

Unnecessary hospitalisation and investigation of low risk patients presenting to hospital with chest pain

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Background

- In Australia 500,000 patients present each year with possible cardiac chest pain to EDs nationwide, accounting for around 8% of all ED presentations
 - Australian Institute of Health and Welfare 2012
- Majority will incur a hospital stay to undergo further assessment
- While chest pain may be first manifestation of an acute coronary syndrome (ACS), no more than 15% of such patients will have this diagnosis subsequently confirmed
 - Weinstock et al. JAMA Intern Med 2015

Background

- Aim of efficient triage is to identify, at an early stage, three types of patient
 - minority with probable or definite ACS for whom appropriate management must be promptly instigated
 - intermediate to high risk patients who need further risk stratification and evaluation
 - low risk patients who can be safely and quickly discharged with follow-up as necessary

Aims

- Describe the clinical characteristics, risk level, methods of evaluation and medium term outcomes of patients with chest pain admitted to a medical assessment and planning unit (MAPU) of a large tertiary hospital
- Characterise patients who were shown to have a low risk of ACS and were potentially eligible for safe discharge early in their hospital stay

Methods

- Retrospective study of all consecutive patients admitted with chest pain for further evaluation to the MAPU at PAH between February 1st and June 1st 2012
- Patients underwent initial ECG and first troponin assay in ED
 - If negative, admitted to general or cardiology bed
 - If positive admitted to cardiology bed
 - During study period, no formal guidelines on stratifying risk of CAD or indications for subsequent investigation
 - choice of testing or use of telemetry left to discretion of treating consultant

Methods

- Data collected from medical notes, discharge summaries, and electronic pathology and radiological databases
- Demographic details
- Initial description of chest pain
 - atypical or typical for ischaemia
- Results of serial ECGs, troponin assays and cardiac investigations performed
 - exercise stress test, rest or stress echocardiogram, myocardial perfusion scan, CTCA] and ICA,
- Use of telemetry
- Length of hospital stay
- TIMI (Thrombolysis in Myocardial Infarction) scores retrospectively calculated for all patients
 - range of 0-7, with low risk ascribed to scores of 0 or 1
 - Hess et al. Acad Emerg Med 2010

Methods

- Outcomes during the index admission
 - Diagnosis of ACS and all-cause death
 - Yield of diagnostic tests
 - Frequency of coronary revascularisation
 - either PCI or CABG
- Outcomes at 6 months follow-up
 - Major adverse cardiac events (MACE)
 - diagnosis of ACS, all-cause death and readmission for cardiac diagnoses to any public hospital throughout the state
 - as ascertained using state-wide public hospital electronic databases via Viewer software

Results

- 321 patients were included
- Mean age 58.4 (+/-SD 14.1)
- Mean length of stay 1.6 (+/- SD 1.2) days
- 151 (47.0%) admitted to telemetry beds
- 73 (22.7%) patients had known CAD
- 54 (16.8%) patients described typical pain
- Mean TIMI score was 1.8 (+/- 1.7)
 - 167 (52.0%) patients had TIMI score 0 or 1
 - TIMI = 0, n=103; TIMI =1, n=64

Results

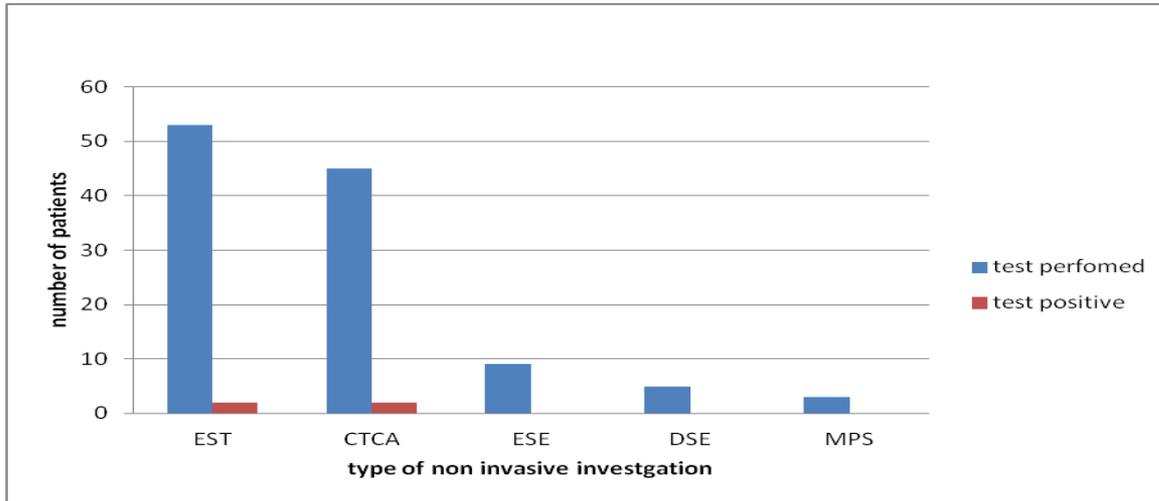
Initial investigations in emergency department

- 31 (9.6%) patients provisionally diagnosed in ED as having ACS
 - elevated troponin on presentation (n=30)
 - new or dynamic ECG changes (n=7)
 - All had TIMI score >3
- 25 (80.6%) had diagnosis of ACS confirmed at discharge following further evaluation
- 15 patients (48.4%) underwent ICA
 - 11 were diagnosed as having ACS in ED. Of these 15 patients, 10 (66.7%) demonstrated CAD, with five patients undergoing PCI and two referred for CABG.

Results

Subsequent course of patients with initially negative investigations in ED

- 290 patients; 112 (38.6 %) underwent non-invasive testing
- 159 (54.8%) low risk (TIMI score of 0 or 1)
 - Tests in 52 (32.0%); one (0.6%) positive
- 131 patients (45.2%) intermediate to high risk (TIMI scores ≥ 2)
 - Tests in 60 (45.8%); 3 (2.3%) positive



Results

Factors associated with testing

	Non- invasive tests (n=112)	No testing (n=178)
Average age (+/-SD)	57.1 (+/-12.7)	58.8 (+/- 13.3)
History of CAD	6/112 (5.3%)	51/178 (28.6%)*
% Male	69/112 (61.6)	109/178 (61.1%)
Typical chest pain	17/112 (12.7%)	24/178 (13.4%)
Average TIMI score	1.82+/-1.65	1.76+/-1.59

*p<0.001

Results

Subsequent in-hospital course of patients with initially negative investigations in ED

- 290 patients (90.3% of cohort)
 - 6 (2.1 %) with confirmed ACS at discharge
- 159 (54.8%) patients deemed low risk (TIMI score of 0 or 1)
 - 6 (2.1 %) subsequently diagnosed as ACS at discharge
 - TIMI score 0 or 1 = 2 (1.2%) patients
 - TIMI score ≥ 2 = 4 (2.5%) patients

Results

Follow-up to 6 months of patients with initially negative investigations in ED

- Outcome data on all 290 patients
- Mortality: 2 (0.7%)
 - palliative care for advanced multi-morbidity (n=1)
 - long-standing refractory congestive heart failure (n=1)
- Readmissions: 47 (16.2%)
 - Confirmed diagnosis ACS (n=1; TIMI score=4) urgent PCI
 - Non-ACS diagnoses (n=46)
 - stable angina (n=4)
 - atypical chest pain (n=22)
 - gastro-oesophageal reflux (n=4)
 - musculoskeletal chest pain (n=8)
 - other non-cardiac causes (n= 7)

Summary

Among 290 patients admitted to MAPU with chest pain following initially negative results in ED

- More than half were low risk (TIMI score 0 or 1)
- A third underwent non-invasive testing on an ad hoc basis
 - <4% returned positive results
- Only 2% confirmed as having ACS at discharge
 - Only 2% demonstrated CAD at coronary angiography
- No in-hospital deaths
- <1% mortality at 6 months: all non-coronary
- <1% re-presented with ACS
- Even among patients with intermediate to high risk (TIMI scores ≥ 2), yield of ACS 3%; rates of MACE 2%

Implications

- More than 9 out of 10 patients admitted to MAPU for further evaluation of chest pain after initially negative investigations in ED have no ACS, death or cardiac-related readmission at 6 months follow-up
- Further testing in such patients has very low yield for CAD
- At least half of all patients with TIMI scores of 0 and 1 and initially negative investigations in ED could be discharged without any further evaluation
 - Most emergency physicians will accept a MACE rate at 30 days of <1% in presence of initially negative investigations in ED
 - Than et al. Int J Cardiol 2013; 166:752-758

Discussion

- Accelerated diagnostic protocols (ADPs) and clinical assessment pathways that integrate TIMI scores with results of initial ECGs and troponin results in ED can reliably identify low risk patients who can be rapidly discharged with 30-day MACE rates of <1%.^{28,29}
 - Than et al. Lancet 2011; **377**: 1077–1084.
 - Than et al. JAMA Intern Med 2014; 174:51_
- Such protocols decongest EDs and MAPUs by minimising the time and resources expended on investigating low risk patients with chest pain and avoid adverse events incurred by unnecessary and, in some cases, invasive management
 - 15-fold risk of care related complications compared to benefits realised in terms of prevented MACE among low risk patients who are admitted for investigation
 - Weinstock et al JAMA Intern Med 2015;175 (7):1207-1212
- Initiatives aimed at systematising the use of ADPs have shown increased numbers of low risk patients discharged more quickly from ED.
 - Between 19% and 70% of patients with undifferentiated chest pain
 - George et al. Emerg Med Australas 2013; 25(4):340-4.
 - Munro et al. N Z Med J 2015; 128(1408):62-71.

Discussion

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<http://dx.doi.org/10.1016/j.hlc.2016.06.789>

POSITION STATEMENT

National Heart Foundation of Australia & Cardiac Society of Australia and New Zealand: Australian Clinical Guidelines for the Management of Acute Coronary Syndromes 2016



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2.4.1. Use of Clinical Assessment Protocol

Recommendation: A patient presenting with acute chest pain or other symptoms suggestive of an ACS should receive care guided by an evidence-based Suspected ACS Assessment Protocol that includes formal risk stratification. (NHMRC Level of Evidence (LOE): IA; GRADE strength of recommendation: Strong).

Discussion

Table 5 Performance of various risk scores and Clinical Assessment Protocols in the management of suspected ACS#

Tool ^	Sens	Spec	NPV	PPV	LR	Proportion in risk group	References
High risk Risk Score (Positive Likelihood ratios)							
HFA – high risk	78 - 100	8 – 72	98	23	2.2-2.7	33-59%	[6,36,200]
TIMI 5-7	22	96.4	92	39	6.8	1-5%	[7,36]
GRACE \geq 100	69	76	96	24	2.9	28%	[36]
HEART score 7-10					13		[30,37,201,202]
Low risk Risk Score (Negative Likelihood ratios)							
TIMI 0-1	89 - 98	13 - 56	96 - 99	12 - 20	0.19	23 – 51%	[30,36,200,203,204]
HEART score	58- 100	32 - 85	96-99	4-34	0.05-0.15	28 -34%	[30,41,42,205,206]
HFA - Low	100	1	100	10	0.4	1-17%	[7,36]
GRACE \leq 50	99	27	100	13	0.04	24%	[36]
GRACE FFE score	93-100	35-68	100		0.4		[39,207]
MACS rule	98		99		0.09		[32,208]
Low risk Suspected ACS-APs (Negative Likelihood ratios)							
ADAPT ADP*	100	23	100	19	0.014	20%	[43,108]
Modified ADAPT ADP*	99	47-49	100	26-28	0.17	39-42%	[49,209]
HEART Pathway^^	99-100		99-100		0.04	20-82%	[45,48]
EDACS-ADP*	99- 100	50-59			0.011	42 - 51	[31]
NACPR (age cut-off 50)	100	20.9	100		0	18%	[46]
TRUST ADP	99	43	100	14	0.029	40%	[210]
TRAPID	97	75	99	44	0.044	17%	[86]

Note: All values are rounded to nearest whole number

#Table was modified from Fanaroff AC, et al. "Does This Patient With Chest Pain Have Acute Coronary Syndrome?: The Rational Clinical Examination Systematic Review." JAMA. 2015;314(18):1955-65. [211]

Discussion

2.6.1. Selection of Patients for Further Diagnostic Testing

- (a) **Recommendation:** Non-invasive objective testing is recommended in intermediate-risk patients, as defined by a validated Suspected ACS-AP, with normal serial troponin and ECG testing and who remain symptom free (NHMRC Level of Evidence (LOE): IA; GRADE strength of recommendation: Weak).
- (b) **Recommendation:** Patients in whom no further objective testing for CAD is recommended are those at low risk, as defined by a validated Suspected ACS-AP: age <40 years, symptoms atypical for angina, in the absence of known CAD, with normal troponin and ECG testing and who remain symptom free (NHMRC Level of Evidence (LOE): III-3C; GRADE strength of recommendation: Weak).