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ORIGINAL ARTICLE

What is the Yield of Testing for Coronary Artery Disease after an Emergency Department Attendance with Chest Pain?

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Background Guidelines recommend testing for coronary artery disease (CAD) for emergency department (ED) patients with a negative workup for acute coronary syndrome (ACS). The rationale is that, although myocardial infarction has been ruled out, the presentation could still indicate cardiac ischaemia. Evidence supporting this recommendation is weak.

Methods Planned sub-study of prospective cohort study of ED chest pain patients with a negative ACS workup who were discharged. Primary outcome of interest was occurrence of major adverse cardiac events (MACE) within 30 days. Secondary outcomes were rate of combined MACE or revascularisation and rates and outcome of referral for CAD testing. Analyses were descriptive.

Results 742 patients were included; median age 56, 52% male. There were two MACE within 30 days (0.3%; 95% CI 0.07–1%). Two patients had revascularisation without ACS - combined MACE or revascularisation rate 0.5% (95% CI 0.2-1.4%). Seventy-five per cent of patients with adverse events had previously known CAD. There was no statistically significant difference in outcome between those referred for testing and those who were not. Age, TIMI score 0-1 and absence of known CAD performed well as potential discriminators for selective testing.

Conclusions In our study the rate of MACE within 30 days was very low, coronary intervention was rare and most patients with MACE or revascularisation had previously known CAD. For young patients, those without known CAD and those with a low TIMI score, the risk of clinically significant CAD appears to be very low. It adds to the case for abandoning routine testing for CAD.

Keywords Chest pain • Emergency Department • Non-invasive testing

Introduction

Chest pain is a common reason for presentation to Australasian emergency departments (ED). The vast majority of patients investigated for acute coronary syndrome (ACS) have a negative ACS workup; only approx. 13-23% rule in for ACS [1–3]. Current Australasian guidelines [4] recommend consideration of testing for myocardial ischaemia or coronary artery disease (CAD) for ED patients with a negative workup for ACS who are discharged from ED. Such testing may be functional or anatomic. The rationale is that although myocardial infarction (MI) has been ruled out, the presentation could still indicate coronary ischaemia or CAD which might benefit from treatment. The guideline authors acknowledged that this was a consensus recommendation and that evidence supporting this recommendation is weak [4].

Routine testing is resource intensive [5] and may result in false positive tests and further unnecessary investigations

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and procedures. Since the guidelines were published a small body of evidence has challenged the need for routine testing showing adverse event rate <1% and low rates of identification of clinically relevant CAD [6–8]. Some authors have suggested clinical characteristics for the identification of very low risk groups including age and absence of known CAD [9,10].

The aim of this study was to determine the rate of major adverse cardiac events (MACE; defined as death, new MI, survived cardiac arrest, cardiogenic shock, life-threatening arrhythmia) in patients who underwent a rule-out ACS process in ED and were discharged home and to compare outcomes between those who were referred from ED for testing for CAD and those who were not.

Methods

This was a planned sub-study of a prospective cohort study conducted in the ED of a community teaching hospital with an annual adult ED census of approximately 36,000 between 16 April 2012 and 3 February 2013.

Patients were screened for inclusion if they presented with chest pain. Exclusion criteria were chest pain due to trauma, aged <18 years, no chest pain within 24 hours of the index ED visit, chest pain lasting <10 minutes, no ECG or no troponin assay performed within 24 hours of index ED visit, a clear alternative diagnosis at initial medical officer assessment, ischaemic ECG changes at ED presentation, haemodynamic instability, advanced terminal disease, inability to communicate in English and declined/unavailable for follow-up. Patients transferred to other hospitals and self-discharging against advice were also excluded because of inability to obtain accurate follow-up data.

For this sub-study, patients admitted to hospital wards or transferred to another hospital for admission were also excluded; i.e. only patients with a negative ACS workup who were discharged from ED (including ED observation unit) were included. The ACS workup included clinical assessment, serial ECG and serial biomarker analyses (Troponin I, TnI-Ultra by Siemens Diagnostics performed on an Advia Centaur analyser). Biomarker assays were taken at ED arrival and at least three to four hours later or six hours from symptom onset in accordance with current guidelines [4]. Decision to admit was made by the treating ED clinician in consultation with the duty cardiology team. During the study period, doctors were encouraged (using educational sessions, pre-printed forms and pathway reminders) to refer patients for outpatient testing for myocardial ischaemia/CAD directly from ED however clinical judgment was allowed to guide discharge and follow-up planning.

In the study hospital the pathway for care for patients with chest pain suspicious of ACS is clinical assessment and risk stratification by an ED clinician, serial ECG and biomarker assays with observation including continuous cardiac monitoring in ED or in the Emergency Department Observation Unit. Patients with negative ACS workup who are assessed as non-high risk are discharged for further testing (if required) or follow-up in the community. Those assessed as high risk or with positive ECG or biomarkers are referred to Cardiology. The study hospital does not have a chest pain unit.

Data collected included demographics, cardiac risk factors, biomarker assay results, ED disposition, final diagnosis, data to calculate GRACE risk and freedom from events scores and TIMI score, referral to and attendance at outpatient testing for CAD and seven- and 30-day outcome. Known CAD was defined as previous MI or coronary artery bypass grafts, known coronary artery stenosis >50% or previously diagnosed angina pectoris. Seven- and 30-day outcome was assessed by review of medical records and structured telephone follow-up.

The primary outcome of interest was the occurrence of MACE within 30 days, comparing patients referred for testing for myocardial ischaemia/CAD with those who were not. MACE was defined as death, new MI, survived cardiac arrest, cardiogenic shock or life-threatening arrhythmia. These mirror adverse events as reported in similar studies. Final diagnosis was as assigned by the treating clinician. An independent cardiologist adjudicated on final diagnosis and outcome for the subgroups where patients with troponin elevations on any assay exceeded the 99th centile and were coded as non-ACS and for patients without troponin elevations who were coded as ACS. The secondary outcomes of interest were the composite of MACE or revascularisation at 30 days between referred and non-referred group and rates of compliance with ED referral for CAD testing. We also conducted an exploratory analysis for adverse outcomes using age (<40 and <50), absence of known CAD and TIMI score 0-1 as potential discriminators in an attempt to identify a very low risk group in whom testing might not be required.

Analysis was by descriptive statistics and intention to treat analysis. No formal sample size calculation was performed. The study was approved by the institutional ethics panel and was registered with the Australia and New Zealand Clinical Trials Registry (ACTRN12612000990820). Patients provided verbal consent to telephone follow-up.

Results

742 patients were included in the analysis. (Figure 1) Median age was 56 (IQR 46-67) and 52% were male. Characteristics of patients are shown in Table 1.

There were two MACE within 30 days (0.3%; 95% CI 0.07 – 1%); both non-ST segment elevation MI within one week of index visit. A further two patients had revascularisation without ACS within 30 days giving a composite MACE or revascularisation rate of 0.5% (95% CI 0.2-1.4%). Clinical features of these patients are shown in Table 2.

340 patients were referred from ED for CAD testing (46%). Of these, 265 completed testing (78%; 95% CI 73-82%). There was no statistically significant difference in MACE or combined MACE or revascularisation rates between those referred for testing and those who were not.

265 patients underwent testing for CAD; 53 stress ECG, 176 stress radionucleotide scan, 26 stress echocardiography, four