise they would wait until the morning round. If a cardiology opinion was requested from the evening ward round then patients would remain in the AMRU until the following morning.

During the first three months (Group 1), routine clinical service was audited. During this period, blood was collected by the phlebotomy service, and transferred to the laboratory by the hospital portering service. Once analysed, the troponin result would be entered onto the hospital computer system, which is available to the junior medical staff. It was the responsibility of the house officer to look up the result, and communicate with other members of the medical team.

If a troponin was requested between the hours of 9 am and 3pm, then it was performed immediately with the result available on the same day. If the sample was taken after 3pm, it was stored and analysed the following morning.

During the second three months (Group 2) a "fast-track" troponin service and cardiology specialist nurse were introduced in an attempt to improve the turnaround times of chest pain patients. A service was set up with the aim of having the troponin result available to the consultant on the ward round. An early morning venepuncture service was adopted, with blood being collected by the specialist nurse and phlebotomy team. This was then passed to the laboratory, where a dedicated staff member analysed the samples, and entered the results onto the hospital intranet service. The specialist nurse accessed and transcribed the result into the medical notes, as well as communicating this to the medical team.

The cardiology nurse specialist with 10 years' experience of coronary care reviewed all chest pain admissions, obtaining previous relevant investigation results, and referred appropriate patients directly to the cardiology team. Following admission the nurse would follow patients during their admission, expedite investigations, offer advice, and assist in their care until discharge. The same details were audited for these patients using the standard form.

The main outcome of this study was on length of admission, however the percentage of patients who were discharged directly from AMRU was determined. Times are expressed as a median with inter-quartile range (IQR) and are compared using a Mann-Whitney test for non-parametric data. The differences between patients' past history, age and the number of patients discharged directly from AMRU was compared using a chi-square test. A value of $p \leq 0.05$ was considered significant.

Results

957 consecutive patients were audited during the 6 month period of January 2002 to June 2002, with 446 and 511 patients recorded in the first and second 3 month periods respectively. Patient demographics were similar during both periods (Table I) and there were similar rates of previous angina (57% v 59%) and myocardial infarction (29% v 32%) in patients' past medical history. Troponin I was negative (<0.2 mg/L) in 85% of patients in both periods, and ECGs were normal in 31% vs. 29%, indicating comparable groups for analysis.

Table I Clinical Characteristics and Investigation Results Between the Two Groups

	Group 1 (n=446)	Group 2 (n=511)	p
Age (mean +/- SD)	61.6 +/- 14.0	60.7 +/- 13.1	NS
Male (%)	263 (59)	282 (55)	NS
Angina (%)	253 (57)	300 (59)	NS
Past myocardial infarction (%)	130 (29)	166 (32)	NS
Chronic heart failure (%)	13 (3)	12 (2)	NS
Previous re-vascularisation (CABG/PCI) (%)	81 (18)	115 (22.5)	NS

Time between the onset of chest pain and arrival in hospital was slightly shorter in Group 2 (4.5 hours vs. 3.2 hours), and the time for arrival in AMRU was also quicker in the second period (4.0 hours vs. 3.3 hours), however the median time from chest pain onset until review by the physician and cardiologist was comparable between the groups. (Table II)

Table II Time Course of Patient Admission in Each Group (All Times in Hours).

	Group 1	Group 2	p
Median time between chest pain onset until arrive in A and E (IQR).	4.5 (2.0-12.4)	3.2 (1.6-7.2)	<0.05
Median time between arrival in A and E transfer to AMRU (IQR).	4.0 (3.0-5.2)	3.3 (2.5-4.4)	<0.05
Median time between arrival in AMRU and review by consultant physician (IQR).	8.5 (3.0-14.3)	9.2 (4.2-14.0)	NS
Median time between arrival in AMRU and review by consultant cardiologist (IQR).	14.4 (8.8-19.2)	14.2 (9.5-18.7)	NS

Early morning venepuncture resulted in a reduction in the median time from admission until troponin sample taken (17.2 hours vs. 15.6 hours), and the fast-track troponin service reduced the median time for results to be made available (4.8 hours vs. 1.3 hours). (Table III)

In-patient stress tests were performed in 146 patients (35%) in group 1, compared with 168 patients (34%) in group 2, and with the introduction of the specialist nurse the median time from review by a consultant until the stress was performed fell from 66.0 hours to 50.1 hours.

Table III Time Course of Troponin Sampling (All Times in Hours)

	Group 1	Group 2	p
Median time from chest pain onset until TnI specimen taken (IQR).	23.0 (18.2-29.3)	20.3 (14.8-23.6)	<0.05
Median time from arrival in A and E until TnI specimen taken (IQR).	17.2 (11.5-21.2)	15.6 (11.3-19.5)	<0.05
Median time between blood collection and result available on hospital computer system (IQR).	4.8 (3.8-5.5)	1.3 (1.0-1.9)	<0.05
Median time between blood collection and result acted upon (IQR).	5.2 (4.3-6.0)	1.3 (1.1-2.0)	<0.05

There was a significant reduction in admission rates from the AMRU in Group 2 (n=272, 53%) compared with Group 1 (n=276, 62%, χ^2 15.1, $p < 0.001$)

The median time from arrival in A & E until discharge in Group 2 was 51.0 hours compared with 73.1 hours in the Group 1, indicating a significant reduction in length of stay ($p < 0.05$). This reduction would result in an annual saving of 4250 bed-days, releasing 5-6 acute beds per day.

There was an increase in median length of stay in patients admitted to other wards from AMRU following the introduction of the new measures (122.4 vs. 134.8 hours). However this was not significant.

Discussion

Patients who present with chest pain present an ever growing problem for the National Health Service as admission rates continue to rise.¹ An exact diagnosis is often difficult to make, and patients are often admitted for a period of observation, before decisions are made, and further investigations ordered.

After myocardial injury, troponin is elevated in the peripheral blood and this occurs at 6-12 hours after the onset of pain. Guidelines from the joint committees of the European Society of Cardiology and the American College of Cardiology advise testing on admission, at 6 to 9 hours, and again at 12 to 24 hours, if earlier samples are negative and the clinical index of suspicion is high.³ For financial reasons we are limited locally to a single troponin measurement. It has been suggested that the optimal timing for the measurement of troponin T is 12 hours after the onset of pain,⁴ and we have adopted this timing for TnI. As our patients are admitted overnight, and with the high cost of operating an out of hours troponin service, blood would normally be collected by the phlebotomy

service during the early morning, and measured by the laboratory as a routine sample. This resulted in a delay from chest pain onset to troponin sampling of approximately 23 hours prior to the initiation of our intervention. The new measures which were introduced brought the median time down, but only by 2.7 hours.

There is debate about the value of operating a 24 hour troponin service given that a suitably qualified medical professional is required to interpret the result, and arranging discharge outwith normal working hours is often not feasible. Trusts have adopted ways of measuring troponin including bedside testing kits, or laboratory based measurement. Bedside or point-of-care testing is of comparable diagnostic performance to laboratory-based assays⁵ and does not require trained technical staff. However our initial results with this method were not comparable to laboratory based measurements, so this was not adopted.

A patient presenting with chest pain, who has a negative troponin result is at low risk of subsequent cardiac events at 30 days.⁶ Therefore early discharge of a large percentage of chest pain admissions is possible with early out-patient investigation or review at a clinic if appropriate. Indeed although there are high numbers of chest pain admissions, less than half will have a final diagnosis of acute myocardial infarction or unstable angina⁷ and in our own series, only 15% were TnI positive. It should be noted that troponin is just one part of the clinical and biochemical assessment, and should not be interpreted in isolation.

Cardiology nurse specialists have previously been employed in the thrombolysis of patients with ST elevation myocardial infarction, and improve outcomes in patients admitted to hospital with heart failure. A specialist nurse in the accident and emergency department can expedite definitive treatment of patients with acute coronary syndromes,⁹ although their role has not previously been published in an acute medical receiving ward. Chest pain observational units are now being introduced, often based in the accident and emergency department, and this has also reduced hospital admissions. These are staffed by nurses with experience in coronary care or emergency medicine.¹⁰ A dedicated specialist nurse who is trained in the management of coronary care patients provides an excellent link between these patients and the cardiology team.

The main outcome in this audit was on length of admission; however it quickly became obvious that the

chest pain nurse provided input into other areas e.g patients with evidence of acute coronary syndromes were quickly referred to the cardiology team, and transferred to the Coronary Care Unit, or underwent coronary arteriography. The presence of an experienced specialist nurse in the ARMU reduced the times for investigations to be performed, contributing to the overall reduction in length of stay.

We assessed the possibility that providing the troponin result to the consultant making management decisions on the morning ward round would influence length of stay and overall patient care could be improved. A fast-track troponin service and chest pain nurse specialist resulted in a statistically significant reduction in hospital admissions, and achieved a reduction of nearly 24 hours in median length of stay. This was on the basis that low risk chest pain admissions were more quickly identified and having been seen by an appropriate consultant could be discharged. However, even under the redesigned system, approximately 4250 bed days will be occupied by chest pain admissions. More radical solutions are necessary to further address this problem such as chest pain observation areas, reducing the time for troponin to be taken, or using other biochemical markers.

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