

Is cardiac monitoring necessary for intermediate risk acute coronary syndrome patients who have a normal electrocardiogram and cardiac markers in the emergency department?

在急症室的心電圖和血液的心臟標誌正常及急性冠動脈綜合症風險中度的病者，是否需要進行心臟監察？

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This study aimed to investigate the safety of managing selected patients with suspected acute coronary syndrome without cardiac monitoring by determining the rate of complications occurring in chest pain patients classified as intermediate risk according to the National Heart Foundation of Australia guidelines and with normal cardiac marker levels and a normal/unchanged ECG in the emergency department. One patient suffered a critical adverse event within 24 hours (0.3%, 95% CI 0.1-1.7%) and 24 patients suffered other adverse events (6.3%, 95% CI 4.2-9.4%). This study provides further evidence that this group of patients are at low risk of experiencing a critical adverse event within 24 hours of hospital presentation and may be safely managed without continuous cardiac monitoring. (*Hong Kong j.emerg.med.* 2007;14:6-9)

這研究挑選在急症室血液的心臟標誌濃度正常，心電圖正常或不變，懷疑為急性冠動脈綜合症而根據澳洲國家心臟基金會的指引分類為風險中度的病者，測定其併發症的發病率，旨在調查不進行心臟監察治理的安全性。其中一名病者在 24 小時內病情一度危殆（0.3%，95% 置信區間 0.1-1.7%），24 名病者經受其他不良病況（6.3%，95% 置信區間 4.2-9.4%）。這研究進一步證明這類病者在到醫院求診後的 24 小時內可能經歷危殆病況的風險甚低，不使用持續的心臟監察也可以安全地治理。

Keywords: Chest pain, heart disease, physiologic monitoring, troponin

關鍵詞：胸痛、心臟病、生理監察、肌鈣蛋白

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Introduction

The National Heart Foundation of Australia (NHF) guidelines¹ recommended risk stratification of patients with suspected acute coronary syndromes (ACS) based on clinical, ECG and biomarker data to guide further assessment and treatment. High-risk patients require aggressive investigation and therapy as inpatients. Low risk patients can often be managed as outpatients. For intermediate risk patients, it was recommended that they be observed for a minimum of six hours with frequent ECGs, continuous cardiac monitoring and serial biomarker assays followed by provocative testing,

if possible, before discharge. Previous published data questioned the need for cardiac monitoring in patients with normal ECG and CK-MB levels.²⁻⁴ However, these were conducted before the widespread use of troponin as a marker of myocardial damage. It is possible that troponin could define subsets of patients at different risk.

The aim of this project was to investigate the safety of managing selected patients with suspected ACS without cardiac monitoring by determining the rate of complications occurring in patients admitted to hospital for ACS work-up who were classified as intermediate risk according to the NHF guidelines¹ and who had normal cardiac marker levels (creatinine kinase [CK], troponin) and a normal/unchanged ECG in the emergency department (ED).

Methods

This study was undertaken at Western Hospital, Footscray – a 250-bed university teaching hospital in Melbourne, Australia. It was an observational, cohort study using explicit retrospective medical record review methodology. Participants were all patients with an ED admission diagnosis of "unstable angina" or "angina" or "chest pain" suspected to be cardiac in origin for the period of 1 January 2002 to 31 December 2002, who were considered to warrant ward admission for work-up as judged by the admitting cardiology team and who met the intermediate risk criteria according to the NHF guidelines.¹ Patients would be excluded if they were discharged directly from the ED (including those with extended monitoring and marker assays), if they were transferred out of the hospital, if the ECG showed clear evidence of new ischaemia, if the medical record or ECG were incomplete/unavailable or if there was a clear documentation of a "Not For Resuscitation" or "Not For Monitoring" order due to pre-existing co-morbidity.

Data collected included demographic information, cardiac risk factors, past history of ischaemic heart disease, hospital discharge diagnosis, ECG analysis, cardiac marker assays (CK, Troponin I), adverse events and re-attendance or readmission.

Abnormal ECG was defined as the presence of new ST elevation and/or depression ≥ 1 mm and/or T-wave inversion or normalisation in two or more adjacent leads. At the time of the study, troponin levels were considered normal if <0.5 mcg/L (the then defined upper limit of normal) and abnormal if higher. Markers were measured at the discretion of the treating clinician, but usually at ED presentation and/or at 4-6 hours after pain onset and at appropriate intervals thereafter. No data were obtained on the temporal relationship between the onset of chest pain and the initial set of markers drawn.

The primary outcome of interest was the occurrence of a critical adverse event (death, cardiac arrest, life-threatening arrhythmia, cardiogenic shock) within 24 hours of hospital presentation. Life-threatening arrhythmia was defined as ventricular fibrillation, sustained ventricular tachycardia, asystole, bradycardia (heart rate <50 /min) or heart block with haemodynamic compromise or requiring pacing. Secondary outcomes were the occurrence of other adverse events including uncomplicated acute myocardial infarction (AMI), recurrent chest pain requiring ongoing monitoring or glyceryl trinitrate (GTN) infusion and other arrhythmias such as atrial fibrillation (AF) and supraventricular tachycardia (SVT) on the condition that they did not cause haemodynamic compromise. This distinction was made as, in the opinion of the investigators, the former group was likely to have benefited from continuous cardiac monitoring e.g. by early detection of rhythm change with a consequent impact on outcome. The latter group was not likely to have had any outcome benefit from continuous monitoring.

Data were analysed using descriptive statistics. The study was approved by the Melbourne Health Human Research Ethics Committee.

Results

A total of 379 met the criteria for inclusion in the study, 57% were men and the median age was 68 years (range 27-94). Cardiac risk factors were common (Table 1). Initial troponin was <0.5 mcg/L in 334 (88%) of patients and 161 (42%) were managed in

monitored cardiology beds. The median length of stay was 40 hours (range 5-550) and the median duration of cardiac monitoring in those monitored was 11 hours (range 0-162). The final diagnoses are summarised in Table 2. Of note, 55% of the sample had a final ACS diagnosis, including the 2% diagnosed as AMI.

One patient suffered a defined critical adverse event within 24 hours [0.3%, 95% CI 0.1-1.7%]. This patient suffered an AMI complicated by rapid AF without compromise 17 hours after presentation. At about 20 hours, the patient had short (3-4 second) periods of standstill, again without haemodynamic compromise, but required a semi-urgent pacing wire before pharmacological treatment of the AF at about 22-24 hours after admission. The patient recovered well. The ED ECG was normal and the 6-hour troponin was 0.3 mcg/L.

Twenty-four patients suffered other adverse events as defined (6.3%, 95% CI 4.2-9.4%). Six suffered uncomplicated AMI, 2 suffered AMI complicated by rapid AF, 11 suffered recurrent chest pain requiring monitoring (10 of whom required intravenous GTN),

3 patients suffered AF (one of them also had recurrent chest pain), 1 patient had SVT and 1 developed cardiac failure related to a blood transfusion.

Discussion

There is ongoing debate about the need for cardiac monitoring in patients with suspected ACS who have normal or unchanged ECG and normal cardiac marker levels in the ED. We found that patients with a troponin <0.5 mcg/L, CK <180 units/L and normal/unchanged ECG had a very low rate of critical adverse events within 24 hours (0.3%). This is consistent with previous analyses based on CK and CK-MB biomarkers.²⁻⁴ Collectively with this study, these studies have reported outcome data on more than 1,100 patients, with 2 deaths (both aged over 80 where an active decision not to monitor had been made) and 1 presumed urgent pacemaker insertion as the only critical adverse events.

It is possible that we have over-estimated the critical adverse event rate. It was not possible from the case record to determine the frequency of the short periods of standstill suffered by the patient classified as having a critical adverse event. Also we could not determine the urgency in the mind of the treating cardiologist of the pacing wire insertion. Thus we have erred on the conservative side in assigning it as a critical adverse event.

While a proportion of intermediate risk chest pain patients can be managed with short stay unit protocols,⁵ others will warrant admission based on past history and clinical assessment. Being able to manage intermediate risk ACS patients safely in unmonitored beds has potential benefits for the health system and for patients. There should be better access to monitored beds for high risk and AMI patients. There should be better patient flow from the ED thus reducing access block. More monitored beds might be available for other patient groups who might benefit from closer monitoring. Alternatively, less monitored beds may be necessary, thus reducing the high staffing costs associated with them.

Table 1. Cardiac risk factors

Risk factor	Number (%)
Diabetes	99 (26.1%)
Hypertension	242 (63.9%)
Hyperlipidaemia	217 (57.3%)
Smoker	60 (15.8%)
Family history	80 (21.1%)
Chronic renal impairment	25 (6.6%)

Table 2. Hospital final diagnosis

Discharge diagnosis	Number (%)
Angina	200 (52.8%)
Non-specific chest pain	143 (37.7%)
Musculoskeletal chest pain	9 (2.4%)
Acute myocardial infarction	8 (2.1%)
Gastro-oesophageal reflux	7 (1.8%)
Respiratory	6 (1.6%)
Others	6 (1.6%)

In this study, we looked at patients admitted to hospital for observation. The study hospital did not have a short stay unit or chest pain unit at the time of the study, although the principles underpinning these were applied within the limits of our resources. A significant proportion of the patients studied might have been suitable for a chest pain assessment protocol similar to that described by Aroney et al.⁵ Their finding that 65% of the patients could be re-classified as low risk after a period of observation averaging 14 hours would be broadly consistent with our findings. Our findings would however suggest that these patients do not necessarily need to have cardiac monitoring during this period. That said, access to cardiac monitoring and prolonged observation is required for those who have recurrent symptoms or later cardiac marker elevations.

Of note, 55% of the patients studied had an ACS diagnosis at discharge. This is higher than the rate reported in most 'rule out' ACS studies. It might be related to the population studied. It might be because a proportion of patients underwent a 'rule out' process in the ED (and thus were excluded) so that only those with higher clinical suspicion were referred for cardiology admission thus introducing selection bias or it might be due to the criteria individual cardiologists applied to determine an ACS diagnosis. This study was not designed to determine which of these contributed. However, if the rate of ACS was accurate, this group might well have been at higher risk making our results more convincing.

This study has some limitations that should be considered when interpreting our findings. The main limitation is the retrospective chart review methodology with its well-known issues relating to data documentation. We tried to minimise these by having explicit data collection, checking processes and clear definitions. Inter-rater agreement was only fair to moderate for some parameters. This may highlight variability in interpretation of risk stratification tables in the NHF guidelines.¹ We only studied patients who were admitted for observation and not those directly discharged from ED. It is possible that some of these

were also 'intermediate risk' and that our sample was biased towards the higher end of the intermediate risk spectrum. Unfortunately, our ethics approval conditions precluded data collection or follow-up on this group. Patients were identified by ED admission diagnosis. There might have been errors in coding resulting in missed patients that we were unable to identify. Risk stratification was retrospective and thus reliant on documentation. As some patients were not monitored for the whole 24 hours, brief, self-limiting arrhythmias might not have been detected. Timing of marker assays was at intervals dictated by duration of pain rather than time of ED arrival. This is appropriate given the release characteristics of the markers but means that timing after ED arrival was variable.

Conclusion

This study provides further evidence that intermediate ACS risk patients who have normal/unchanged initial ECG and normal cardiac markers in the ED but who require further work up can be managed without continuous cardiac monitoring.

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