

Original Article

Is there a Need for a Chest Pain Observation Unit in St Luke's Hospital and will it be cost effective?

Mary Rose Cassar, Kevin Zammit, Wojciech Sawicki, Claire Falzon

Abstract

Objectives: Studies from the USA suggest that using an A&E department based chest pain observation unit (CPOU) saves from \$567 to \$2030 per patient compared with hospital admission. In the UK cost effectiveness figures are lower at around £78 per patient. This study aims to review current practice for patients presenting with chest pain in St.Luke's Hospital (SLH), to determine the proportion of patients suitable for CPOU evaluation and consequently calculate any related cost effectiveness.

Methods: 236 patients presenting with a primary complaint of chest pain to the A&E department at SLH between 1st June and 12th July 2003 were selected. The case histories of these patients were reviewed to ascertain how many of them would qualify for a CPOU management and specific data was collected.

Results: Notes were retrieved for 217 patients. A total of 103 (47.5%) patients were suitable for a CPOU management. Mean length of in-hospital stay of these patients was 67.5 hours. Estimated mean cost saving per patient was LM220 and overall LM 19,800 per month.

Conclusion: Potential exists for the setting up of CPOU care to reduce health service costs and improve health utility at St.Luke's Hospital.

Introduction

Chest pain is a common cause of Accident and Emergency (A&E) presentation. The principal challenge in these patients is to identify those with an acute coronary syndrome (ACS). Early diagnosis allows immediate and appropriate treatment whilst inappropriate discharge may have disastrous consequences for patient and doctor. During the 1980s studies from the USA suggested that 3-4% of patients presenting with acute myocardial infarction (AMI) were being discharged from the A&E^{1,2} and many of those admitted had a benign cause.³ A similar study from the UK found that 11.8% of such patients were discharged home.⁴ The problem with the A&E assessment of these patients lies in the limitations of diagnostic tests for AMI. Initial ECG is diagnostic of AMI in only 40-65% of patients and is even less useful in unstable angina.⁵ Despite recent advances, serum markers for myocardial necrosis detect, at best, 66% of AMI's on arrival.⁶

It is against this background that the concept of A&E based chest pain observation units (CPOU) emerged. The concept originated in the USA but other countries like the UK are adopting this idea. CPOU's are staffed by A&E nurses and senior A&E doctors and patients are admitted here according to specific criteria. They are then investigated according to protocols which include intensive ECG monitoring and cardiac enzyme testing and may be followed by exercise stress test. These protocols usually take 2-6 hours to complete and the patient's overall stay is definitely less than 24 hours (mean stay of 12 hours). If any of these tests are positive, then patients are admitted to other hospital wards for further treatment. If they are negative, they will be discharged home.^{7,8,11}

In the USA, CPOU's are now very popular and their safety and cost effectiveness are established. Quoted estimates of cost savings here range from \$ 567 to \$2030 per Patient.⁹ In the UK, figures quoted are in the region of £78 per patient.¹⁰ The main reasons for this significant difference between the two countries are that in-patient costs in the USA are higher and they tend to admit more patients due to medico-legal reasons which again tend to increase the expenses incurred.¹²

In Malta, ischaemic heart disease is very common and many people are admitted through the Accident and Emergency Department with chest pain. The aims of this study are to examine current practice for patients admitted to St.Luke's Hospital with a primary presenting complaint of chest pain, to see the average hospital stay and investigations of such patients, to establish how many of these patients would qualify for a CPOU if there was one, and finally taking all these data into consideration to determine whether a CPOU in our main tertiary hospital would be cost effective, reduce hospital stays and speed up diagnosis.

Keywords

A&E department, chest pain, CPOU

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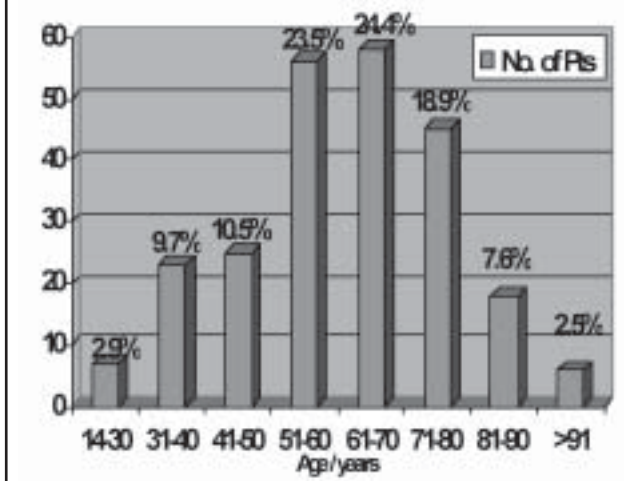
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Figure 1: Age Distribution of all chest pain admitted patients

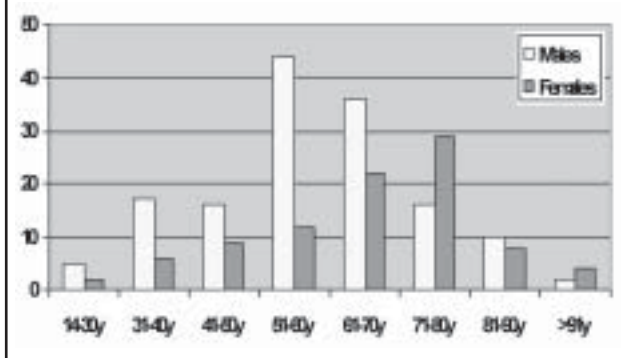


Methods

St. Luke's Hospital's A&E department is the main adult A&E department in Malta. It sees over 100,000 new patients per year. High risk cardiac patients are admitted to the coronary care unit. Lower risk patients are admitted to general medical wards. The A&E department to this date records its daily medical admissions in a specific book. There is no specific computer programme to randomly select patients. This book was used to generate a list of consecutive patients admitted with a primary presenting complaint of chest pain between 1st June and 12th July 2003 (6 weeks, middle of the year). All the medical admission books for that year were also screened and there was no significant difference in the monthly number of patients admitted for chest pain.

The management of the selected patients was followed up for one year after their initial admission. Each set of notes was assessed and discussed, at the same time, by four A&E doctors who are experienced in the management of acute chest pain and familiar with literature relating to CPOUs. Decisions whether each patient might have been eligible for assessment on a CPOU were first made by applying the list of absolute exclusion criteria outlined in appendix 1. These criteria define a population who are at low but not negligible risk of AMI. Also they are established and universally accepted criteria.¹³⁻¹⁶ For

Figure 2: Sex distribution vs age in all chest pain admitted patients



each case excluded, the assessors recorded which criteria applied. All disagreements were reviewed and discussed until agreement was achieved.

The case notes were searched for data relating to the original admission (sex / age of patient, length of stay, procedures and investigations) and follow up over the subsequent 12 months (out-patient reviews, procedures and investigations). These data were not collected for cases excluded from the study as there was little to be gained from their use.

The present cost per patient of in-patient hospital care at St. Luke's Hospital amounts to Lm110 per day (Malta Government Gazette May 2004). This fee includes the costs of all medical and nursing care (irrelevant of the amount/type of professional care and consultations), all basic investigations (irrelevant of the amount) and pharmacy charges (irrelevant of the types or amount of medications given). This fee is the same for general ward, and CCU management. A CPOU short stay ward with similar monitoring facilities and investigations offered already by the other mentioned wards would therefore presumably follow the same financial calculations and carry the same fee. Fees are quoted for interventional cardiology but these were not taken into account since they do not form part of protocols of management within a CPOU. Therefore calculations to find potential cost savings per patient over one month were based on this theory and were reviewed by a health information/statistics expert and approved.

Results

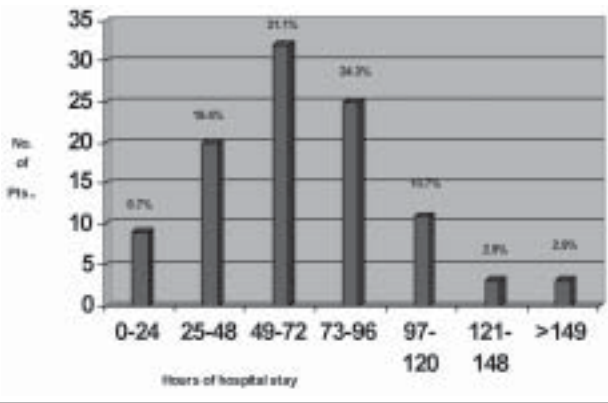
Between 1st June and 12th July 2003, 1124 patients were admitted to general medical wards and 78 patients were admitted to CCU in St. Luke's Hospital. Of the patients admitted to medical wards, 236 patients (21%) presented with a primary complaint of chest pain. Of these selected 236 patients, case histories were retrieved for 217 (91.9%).

Demographic data collected from the retrieved files show a sex ratio of 61.3% male and 38.7% female patients admitted with chest pain. Age distributions are shown in Figures 1 and 2.

Of the 217 files analyzed, 114 patients (52.5%) had exclusion criteria and therefore would not have qualified for a CPOU admission. 103 (47.5%) patients did not have these criteria and would have been candidates for a CPOU management. Of the 114 patients excluded, cases were excluded for the following reasons: ischaemic ECGs (6%), co-morbidity requiring admission (17.1%), suspected or proven alternative diagnosis (6%), known ischaemic heart disease with high risk episode of pain (20.1%) and minimal risks for ischaemic heart disease (2.8%).

The potentially eligible patients stayed in hospital for a mean of 67.5 hours (2.8 days) and distribution was as in Figure 3. Almost all patients who stayed less than 24 hours did so because they discharged themselves against medical advice. None of these patients returned within the consecutive two days. All patients who stayed for further management had 'routine' complete blood picture, blood biochemistry, chest x-ray and serial ECGs and CK enzyme tests. There also seemed to be no standard amount and timings of the latter two investigations. In addition to these, 40% had an exercise stress ECG, 12.6% had a coronary angiogram, and 9.7% had both a stress test and angiogram done whilst 46.6% had no other tests besides the

Figure 3: Hours of hospital stay by 'CPOU-potential' patients



mentioned 'routines'. Diagnosis of these patients, after one year of follow-up, showed that 11.6% had definite ischaemic heart disease, 53.4% had other, non-cardiac, causes and 35% had no definite diagnosis but cardiac causes were excluded.

Extrapolation of these results show that out of the 21% patients (c.200 patients) admitted with a primary complaint of chest pain, 47.5% patients (c.100 patients) qualified for a CPOU management if it were available. Of these 'eligible' patients only 11.6% (c.10 patients) were diagnosed to have definite ischaemic heart disease and therefore about 90 patients would probably have been discharged home after an initial assessment period of less than 24 hours in a CPOU. This data is comparable to findings from similar studies done in the UK.¹⁰ This means that there is a potential cost saving of LM19, 800 per month (2 days less of inpatient care x LM110 x 90 patients). This figure adds up to a mean a cost saving of LM237, 600 per year.

Discussion

The management strategy used in CPOUs represents a condensed form of traditional inpatient management. From the study it is obvious that, at present, inpatient care of our chest pain patients is very variable. The number and type of tests ordered vary and so does the actual length of hospital stay. A major reason for these discrepancies may be the lack of guidelines for the management of chest pain, which is the basis of a CPOU.

In Malta, ischaemic heart disease (IHD) accounts for 25% of all deaths (WHO statistics). This is a very significant figure. Although it is essential to identify all patients with acute coronary syndrome (ACS), it is also important to control costs and not subject patients to unnecessary investigations, inpatient care and resultant psychological stress. The process of chest pain evaluation must therefore be both timely and accurate in order to facilitate early revascularization treatments and also to limit the impact on health care resources.

Guidelines for CPOU admissions depend on clinical risk stratification. These risks depend on ECG findings when the patient presents for the first time to the A&E department, risk factors for IHD and a significant history. At the present time, when a patient presents to our A&E department, he/she is immediately triaged and has an ECG taken. This ECG will be

screened by doctors for significant changes and those patients diagnosed as having an ACS will have the appropriate treatment started immediately. The rest of the patients will be assessed and most of them will be admitted for further tests to the general medical wards irrelevant of their clinical risk for IHD. CPOU admission guidelines take such risks into consideration and will admit only low to moderate risk patients (Figure 4). This framework is actually incorporated in the definition of the 'exclusion criteria' and has been shown to be reliable for the care of chest pain patients.

CPOU care also depends on having reliable, sensitive tests which rule out myocardial infarction. There are now a multitude of diagnostic tests to rule out myocardial infarction: some are early markers, some are cheaper than others and some are more specific or sensitive. However, no single test will reliably rule out acute myocardial infarction with fewer than 12 hours of chest pain. One way to increase sensitivity is to do a series of tests and this is another premise behind CPOUs. One combination that has been studied and extensively used is a combination of CK-MB mass assays and ST segment monitoring. A prospective randomized controlled trial has shown this approach to be safe when compared to inpatient care.⁴⁸ Indeed it has been shown that in low risk patients such a combination of tests is 99.4% sensitive for AMI. Figure 5 shows a typical CPOU framework.⁴⁴

This study was meant to be a pilot one and has some obvious limitations. It may be argued that the number of patients studied

Figure 4: Initial approach to the patient presenting with chest pain to the A&E department

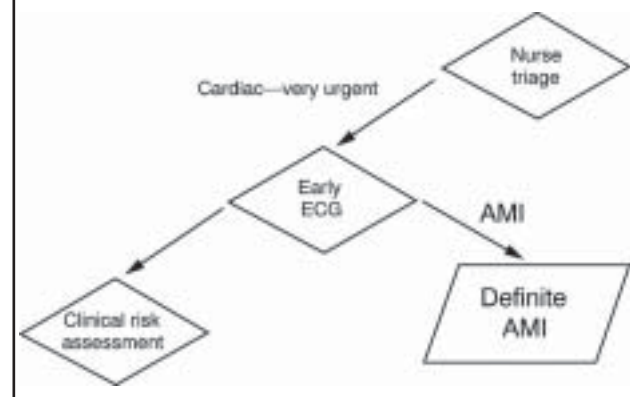
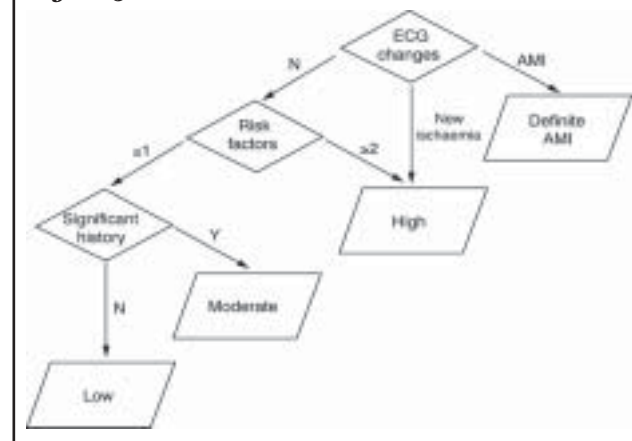


Figure 5: Clinical risk assessment overview



is not very large and the data was collected retrospectively. The costing methods may be considered relatively crude but the costing for general inpatient care is not itemized at St. Luke's Hospital. Establishment of a CPOU would necessitate the addition of a 6-bedded observation ward to the A&E department. The necessary tests carried out in a CPOU already exist and such wards are manned by senior A&E doctors and nursing staff. Therefore one may argue that the expenses involved in the organization of such an observation ward will not be too great especially when compared with the overall cost cutting if inpatient hospital stays were to be reduced. Whether or not to include the costs of interventional cardiology is a controversial yet critical factor in determining cost effectiveness. It can be argued that such costs are not directly related to the initial process of ruling out AMI.

However, if diagnostic testing used in a CPOU results in more referrals for angiography then the costs associated with the CPOU are likely to escalate. Such increased expenditure, on the other hand, could be justified if it leads to improved rates of diagnosis and patient outcomes.

Conclusion

Should there be an A&E department based CPOU at St. Luke's Hospital? Although the answer to this may be complex and open for discussion, some facts cannot be argued. These include the facts that ischaemic heart disease is a prime killer and source of morbidity on our islands, our hospital bed occupancy is perennially high and that chest pain patients account for one fifth of all medical admissions. Wherever they were established, CPOUs offered a safe alternative that was

Appendix 1

Exclusion Criteria

- Any of the following ECG changes, unless known to be old:
 - >1mm ST elevation or depression, or >3mm T wave inversion in two contiguous leads
 - atrial fibrillation
 - tachyarrhythmia (>120 beats per minute)
 - bradycardia (<40 beats per minute)
 - 2nd or 3rd degree heart block
 - Left bundle branch block
- Comorbidity requiring hospital admission, for example, heart failure, poor social support
- Suspected or proven alternative cause requiring hospital admission, for example, pulmonary embolus, dissecting aortic aneurysm
- Known CHD with anginal pain that consists of recurrent episodes or an episode lasting more than one hour
- Minimal risk of myocardial ischaemia – that is, pain that is stabbing, pleuritic, positional or reproduced by palpation in a patient with no history of, and few risk factors for CHD

cheaper and associated with improved health utility, more effective chest pain care and more cost effective than routine care.¹⁰ The outcomes of this study suggest that the same may hold true in our local situation.

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References

- 1 Selker HP, Griffith J, Dorsey F, *et al*. How do physicians admit when the coronary care unit is full? *JAMA* 1987; 257:1181-5
- 2 Lee TH, Ting HH, Shammash JB, *et al*. Long term survival of emergency department patients with acute chest pain. *Am J Cardiol* 1992; 69: 145-51
- 3 Zalenski RJ, Rydman RJ, McCarren M, *et al*. Feasibility of a rapid diagnostic protocol for an emergency department chest pain unit. *Ann. Emerg Med* 1997; 29: 99-108
- 4 Emerson PA, Russell NJ, Wyatt J, *et al*. An audit of doctor's management of patients with chest pain in the accident and emergency department. *Q J Med* 1989; 70: 213-20
- 5 Fesmire FM, Percy RF, Bardoner JB, *et al*. Usefulness of automated serial 12-lead ECG monitoring during the initial emergency department evaluation of patients with chest pain. *Ann Emerg Med* 1998;31:3-11
- 6 Hamm CW, Goldman BU, Heechsen C, *et al*. Emergency room triage of patients with acute chest pain by means of rapid testing for cardiac troponin T or troponin I. *N Eng J Med* 1997; 337:1648-53
- 7 Taylor C, Forrest-Hay A, Meek S. ROMEO: a rapid rule out strategy for low risk chest pain. Does it work in a UK emergency department? *EMJ* 2002; 19:5:395-9
- 8 Goodacre SW, Morris FM, Campbell S, *et al*. A prospective, observational study of a chest pain observation unit in a British hospital. *EMJ* 2002; 19:2:117-21
- 9 Goodacre SW. Should we establish chest pain observation units in the UK? A systematic review and critical appraisal of the literature. *J Accid Emerg Med* 2000;17:1-6
- 10 Goodacre SW, Nichol J, Dixon S, *et al*. Randomised controlled trial and economic evaluation of a chest pain observation unit compared with routine care. *BMJ* 2004;328:254
- 11 Herren KR, Mackway-Jones K. Emergency management of cardiac chest pain: a review. *Emerg Med J* 2001; 18:6-10
- 12 Goodacre SW, Morris F, Arnold J, *et al*. Is a chest pain observation unit likely to be cost effective in British Hospital? *Emerg Med J* 2001;18:11-14
- 13 Gomez MA, Anderson JL, Karagounis LA *et al*. An emergency department based protocol for rapidly ruling out myocardial ischaemia reduces hospital time and expense: results of a randomized study (ROMIO). *J Am Coll Cardiol* 1996; 28:25-33
- 14 Rodriguez S, Cowfer JP, Lyston DJ, *et al*. Clinical efficacy and cost-effectiveness of rapid emergency department rule out myocardial infarction and non-invasive cardiac evaluation in patients with acute chest pain. *J Am Coll Cardiol* 1994; 23:284A
- 15 Hoekstra JW, Gibler WB, Levy RC *et al*. Emergency department diagnosis of acute myocardial infarction and ischaemia: a cost analysis of two diagnostic protocols. *Acad Emerg Med* 1994; 1:103-10
- 16 Farkouh ME, Smars PA, Reeder GS, *et al*. A clinical trial of a chest pain observation unit for patients with unstable angina. *N Eng J Med* 1998; 339:1882-8
- 17 Bakker AJ, Koelemay MJW, Gorgels PMC, *et al*. Failure of new biochemical markers to exclude acute myocardial infarction at admission. *Lancet* 1993; 342:1220-2
- 18 Zalenski RJ, McCarren M, Roberts R, *et al*. An evaluation of a chest pain diagnostic protocol to exclude acute cardiac ischaemia in the emergency department. *Arch. Intern Med* 1997; 157:1085-91