Evaluating the benefits of a rapid access chest pain clinic in Australia

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The known: Rapid access chest pain clinics (RACPCs), common in the United Kingdom, could improve the management of patients with chest pain in Australia.

The new: Median review times and the numbers of clinic reviews required for a diagnosis were lower for patients attending an Australian RACPC than for those attending a general cardiology clinic. Further, emergency department re-attendances and adverse events at 30 days and 12 months were less frequent.

The implications: The RACPC model of care for people with new onset chest pain may have important benefits to Australian hospitals.

Abstract

Objectives: To compare the outcomes and safety of a rapid access chest pain clinic (RACPC) in Australia with those of a general cardiology clinic.

Design: Prospective comparison of the outcomes for patients attending an RACPC and those of historical controls.

Setting: Royal Hobart Hospital cardiology outpatient department.

Participants: 1914 patients referred for outpatient evaluation of new onset chest pain (1479 patients seen in the RACPC, 435 patients previously seen in the general cardiology clinic).

Main outcome measures: Service outcomes (review times, number of clinic reviews); adverse events (unplanned emergency department re-attendances at 30 days and 12 months; major adverse cardiovascular events at 12 months, including unplanned revascularisation, acute coronary syndrome, stroke, cardiac death).

Results: Median time to review was shorter for RACPC than for usual care patients (12 days [IQR, 8–15 days] *v* 45 days [IQR, 27–89 days]). All patients seen in the RACPC received a diagnosis at the first clinic visit, but only 139 patients in the usual care group (32.0%). There were fewer unplanned emergency department re-attendances for patients in the RACPC group at 30 days (1.6% *v* 4.4%) and 12 months (5.7% *v* 12.9%) than in the control group. Major adverse cardiovascular events were less frequent among patients evaluated in the RACPC (0.2% *v* 1.4%).

Conclusions: Patients were evaluated more efficiently in the RACPC than in a traditional cardiology clinic, and their subsequent rates of emergency department re-attendances and adverse cardiovascular events were lower.

Chest pain is frequently a reason for presentations to primary care physicians and hospital emergency departments;[1] in fewer than 15% of cases, the underlying cause is an acute coronary syndrome.[2] The associated costs are substantial, particularly when patients are admitted to hospital for further investigation.[2] Australian guidelines advise that people at low to intermediate risk of acute coronary syndrome be managed as outpatients if timely follow-up can be provided.[3]

Rapid access chest pain clinics (RACPCs), first established in the United Kingdom in the late 1990s, have been found to facilitate safe, efficient and cost-effective evaluation of people with new onset chest pain.[4–8] Patients and referrers report a high degree of satisfaction with this model of care.[9] However, the RACPC model has not been extensively assessed outside the UK,[10] and their outcomes have not been compared with those of typical general cardiology clinics.

Evaluating the RACPC model in an Australian setting has been suggested.[10,11] We therefore tested the hypothesis that an RACPC would provide more efficient care and superior clinical outcomes for patients with new onset chest pain than the usual care model of cardiology outpatient clinics.

Methods

Rapid access chest pain clinic care

An RACPC was established at the Royal Hobart Hospital on 24 June 2014 as a partnership between the departments of cardiology and general medicine. The clinic accepted referrals from emergency and primary care physicians of patients with new onset chest pain that suggested myocardial ischaemia, as well as patients for whom this diagnosis needed to be excluded. Patients with known cardiovascular disease were excluded from the clinic as they were likely to require ongoing follow-up in the general clinic. Pre-referral testing was undertaken at the discretion of the referring doctor. Data for eligible patients seen at the RACPC to 14 December 2016 were included in our analysis.

All patients were contacted by telephone within 72 hours of referral and offered an RACPC appointment within the following 2 weeks. Fasting lipid levels were reviewed or assessed if recent results were not available. The RACPC operated one half-day per week, reviewing 15–20 patients per session. Patients were initially seen by a registered nurse, who documented their cardiovascular risk factors, took an electrocardiogram (ECG), and calculated their 5-year Australian absolute cardiovascular disease risk score (www.cvdcheck.org.au); this risk score was used for risk factor modification rather than for guiding clinical decision-making regarding the presenting symptom. Clinical review was undertaken by a cardiologist, general physician, or advanced trainee. Further investigation was arranged as necessary, with priority access facilitating prompt testing. The patient was followed up by telephone by the clinic nurse or doctor, generally within 48 hours of the initial investigation. The RACPC was designed as a single attendance clinic; if a significant finding was made, the patient was followed up in the general cardiology clinic.

Usual care (control group)

We undertook a retrospective chart review of all patients who attended general cardiology clinics during 2 July 2012 – 26 December 2013. Patients who were referred for assessment of

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chest pain, and would therefore have met the eligibility criteria for RACPC care, were selected for the control group; those with a prior history of cardiovascular disease were excluded. The general clinic accepted any patients referred from the emergency department or the community, without specific exclusion criteria.

Patients received an appointment with the first available cardiologist or advanced trainee, and the patient was notified by mail. No investigations were routinely undertaken prior to the review. The clinic doctor determined whether further investigation or follow-up visits were required. Nursing support was available, but the nurse did not undertake any clinical assessment.

Clinical data

For the RACPC group, patient demographic data, referral details, and risk factor profile were recorded prospectively. If an ECG had been taken prior to referral, its result was recorded as normal, showing non-specific changes, or showing changes suggestive of ischaemia. If available, pre-referral troponin levels were categorised as normal, mildly abnormal (1–3 times the upper limit of normal), or abnormal (more than 3 times the upper limit of normal). The nature and outcome of any investigations ordered by the RACPC clinician were recorded, as was the final diagnosis.

For the control group, patient demographic data, referral details, and risk factor profile were determined by a retrospective review of their medical records.

Outcomes

Service outcomes were time from referral to review and number of clinic appointments prior to a diagnosis. Adverse outcomes were emergency re-attendances by 30 days and 12 months, and major adverse cardiovascular events (unplanned revascularisation, acute coronary syndrome, stroke, cardiac death) at 12 months, as determined from ongoing review of digital medical records.

Statistical analysis

Data analysis was performed in SPSS 24 (IBM). Values for continuous variables are expressed as means with standard deviations (SDs) or medians with interquartile ranges (IQRs). Categorical variables are expressed as numbers and proportions, and assessed in Pearson χ^2 tests. Adverse outcomes were analysed by multiple logistic regression (enter method). Odds ratios for adverse events were calculated, adjusted for age, sex, hypertension, dyslipidaemia, smoking status, and diabetes.

Ethics approval

This study was approved by the Tasmanian Human Research Ethics Committee (reference, H0016976).

Results

Between 24 June 2014 and 14 December 2016, 1479 patients were seen in the RACPC. A 5-year absolute cardiovascular disease risk calculation was documented for 1400 patients (94.7%), of whom 954 (68.1%) were deemed to be at low risk (< 10%), 139 (9.9%) at intermediate risk (10–15%), and 307 (21.9%) at high risk (> 15%). A retrospective review of 4038 patients seen in the general cardiology clinic between 2 July 2012 and 26 December 2013 identified 435 people referred for new chest pain (10.8% of all patients) who met the RACPC eligibility criteria and were therefore included in our usual care control group.

The baseline characteristics of the two groups were similar. Larger proportions of the RACPC group were smokers (26.3% *v* 20.9%) and had been referred from the emergency department (70.5% *v* 18.4%). Lower proportions of the control group had undergone pre-referral troponin or ECG assessments; the results for those who had been assessed by the referring doctor were similar to those of patients in the RACPC group (Box 1).

The median time from referral to clinic review was shorter for patients in the RACPC (12 days; IQR, 8–15 days) than in the control group (45 days; IQR, 27–89 days). At least one additional clinic visit was required for a diagnosis in 296 cases in the control group (68.0%), but not for any patients in the RACPC group, who were followed up exclusively by telephone (Box 2).

Clinical testing

Initial cardiac investigations were ordered for 1194 RACPC (80.7%) and 314 control patients (72.2%) ($P < 0.001$). Additional testing was required for 134 RACPC (9.1%) and 38 control patients

1 Baseline characteristics of rapid access chest pain clinic (RACPC) and usual care (control) patients

	RACPC group	Control group	*P*
Number of patients	1479	435	
Demographic characteristics			
Age (years), mean (SD)	55.9 (13.1)	54.6 (13.5)	0.07
Sex (men)	708 (47.9%)	204 (46.9%)	0.72
Risk factors			
Hypertension	656 (44.4%)	200 (46.0%)	0.55
Diabetes mellitus	198 (13.4%)	58 (13%)	0.98
Current smoking	389 (26.3%)	91 (21%)	0.023
Dyslipidemia	546 (36.9%)	164 (37.7%)	0.77
Referral source			< 0.001
Emergency department	1042 (70.5%)	80 (18%)	
General practitioner	437 (29.5%)	355 (81.6%)	
Pre-referral electrocardiogram			< 0.001
Not documented in referral	0	112 (25.7%)	
Available for review	1479 (100%)	323 (74.3%)	
Normal	1303 (88.1%)	277 (85.8%)	0.24
Non-specific ST changes	160 (10.8%)	41 (13%)	0.33
Ischaemic changes	16 (1.1%)	5 (1.5%)	0.48
Pre-referral troponin level			< 0.001
Not documented in referral	168 (11.3%)	334 (76.8%)	
Available for review	1311 (88.6%)	101 (23.2%)	
Normal	1225 (93.4%)	97 (96%)	0.30
1–3 × upper limit of normal*	81 (6.2%)	3 (3.0%)	0.20
≥ 3 × upper limit of normal*	5 (0.4%)	1 (1.0%)	0.36

SD = standard deviation. * Defined as 99th percentile reference limit. ◆

2 Service outcomes for rapid access chest pain clinic (RACPC) and usual care (control) patients

	RACPC group	Control group	*P*
Number of patients	1479	435	
Time from referral to first review (days), median (IQR)	12 (8–15)	45.0 (27–89)	< 0.001
Number of clinic visits required for diagnosis			< 0.001
1	1479 (100%)	139 (32.0%)	
2	0	253 (58.2%)	
3	0	34 (7.8%)	
≥ 4	0	9 (2%)	

(8.7%; $P = 0.84$). A larger proportion of RACPC patients underwent exercise stress electrocardiography or myocardial perfusion imaging, but a smaller proportion underwent invasive angiography. When angiography was performed, abnormal findings were more frequent for patients in the RACPC group (Box 3).

A cardiac cause for the presenting symptom was identified more frequently in patients in the RACPC than in the control group (10.3% *v* 6.7%; $P = 0.022$) (Box 4). Common diagnoses for patients without a cardiac aetiology included musculoskeletal symptoms and gastroesophageal reflux, for whom follow-up by a general practitioner was generally recommended.

Every RACPC patient was followed up by telephone, while 42 patients in the control group (9.7%) failed to attend follow-up ($P < 0.001$).

Adverse events

Unplanned emergency department re-attendances were less frequent among patients in the RACPC group at 30 days (1.6% *v* 4.4%; odds ratio [OR], 0.36; 95% confidence interval [CI], 0.19–0.67) and 12 months (5.7% *v* 13%; OR, 0.41; 95% CI, 0.28–0.58). The number of major adverse cardiovascular events within 12 months was also lower for patients in the RACPC group (0.2% *v* 1.4%; OR, 0.09; 95% CI, 0.02–0.46) (Box 5).

None of the 285 RACPC patients for whom no investigations were ordered (19.3%) had experienced an adverse event by 12 months, and none experienced an adverse event between the date of referral and the clinical review in the RACPC.

Discussion

We prospectively evaluated a new RACPC in Hobart by comparing service outcomes and adverse outcome rates for patients with new onset chest pain with those of people attending a general cardiology clinic. The service outcome benefits reported in the UK[4–8] were confirmed by our study. Specifically, the median time to review and the number of clinic appointments were

3 Cardiac investigations of rapid access chest pain clinic (RACPC) and usual care (control) patients

	Investigation ordered (proportion of patients)			Abnormal result (proportion of tests)		
	RACPC group	Control group	*P*	RACPC group	Control group	*P*
Number of patients	1479	435				
Investigation						
Any investigation						
Initial investigation	1194 (80.7%)	314 (72.2%)	< 0.001	—	—	
Second investigation	134 (9.1%)	38 (8.7%)	0.84	—	—	
Exercise stress electrocardiogram						
Initial investigation	438 (29.6%)	78 (18%)	< 0.001	72 (16%)	10 (13%)	0.42
Second investigation	3 (0.2%)	0	0.35	0		
Exercise stress echocardiogram						
Initial investigation	174 (11.8%)	40 (9.2%)	0.13	21 (12%)	6 (15%)	0.61
Second investigation	12 (0.8%)	4 (0.9%)	0.83	1 (8%)	0	0.55
Myocardial perfusion scan						
Initial investigation	404 (27.3%)	89 (20%)	< 0.001	62 (15%)	18 (20%)	0.26
Second investigation	32 (2.2%)	7 (2%)	0.47	5 (16%)	0	0.26
Cardiac computed tomography						
Initial investigation	116 (7.8%)	23 (5.3%)	0.07	8 (7%)	0	0.19
Second investigation	20 (1.4%)	3 (0.7%)	0.26	2 (10%)	0	0.57
Invasive coronary angiography						
Initial investigation	62 (4.2%)	58 (13%)	< 0.001	33 (53%)	12 (21%)	< 0.001
Second investigation	67 (4.5%)	24 (5.5%)	0.39	38 (57%)	7 (29%)	0.022

4 Cardiac diagnoses for rapid access chest pain clinic (RACPC) and usual care (control) patients

	RACPC group	Control group	*P*
Number of patients	1479	435	
Any cardiac diagnosis	153 (10.3%)	29 (6.7%)	0.022
Ischaemia requiring revascularisation	59 (4.0%)	15 (3.4%)	0.61
Ischaemia managed medically	46 (3.1%)	7 (1.6%)	0.09
Arrhythmia	8 (0.5%)	3 (0.7%)	0.72
Cardiomyopathy	8 (0.5%)	1 (0.2%)	0.40
Heart failure with preserved ejection fraction	18 (1.2%)	1 (0.2%)	0.07
Valvular heart disease	7 (0.5%)	0	0.15
Pericarditis	2 (0.1%)	1 (0.2%)	0.66
Aortic aneurysm	1 (0.1%)	0	0.59
Hypertensive heart disease	4 (0.3%)	1 (0.2%)	0.88

significantly lower for patients reviewed in the RACPC, and these patients also underwent less invasive clinical investigation. These gains did not compromise patient safety: rates of emergency department re-attendance and of major adverse cardiovascular events at 12 months (particularly of acute coronary syndrome and stroke) were significantly lower for the RACPC group, which may reflect the greater focus of the RACPC on assessing and managing cardiovascular risk factors. The low adverse event rates we found are similar to those recently reported for a case series evaluation of an RACPC in a major Sydney tertiary hospital.[12]

We aimed to review patients within two weeks of referral, rather than the 72 hours often described.[13] Our review target was determined in consultation with referring doctors, and is consistent with current Australian guidelines.[14] In practice, review times were sometimes longer, largely because patients preferred convenience to promptness, consistent with observations in other RACPCs.[11] The two-week target is practicable and safe, no patient having experienced an adverse event during this period. Further, most patients seen in the RACPC had a normal high sensitivity troponin level before referral, which itself predicts a low 30-day risk of adverse events.[15]

RACPC-initiated investigations were at the discretion of the treating clinician. An alternative model, recently evaluated in an Australian hospital,[11] includes routine exercise testing before review. The investigators reported a low rate of unplanned re-presentations at 28 days (2.6%) and no episodes of acute coronary syndrome; however, the burden of investigation was high, with 93% of patients undergoing exercise testing, leading to additional investigations in 35% of those tested. In our study, the initial RACPC review identified that 19.3% of patients required no investigation, and no major adverse cardiovascular events were subsequently encountered in this group. Only 9.1% of patients required more than one investigation. Data from the UK similarly indicated that the overall burden of testing was reduced in an RACPC, with early functional imaging and cardiac computed tomography more frequent.[16] Further, employing a range of investigations, selected according to the clinical presentation of the individual patient, facilitates considering a broader range of cardiac diagnoses than obstructive coronary disease alone.

In our study, we found invasive angiography was ordered significantly less frequently for patients in the RACPC group than those in the control group. This was probably because streamlined access to non-invasive testing was available, with prompt follow-up and progression to angiography when indicated. The overall reduction in invasive procedure rates in the RACPC would be expected to achieve significant cost savings.

The high prevalence of cardiovascular risk factors among patients attending the RACPC[17] was again noted. RACPCs could play a role in the opportunistic management of modifiable risk factors, including encouraging patients to re-engage with general practitioners.

Limitations

The data for RACPC patients were compared with data from a retrospective review of a general cardiology clinic, and the two source populations may have differed in some respects. However, the higher rate of cardiac diagnoses for patients attending the RACPC, as well as similar baseline risk factor profiles, suggest that cardiovascular risk was not lower in the RACPC group than in the control group.

RACPC patients were more frequently referred from the emergency department than those attending the cardiology clinic. This reflects the historical practice of emergency department staff directing discharged patients to their general practitioner, with the recommendation they be further referred to an outpatient cardiology clinician.

The numbers of adverse cardiovascular events were low in both groups, and this needs to be considered when comparing the safety of the two models, particularly given that the control group was derived from a retrospective review. Patients in the RACPC were more likely to undergo cardiac investigation, and this may have been a factor in the superior clinical outcomes for this group.

We are confident that we captured all adverse events in both groups, as Tasmania has a single public health system with

5 Adverse events for rapid access chest pain clinic (RACPC) and usual care (control) patients

	RACPC group	Control group	Adjusted odds ratio (95% CI)*
Number of patients	1479	435	
Emergency re-presentation (30 days)	24 (1.6%)	19 (4.4%)	0.36 (0.19–0.67)
Emergency re-presentation (12 months)	85 (5.7%)	56 (13%)	0.41 (0.28–0.58)
Major adverse cardiovascular event (12 months)	3 (0.2%)	6 (1.4%)	0.09 (0.02–0.46)
Unplanned revascularisation	3 (0.2%)	2 (0.5%)	0.35 (0.05–2.65)
Acute coronary syndrome	2 (0.1%)	3 (0.7%)	0.09 (0.01–0.97)
Stroke	0	3 (0.7%)	—
Cardiac death	0	0	—

CI = confidence interval. * Adjusted for age, sex, hypertension, diabetes, smoking, and dyslipidemia. ◆

linked digital medical records. Some patients may have experienced adverse events interstate or in private hospitals, but their numbers would be few.

Conclusions

In an Australian setting, patients with new onset chest pain were safely evaluated more efficiently in an RACPC than in a general cardiology clinic. Specific benefits were reduced numbers of clinic attendances and invasive investigations, and lower rates of emergency department re-presentations and adverse cardiovascular events. Further evaluation of the cost-effectiveness of the RACPC model would be valuable. Finally, our study again documents the high prevalence of cardiovascular risk factors among people attending the RACPC, which may also offer opportunities for initiating preventive measures for the patients most likely to benefit from them.

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