Title: The management of Indigenous patients presenting with non ST-segment elevation acute coronary syndrome in South Australia: a retrospective cohort study.

Type: Original Article

Authors:

Yvette L Roe (Corresponding Author, roeyl001@mymail.unisa.edu.au)	University of South Australia - Sansom Institute for Health Research Corner of Frome Road North Terrace Adelaide, Adelaide, South Australia 5000, Australia
Adrian Esterman	University of South Australia - School of Nursing and Midwifery North Terrace , Adelaide, South Australia 5000, Australia
Robyn McDermott	James Cook University - Faculty of Medicine, Health & Molecular Sciences Cairns, Queensland, Australia
Christopher Zeitz	The Queen Elizabeth Hospital - Division of Medicine Woodville, South Australia, Australia

Keywords: Indigenous, age, gender, acute coronary syndrome, therapeutic intervention, diagnostic coronary angiography

This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as doi: 10.1111/imj.12949

Abstract

Aim: Using Australian guidelines for management of acute coronary syndromes (ACS), we assessed the probability of an Indigenous patient receiving interventional and therapeutic care after presenting in two metropolitan hospitals.

Methods: A retrospective case note review of patients admitted through two Adelaide public tertiary hospital emergency departments from December 2007 to December 2009. The study cohort was 488 patients with high-risk clinical features without ST-segment-elevation.

Results: Indigenous patients were significantly younger, present later in the disease process and have a higher burden of cardiovascular risk factors, when compared to non-Indigenous patients. Indigenous patients were 54% more likely to receive angiography (RR=1.54; 95% CI 1.31;1.81) than non-Indigenous patients however this difference disappeared after adjustment for age, sex and propensity score. Indigenous patients were 20% more likely to receive the recommended medications (RR=1.19, 95% CI 1.01;1.40) compared to non-Indigenous patients. Patients over 65 years were 53% less likely to receive an angiogram (RR=0.47, 95% CI 0.38;0.56) and were 35% less likely to receive the recommended medications (RR=0.65, 95% CI 0.54;0.78) than a patient at the ages of 18-49. Women were almost 20% less likely to receive an angiogram (RR=0.81, 95% CI 0.66;0.99) and 20% less likely to receive the recommended medications (RR=0.80, 95% CI 0.71;0.91) when compared to men. The likelihood of receiving medications on discharge was significantly influenced by age, gender, ethnicity, comorbid burden and revascularisation.

Conclusions: The younger age and significantly higher risk profile of Indigenous adults presenting to SA hospitals with ACS appears to lead to different management decisions, which may well be led by patient factors. Many of these risk conditions can be better managed in the primary care setting.

Keywords: *Indigenous, gender, age, therapeutic intervention, diagnostic coronary angiography, acute coronary syndromes*

Introduction

Compared to other Australians, Indigenous people are three times more likely to have a coronary event, 40% more likely to have out-of-hospital-death from coronary heart disease and 40% less likely to be investigated by angiography.[1] This is problematic as cardiovascular disease (CVD) followed by diabetes accounts for one-fifth of the health 'gap' in shortened life expectancy experienced by Indigenous Australians. Indigenous people at the ages of 35-44 years are 9-12 times more likely to die from CVD than non-Indigenous Australians.[2]

The few studies that examine revascularisation rates after an acute cardiac event comparing Indigenous patients and non-Indigenous patients report mixed results.[2-4] We assessed the probability of an Indigenous patient receiving Australian guideline-concordant interventional and therapeutic care for acute coronary syndromes (ACS) after presenting at two metropolitan Australian hospitals. The outcome of interest was whether Indigenous patients diagnosed with non ST-segment elevation acute coronary syndromes (NSTEACS) received diagnostic coronary angiography and discharge medications as recommended in the Australian guidelines for the management for ACS[5,6].

Methods

Study cohort

We conducted a retrospective case note review of patients admitted through two Adelaide metropolitan public tertiary hospital emergency departments from December 2007 to December 2009 who were categorised as having high-risk NSTEACS. Inclusion criteria included persistent ECG changes of ST-segment depression, haemodynamic compromise, prior coronary intervention within 6 months, presence of known diabetes and elevated level of at least 1 cardiac biomarker.[5]

The variables extracted from in-hospital patient medical records included demographic data, history of CVD, clinical presentation, and in-hospital treatment. The sample cohort consisted of 3941 non-Indigenous and 159 Indigenous patients (Figure 1). To provide clinical significance sample sizes of 85 Indigenous patients and 403 non-Indigenous patients were used to achieve 80% power to detect a rate ratio for each outcome measure of 1.2. The rate in the Indigenous group is assumed be 0.60 under the

null hypothesis and 0.72 under the alternative hypothesis. The rate in the non-Indigenous group is 0.6. The significance level of the test was targeted at 0.05. At both study sites, Indigenous status was identified in the hospital administrative database and confirmed by a manual review of the patient medical records.

Guidelines for the management of ACS

The Australian guidelines for the management of ACS recommend that patients at high-risk of a secondary cardiac event (except those with severe comorbidities) undergo angiography. The procedure examines the cause of acute ischaemia and the extent of underlying coronary artery disease (CAD), consequently influencing patient management.[7] In addition, the guidelines recommend medications that should be prescribed before discharge for high-risk patients: aspirin, clopidogrel, angiotensin-converting enzyme inhibitor or angiotensin receptor antagonist, β blocker and statin. If at least three of the five recommended medications were prescribed to the patient on discharge, the care was assessed as guideline-concordant.

Propensity Score

To account for potential confounders[7], a propensity score was calculated based on cardiovascular risk factors (hypertension, diabetes, smoking status); history of previous infarction; percutaneous or surgical revascularisation; peripheral artery disease; and troponin release. Logistic regression with Indigenous status as the dependent variable was used to create the propensity score.

Adjusting for Age

The Australian Indigenous population is relatively young and characterized by higher fertility and lower life expectancy than the non-Indigenous population. [8] Life expectancy at birth for males is 59 years and 65 years for females, with the most recent estimate of an 11 year life expectancy 'gap' when compared to non-Indigenous Australians.[8] In addition, health disparities between Indigenous and non-Indigenous populations are not constant over the life course. Higher mortality rates for Indigenous people in potentially the most productive years of their life, add to the differing population

structures in the groups.[9-12] We adjusted for age as it is almost certainly a confounding variable. Because of this, age was used as a separate covariate rather than including it in the propensity score.

Analysis

We used risk ratios (RRs) to estimate the likelihood of having angiography and medications on discharge among Indigenous patients compared to non-Indigenous patients. We included descriptive and multivariate analyses. The descriptive analysis includes the health profile of the study populations by gender and age as well as comorbidities and risk factors that may be associated with angiography and discharge medications. We applied a 3-step approach to develop the model-based estimate. Model 1 is an unadjusted univariate analysis with Indigenous status as the independent variable, Model 2 is Model 1 adjusted for age, and Model 3 is Model 1 adjusted for age and propensity score. Log binomial generalized linear models were primarily used, and replaced with robust Poisson models in the case of non-convergence.

Results

Descriptive Analysis

Description of the study population

The clinical characteristics of the 85 Indigenous subjects with high-risk NSTEACS and 403 non-Indigenous high-risk patients are presented in Table 1. The Indigenous cohort was substantially younger, more likely diabetic, and or known to have coronary artery disease (CAD). Current smoking rates were much higher for Indigenous patients regardless of gender compared to non-Indigenous patients. Notably, a higher proportion of Indigenous patients received an angiogram compared to non-Indigenous patients. A larger proportion of Indigenous women received an in-hospital revascularisation procedure i.e. percutaneous coronary intervention (PCI) and coronary artery bypass graft (CABG). Almost half of the non-Indigenous patients were re-hospitalised within 12 months of discharge. There were more in-hospital deaths of non-Indigenous patients and a larger proportion died within 12 months of initial hospital discharge.

Age, comorbidity and risk factor profile

When stratified by age-group, comorbidity, risk factors and Indigenous status, 82% of Indigenous patients were under 64 years of age compared to just an over a third of non-Indigenous patients. Indigenous patients accrued comorbidities earlier, notably diabetes and hypertension. Both groups had a similar proportion of high risk features that may influence the onset of a second acute cardiac event (Table 2).

Diagnostic Angiogram

Table 3 shows the bivariate analysis that examined factors associated with angiogram including age, ethnicity, transfer to metropolitan hospital, lifestyle risk factors and revascularisation. Patients over 65 years were 53% less likely to receive an angiogram than those aged 18-49 years (RR=0.47, 95% CI 0.38;0.56). Women were 19% less likely than men to receive an angiogram (RR=0.81, 95% CI 0.66;0.99). Patients with known CAD were 24% less likely to receive angiography than patients without known CAD (RR=0.76, 95% CI 0.63;0.91). A current smoker was 52% more likely to undergo angiography than a non-smoker (RR=1.52, 95% CI 1.29-1.79). A patient with prior PCI was over twice as likely to have an angiogram than a patient without prior PCI (RR=2.27, 95% CI 0.1.59;3.24). A patient who received angiography was 40% less likely to die within 12 months of discharge than a patient who did not receive angiography (RR=0.63, 95% CI 0.27;0.1.46).

Medication on Discharge

The likelihood of receiving medications on discharge was significantly influenced by age, gender, ethnicity, comorbid burden and revascularisation. A patient over 65 years was 35% less likely than a patient at the ages of 18-49 years to receive the recommended medications (RR=0.65, 95% CI 0.54;0.78). Women were almost 20% less likely to receive the recommended medications (RR=0.80, 95% CI 0.71;0.91) while Indigenous patients were almost 50% more likely to receive recommended medications (RR=1.49, 95% CI 1.30;1.71). Patients with diabetes were more likely to receive medications on discharge. A patient who had received percutaneous (RR=1.62, 95% CI 1.45;1.81) or surgical revascularisation (RR=1.30, 95% CI 1.05;1.61) was more likely to receive medications on discharge.

Multivariate Analysis

The results of the generalized linear models are presented in Table 5. For angiography, Model 1 demonstrates that Indigenous patients are over 50% more likely than non-Indigenous patients to receive angiography. However, adjustment for age, sex and propensity score reduced this effect to non-significant (RR 0.92, 95% CI 0.75;1.13).

The relationship between Indigenous status and recommended medications illustrated more variation between the models. Model 1 demonstrates that Indigenous patients are almost 50% more likely to receive the recommended medications. Adjustment for age, sex and propensity score reduced this effect but still demonstrated that Indigenous patients were almost 20% more likely to receive the correct medication (RR=1.19, 95 % CI 1.01;1.40).

Discussion

Our study found that Indigenous subjects are significantly younger, present later in the disease process and have a higher burden of cardiovascular risk factors, when compared to non-Indigenous patients. While there was access to angiography and an appropriately higher use of guideline-based medication therapy for Indigenous patients, adjustment for their substantially younger age revealed a slightly lower likelihood of undergoing angiography, despite an equivalent use of medications.

There are two main reasons for performing coronary angiography in the setting of high risk NSTEACS; as a prelude to revascularisation to mitigate the risk for further events, or, to a much lesser extent, as a diagnostic test where there is doubt associated with underlying pathophysiology.[5] However, there are a number of factors that impact on the likelihood of angiography being performed, including accessibility to the service, clinician familiarity with existing treatment guidelines, consideration of procedural risk versus benefit, and patient preference.[5, 13] Procedural risk is determined by the extent of comorbid disease in the individual patient, while benefit is determined by the level of risk imposed by not intervening. In practice, clinicians tend to adopt an interventional approach when procedural risk is deemed lower, and this lower risk may carry greater weight in decision making than the consideration of benefit. As risk increases, (characterised by increasing age,

increasing burden of diabetes, renal disease and increasing comorbidities) the use of angiography declines and management tends towards medical therapy as an initial strategy.[5, 14-16] It is possible clinicians are more inclined to be influenced by procedural risk than the overall risk profile of the patient for secondary events. Decision making may also be influenced by the knowledge that less than half of patients undergoing angiography actually proceed to revascularisation, with much of the risk mitigation for secondary events being driven by appropriate medical therapy.

The Indigenous cohort in this study had a higher level of comorbid disease, despite a significantly younger mean age, and this may have influenced the rate of angiography. Usually, increasing age would be expected to have an inverse relationship with angiography use, largely influenced by the increasing burden of comorbidities as people age.[7] The premature accrual of comorbidities in Indigenous subjects appears to strongly and negatively influence the use of angiography, more-so than the influence that age may usually have on decision making about treatment regimes. There are other factors influencing the use of angiography that are not well understood, such as the observed lower rate of angiography for females with high risk ACS.[17, 18] Interestingly, Indigenous females in the current study were just as likely as Indigenous males to undergo angiography, and more likely than non-Indigenous females to undergo angiography. This suggests that the observation of a lack of protection by female gender in the Indigenous population studied was recognised and impacted clinical decisions.

In contrast to angiography, evidence-based medical therapy is widely available, generally well tolerated and utilised in patients with both low and high burdens of comorbid conditions. The use of guideline-based medical therapy is largely determined by clinician familiarity with guidelines and patient tolerance of medications.[5] Indigenous patients were more likely to receive guideline-compliant medications than non-Indigenous patients. This may be in response to the higher burden of comorbidities, prompting an increased likelihood of prescribing pharmacological therapies, or, clinicians may have adopted a more aggressive approach to medication therapies to compensate for reduced access to angiography.[19]

This study demonstrates that Indigenous patients presenting with high risk NSTEACS have the same likelihood of access to angiography as non-Indigenous patients, all else (except age) being roughly equal. Importantly, however, the age adjusted analysis reveals a significant discrepancy in utilisation of angiography for Indigenous patients, a common observation across a number of studies. The results suggest the majority of difference observed between Indigenous and non-Indigenous populations, with regard to angiography use, is driven by accelerated comorbid disease burden. In essence, at any given age, Indigenous subjects have a greater burden of both established vascular disease and comorbidities and clinical decision making for patients with high risk NSTEACS may be strongly influenced by these factors, more so than by age alone. The mitigation of the disparity in risk could be approached with a two-pronged strategy. Improved compliance with guideline-based therapies, including angiography and recommended medication, is clearly important. However, a greater challenge is to ensure that Indigenous patients with CVD access the tertiary health system at a much earlier stage of the disease process than currently occurs (Figure 2).

Limitations

There were a number of limitations that should be considered in interpreting our data. Both hospitals included in this study have onsite cardiac catheterisation facilities increasing the likelihood of angiography. However, a significant proportion of the Indigenous cohort was transferred into the study centres from rural locations. There is potential for selection bias and, as such, the rate of intervention seen for the Indigenous cohort may be over-estimated, compared to the non-Indigenous cohort with a lower rate of transfer from referral centres. Further, several residual confounders were not controlled for namely socio-demographic status, pre-existing cardiovascular risk factors (e.g. smoking status) and rurality and remoteness. Finally, a national study of the National Hospital Mortality Database reported that the number of Indigenous patients admitted to the hospitals may not have been correctly identified[20], suggesting that under-identification maybe problematic in our study.

Conclusion

The younger age and significantly higher risk profile of Indigenous adults presenting to SA hospitals with ACS appears to lead to different management decisions, which may well be led by client factors. The study findings brings to the forefront the importance of acknowledging the multi-dimensional concept of Indigenous status. The fact that a disparity in treatment between Indigenous and non-Indigenous patients can be explained by other factors (i.e. age, comorbidity, gender) does not mean that there is not disparity. Conversely, if a disparity is not explained by other factors, it does not necessarily mean that there is causal relationship between Indigenous status and outcome of interest.

References

1. AIHW: Mathur S, Moon L, Leigh S. Aboriginal and Torres Strait Islander people with coronary artery disease: further perspective on health status and treatment. Cat. No. CVD. 34. Canberra: AIHW; 2006.

2. Brown, A., Addressing cardiovascular inequalities among indigenous Australians. Global Cardiology Science and Practice, 2012; 2012 (1): **2**.

3. Ong M, A., Weeramanthri T, S. Delay times and management of acute myocardial infarction in indigenous and non-indigenous people in the Northern Territory. Medical Journal of Australia. 2000;173(4):201-4.

4. Coory M, D., Walsh W, F. Rates of percutaneous coronary interventions and bypass surgery after acute myocardial infarction in Indigenous patients. Medical Journal of Australia. 2005;182(10):507-12.

5. National Heart Foundation of Australia and Cardiac Society of Australian and New Zealand, Guidelines for the management of acute coronary syndromes 2006. Medical Journal of Australia, 2006. **184**(8): p. S1-S32.

6. Aroney CN, Aylward P, Chew DP, Huang NP, Kelly A, White A, et al. 2007 addendum to the National Heart Foundation of Australia/ Cardiac Society of Australia and New Zealand Guidelines for the management of acute coronary syndromes 2006. Medical Journal of Australia. 2008;188(5):302-3.

7. Schiele F, Meneveau N, Seronde MF, Descotes-Genon V, Chopard R et al. Propensity Score-Matched Analysis of Effects of Clinical Characteristics and Treatment on Gender Difference in Outcomes After Acute Myocardial Infarction. The American Journal of Cardiology, 2011. **108**(6): p. 789-798.

8. Australian Indigenous Health*InfoNet*. Overview of Australian Indigenous health status 2011. 2012, Australian Indigenous HealthInfoNet: Perth, Western Australia.

9. Brown A. Acute coronary syndromes in indigenous Australians: opportunities for improving outcomes across the continuum of care. Heart, Lung & Circulation. 2010;19(5-6):325-36.

10. Brown, A., Bridging the survival gap between indigenous and non-indigenous Australians: priorities for the road ahead. Heart, Lung & Circulation. 2009. **18**: p. 96 - 100.

11. Vos T, Barker B, Begg S, Stanley L, Lopez AD. Burden of disease and injury in Aboriginal and Torres Strait Islander Peoples: the Indigenous health gap. International Journal of Epidemiology. 2009;38:470 - 7.

12. Australian Indigenous Health*InfoNet*. Summary of the cardiovascular health status of Indigenous peoples, 2014. Retrieved [5 May 2015] from http://www.healthinfonet.ecu.edu.au/health-facts/summary

13. Chew DP, Amerena JV, Coverdale SG, Rankin JM, Astley CM, Brieger DB. Current management of acute coronary syndromes in Australia: observations from the acute coronary syndromes prospective audit. Internal Medicine Journal. 2007;37(11):741-8.

14. Coory MD, Walsh WF. Rates of percutaneous coronary interventions and bypass surgery after acute myocardial infarction in Indigenous patients. Medical Journal of Australia, 2005. **182**(10): p. 507-512.

15. Lehman SJ, Chew DP, Briger D, Amerena J, Coverdale S, et al. Management and 12-month outcomes of indigenous Australians presenting with acute coronary syndrome: The ACACIA Registry. Heart, Lung & Circulation. 2009. **18**(Supplement 3): p. S196 - S.

16. Boden, W.E. Avoidance of routine revascularization in the management of patients with non-ST-segment elevation acute coronary syndromes. The American Journal of Cardiology, 2000. **86**(12, Supplement 2): p. 42-47.

17. Bairey Merz CN, Shaw LJ, Reis SE, Bittner, V, Kelsey SF, et al. Insights From the NHLBI-Sponsored Women's Ischemia Syndrome Evaluation (WISE) Study: Part II: Gender Differences in Presentation, Diagnosis, and Outcome With Regard to Gender-Based Pathophysiology of Atherosclerosis and Macrovascular and Microvascular Coronary Disease. Journal of the American College of Cardiology, 2006. **47**(3, Supplement 1): p. S21-S29.

18. Maas A, van der Schouw YT, Regitz-Zagrosek V, Swahn E, Appelman YE, et al. Red alert for women's heart: the urgent need for more research and knowledge on cardiovascular disease in women. European Heart Journal, 2011. pp1366.

19. Brown, A. Ensuring the quality use of medicines among Indigenous Australians: key directions for policy research and practice for cardiovascular health., National Heart Foundation of Australia, Editor. 2007, National Heart Foundation of Australia (on behalf of the Heart Foundation Pharmaceutical Roundtable),: Melbourne. p. 1-38.

20. Cunningham J. Diagnostic and therapeutic procedures among Australian hospital patients identified as Indigenous. Medical Journal of Australia. 2002;176(2):58-62.

Table 1: Study population characteristics by ethnicity.

	Ethnicity			
	Non-Indigenous n=403		Indigenous* n=85	
Study Factors	Male n=195	Female n=208	Male n=41	Female n=44
Age (years) Mean (SEM)	71 (1.0)	77 (0.9)	55 (1.8)	53 (1.6)
Transfer[†]				
Metropolitan hospital	65 (33.3)	51 (24.5)	33 (80.5)	37 (84.1)
Risk stratification				
Dialysis dependent	2 (10.3)	3 (1.4)	2 (4.9)	7 (15.9)
Dyslipidaemia	18 (9.2)	11 (5.3)	4 (9.8)	6 (13.6)
Diabetes	63 (32.3)	73 (34.6)	30 (73.2)	35 (79.5)
Insulin Dependent	36 (18.5)	21 (10.1)	12 (29.3)	11 (25.0)
Hypertension	120 (61.5)	142 (68.3)	28 (68.3)	31 (70.5)
Smoker (current)[‡]	42 (21.5)	22 (10.5)	21 (51.2)	19 (43.2)
Family history of Coronary Artery Disease[§]	9 (22)	7 (16)	14 (7)	12 (6)
Known Coronary Artery Disease	109 (55.9)	118 (65.7)	32 (78.0)	36 (81.8)
Previous myocardial infarction	32 (16.4)	35 (16.8)	6 (14.6)	6 (13.6)
Prior Percutaneous Coronary Intervention	167 (85.6)	160 (76.9)	35 (85.4)	37 (84.1)
In-hospital procedure				
Diagnostic coronary angiography	109 (55.9)	85 (40.9)	29 (70.7)	34 (77.3)
Percutaneous Cardiac Intervention	64 (32.8)	26 (12.5)	10 (24.4)	16 (36.4)
Bare Mental Stent	25 (12.8)	7 (3.4)	6 (14.6)	5 (11.4)
Drug Eluting Stent	32 (16.4)	13 (6.25)	4 (9.8)	10 (22.7)
Coronary Artery Bypass Graft	8 (4.1)	11 (5.3)	2 (4.9)	3 (6.8)
Function Stress Testing[¶]	39 (20.0)	35 (16.8)	10 (24.4)	9 (20.5)
In-hospital outcomes				
Death	8 (4.1)	8 (2.6)	0	0
New onset of heart failure /acute pulmonary oedema	9 (4.6)	16 (7.7)	1 (2.4)	1 (2.3)
New onset of Atrial Fibrillation	22 (11.3)	38 (18.3)	4 (9.8)	3 (6.8)
Acute Renal Failure	9 (4.6)	23 (11.1)	2 (4.9)	1 (2.3)
Length of in-hospital stay (days) Median (IQR)**	4 (2;7)	4 (2.5;8)	3(2;9)	3 (2;6.5)
Outcomes at 12 months				
Rehospitalisation	90 (46.2)	104 (50.0)	14 (34.1)	18 (40.9)
Cardiac related hospitalisation	53 (27.2)	64 (30.8)	12 (29.3)	13 (29.5)
Revascularisation				
Percutaneous Coronary Intervention	11 (5.6)	7 (3.4)	0	5 (11.4)
Coronary Artery Bypass Graft	9 (4.6)	10 (4.8)	3 (7.3)	3 (6.8)
Death	2 (1.0)	6 (2.9)	1 (2.4)	3 (6.8)

Source: SA NSTEACS Retrospective Case Note Cohort Study

The study cohort are patients who were admitted to two public tertiary metropolitan hospitals in South Australia.

The results are presented as counts (percentages), except for age (years) Mean (Standard Error Mean) and length of stay**in hospital that is reported as a median (interquartile range).

*Indigenous participant refers to Aboriginal and Torres Strait Islander Australians. Indigenous status was recorded if identified by the patient on admission.

[†]Transferred to metropolitan hospital refers to the patient being transferred from other sites to the study centre for a cardiac investigation and/or treatment such as diagnostic coronary angiogram or revascularisation.

[‡]Current smoker is defined as any smoking within the past 12 months.

[§]Family history of coronary artery disease was reported by the patient i.e. first degree relative under the age of 60 years who has had a vascular disease/condition diagnosed.

[¶]Functional stress tests included one of the following tests: electrocardiogram, echocardiography, pharmacological, exercise or nuclear.

Table 2: Comorbidity and risk profile of study participants by age- group and ethnicity

	Age groups and Indigenous Status					
	18-49 years n=52		50-64 years n=123		65+ years n=313	
Study Factors	Non-Indigenous 21	Indigenous* 31	Non-Indigenous 81	Indigenous 42	Non-Indigenous 301	Indigenous 12
Comorbidities						
Dialysis	0	2 (6.5)	0	6 (14.3)	5 (1.7)	1 (8.3)
Dyslipidaemia	0	5 (16.1)	6 (7.4)	2 (4.8)	23 (7.6)	3 (25.0)
Diabetes	3 (14.3)	19 (61.3)	29 (35.8)	35 (83.3)	104 (34.6)	11 (91.7)
Hypertension	9 (42.9)	19 (61.3)	46 (56.8)	30 (71.4)	207 (68.8)	12 (100)
Known Coronary Artery Disease	6 (28.6)	21 (67.8)	38 (46.9)	35 (83.3)	183 (60.8)	12 (100)
Risk Factors						
Current Smoker[†]	13 (61.9)	20 (64.5)	18 (22.2)	15 (35.7)	33 (11.0)	5 (41.7)
Family history[‡]	6 (28.6)	10 (32.3)	8 (9.9)	5 (11.9)	12 (4.0)	1 (8.3)
Prior Myocardial Infarction	3 (14.3)	3 (9.7)	15 (18.5)	6 (14.3)	49 (16.3)	3 (25.0)
Prior Percutaneous Coronary Intervention	16 (76.2)	29 (93.5)	70 (86.4)	33 (78.6)	241 (80.1)	10 (83.3)
Prior Coronary Artery Bypass Graft	1 (4.8)	4 (12.9)	7 (8.6)	5 (11.9)	47 (15.6)	1 (8.3)
History of Atrial Fibrillation	1 (4.8)	1 (3.2)	16 (19.8)	1 (2.4)	17 (5.6)	2 (16.7)

SA NSTEACS Retrospective Case Note Cohort Study

The study cohort are patients who were admitted to two public tertiary metropolitan hospitals in South Australia from Jan 2008-Dec 2009

*Indigenous participant refers to Aboriginal and Torres Strait Islander Australians. Indigenous status was recorded if identified by the patient on admission.

The results are presented as counts (percentages) and all percentages were rounded up to the nearest integer.

[†]Current smoker is defined as any smoking within the past 12 months.

[‡]Family history of coronary artery disease was reported by the patient i.e. first degree relative under the age of 60 years who has had a vascular disease/condition diagnosed

Table 3 Study population characteristics and likelihood of receiving a diagnostic coronary angiogram

Study Factor			Angiogram N	%	Rate Ratio	95% CI RR	Sig.
Demographics							
Age	<50		45	86.5	1.00		
	50-64		86	70.0	0.81	0.70;0.93	0.004
	65+		126	40.3	0.47	0.38;0.56	<0.001
Gender	Male		138	58.5	1.00		
	Female		119	47.2	0.81	0.66;0.99	0.035
Ethnicity	Non-Indigenous		194	48.1	1.00		
	Indigenous‡		63	74.1	1.54	1.31;1.81	<0.001
Transfer to Metropolitan Hospital		No	105	34.8	1.00		
		Yes	152	81.7	2.35	1.95;2.83	<0.001
Comorbidities							
Dialysis		No	247	52.9	1.00		
		Yes	8	57.1	1.09	0.66;1.80	0.745
Dyslipidaemia		No	231	51.5	1.00		
		Yes	26	66.7	1.30	1.04;1.16	0.020
Diabetes		No	144	50.2	1.00		
		Yes	113	56.2	1.12	0.95;1.32	0.166
Hypertension		No	87	53.1	1.00		
		Yes	169	52.6	0.99	0.83;1.18	0.933
Known Coronary Artery Disease		No	119	61.7	1.00		
		Yes	138	46.8	0.76	0.63;0.91	0.002
Risk Factors							
Current Smoker		No	182	47.4	1.00		
		Yes	75	72.1	1.52	1.29;1.79	<0.001
Prior Myocardial Infarction		No	228	55.8	1.00		
		Yes	29	36.7	0.66	0.50;0.87	0.004
Prior Percutaneous Coronary Intervention		No	23	25.8	1.00		
		Yes	234	58.6	2.27	1.59;3.24	<0.001
Prior Coronary Artery Bypass Graft		No	235	55.6	1.00		
		Yes	22	33.8	0.61	0.43;0.86	0.005
Cardiac biomarker							
Elevated Troponin >0.02ng/mL¶		No	107	50.7	1.00		
		Yes	150	54.1	1.07	0.90;1.27	0.461
Revascularisation							
Percutaneous Coronary Intervention		No	141	37.9	1.00		
		Yes	116	100.00	2.64	2.28;3.06	<0.001
Coronary Artery Bypass Graft		No	235	50.7	1.00		
		Yes	22	91.7	1.81	1.57;2.09	<0.001
In-hospital death							
Death		No	256	54.2	1.00		
		Yes	1	6.3	0.12	0.12;0.79	0.027
Outcome at 12 months							
Rehospitalisation		No	160	61.1	1.00		
		Yes	97	42.9	0.70	0.58;0.85	<0.001
Percutaneous Coronary Intervention		No	242	52.0	1.00		
		Yes	15	65.2	1.25	0.91;1.73	0.172
Coronary Artery Bypass Graft		No	239	51.6	1.00		
		Yes	18	72.0	1.39	1.07;1.82	0.015
Death		No	253	53.2	1.00		
		Yes	4	33.3	0.63	0.27;1.46	0.280

SA NSTEACS Retrospective Case Note Cohort Study *Australian Guidelines for the Management of Acute Coronary Syndromes 2006 specifies the eligibility criteria for diagnostic coronary angiography.

All percentage values are rounded up to nearest integer. †The results are presented as percentages (counts), except for Age (year) which is reported as mean (Standard Error of the Mean).

‡Indigenous participant refers to Aboriginal and Torres Strait Islander Australians. Indigenous status was recorded if identified by the patient on admission.

[†]Transfer to metropolitan hospital refers to the patient being transferred from other sites to the study centre for a cardiac investigation and/or treatment such as diagnostic coronary angiogram or revascularisation.

[§]Smoker is defined as any smoking within the last 12 months.

[¶]An elevated troponin was defined as a value >0.02 ng/mL per ESC. Current international criteria for the diagnosis of myocardial infarction have a strong emphasis on biomarkers, specifically troponin, given its high sensitivity, and in particular specificity for myonecrosis.

Table 4 Study population characteristics and likelihood of receiving recommended medications on discharge

Study Factor		Medication N	%	Rate Ratio	95% CI RR	Sig.
Demographics						
Age <50		42	80.8	1.00		
50-64		94	76.4	0.95	0.81;1.10	0.478
65+		165	52.7	0.65	0.54;0.78	<0.001
Gender Male		162	68.6	1.00		
Female		139	55.2	0.80	0.71;0.91	0.001
Ethnicity Non-Indigenous		229	56.8	1.00		
Indigenous‡		72	84.7	1.49	1.30;1.71	<0.001
Transfer to Metropolitan Hospital	No	156	51.7	1.00		
	Yes	145	78.0	1.51	1.33;1.71	<0.001
Comorbidities						
Dialysis	No	288	61.3	1.00		
	Yes	12	85.7	1.40	1.12;1.75	0.003
Dyslipidaemia	No	269	59.9	1.00		
	Yes	32	82.0	1.37	1.16;1.61	<0.001
Diabetes	No	166	57.8	1.00		
	Yes	135	67.2	1.16	1.00;1.34	0.046
Hypertension	No	98	59.8	1.00		
	Yes	203	63.2	1.06	0.93;1.21	0.407
Known Coronary Artery Disease	No	121	62.7	1.00		
	Yes	180	61.0	0.97	0.85;1.12	0.699
Risk Factors						
Current Smoker	No	220	57.3	1.00		
	Yes	81	77.9	1.36	1.18;1.56	<0.001
Prior Myocardial Infarction	No	256	62.6	1.00		
	Yes	45	57.0	0.91	0.76;1.09	0.311
Prior Percutaneous Coronary Intervention	No	40	44.9	1.00		
	Yes	261	65.4	1.46	1.17;1.81	0.001
Prior Coronary Artery Bypass Graft	No	262	61.9	1.00		
	Yes	39	60.0	1.03	0.81;1.30	0.792
Cardiac biomarker						
Elevated Troponin >0.02ng/mL¶	No	140	66.4	1.00		
	Yes	161	58.1	0.88	0.75;1.02	0.095
Revascularisation						
Percutaneous Coronary Intervention	No	200	53.7	1.00		
	Yes	101	87.0	1.62	1.45;1.81	<0.001
Coronary Artery Bypass Graft	No	282	60.8	1.00		
	Yes	19	79.2	1.30	1.05;1.61	0.015
Outcome at 12 months						
Rehospitalisation	No	166	63.4	1.00		
	Yes	135	59.7	0.94	0.83;1.07	0.366
Percutaneous Coronary Intervention	No	283	60.9	1.00		
	Yes	18	78.3	1.29	1.01;1.64	0.041
Coronary Artery Bypass Graft	No	286	61.8	1.00		
	Yes	15	60.0	0.97	0.69;1.37	0.868
Death	No	292	61.3	1.00		
	Yes	9	75.0	1.22	0.90;1.66	0.196

SA NSTEACS Retrospective Case Note Cohort Study

*Australian guidelines for the management of acute coronary syndromes 2006 specify the eligibility criteria for recommended medication on patient discharge.

All percentage values are rounded up to nearest integer.

‡Indigenous participant refers to Aboriginal and Torres Strait Islander Australians. Indigenous status was recorded if identified by the patient on admission.

†Transfer to metropolitan hospital refers to the patient being transferred from other sites to the study centre for a cardiac investigation and/or treatment such as diagnostic coronary angiogram or revascularisation.

§Smoker is defined as any smoking within the last 12 months.

¶An elevated troponin was defined as a value >0.02 ng/mL per ESC. Current international criteria for the diagnosis of myocardial infarction have a strong emphasis on biomarkers, specifically troponin, given its high sensitivity, and in particular specificity for myonecrosis

Table 5: Multivariate analysis on the likelihood of angiography and recommended medications on discharge by ethnicity

Outcome of interest	Model-based estimate								
	Model 1*			Model 2[§]			Model 3[†]		
	RR	95% CI	Sig.	RR	95% CI	Sig.	RR	95% CI	Sig.
Angiography[¶]									
Non-Indigenous	Base Reference								
Indigenous‡	1.54	1.31;1.81	<0.001	0.91	0.76;1.09	0.305	0.92	0.75;1.13	0.449
Medications[§§]									
Non-Indigenous	Base Reference								
Indigenous	1.49	1.30;1.71	<0.001	1.22	1.06;1.42	0.006	1.19	1.01;1.40	0.035

SA NSTEACS Retrospective Case Note Cohort Study

*Model 1 (crude) The risk ratio is derived from the matched bivariate analysis, with no adjustment for age, gender or propensity score

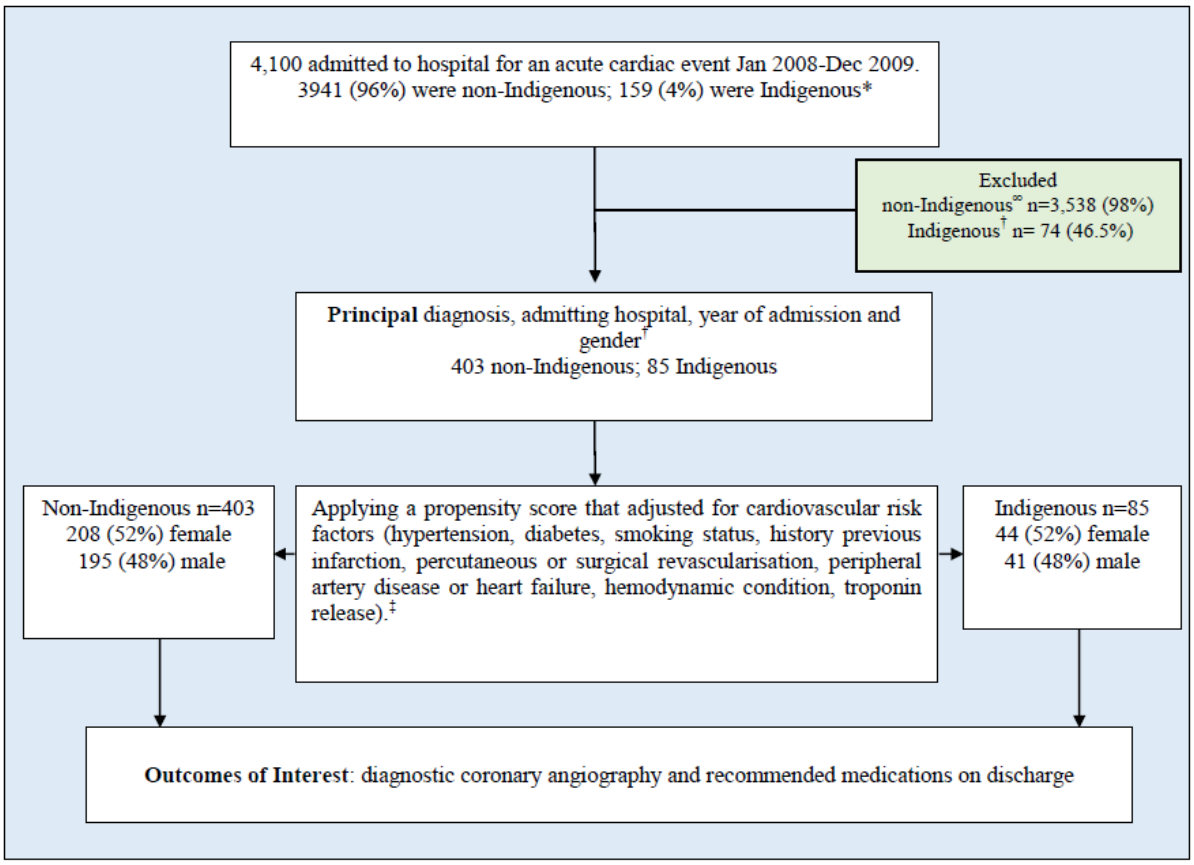
[§] Model 2 (adjusted) The risk ratio is derived from a matched cluster that is adjusted for age (current practice for adjusting for age) and gender.

[†]Model 3 (adjusted) The risk ratio is derived from a matched cluster that is adjusted for age, gender and propensity score. The propensity score includes cardiovascular risk factors (hypertension, diabetes, smoking status), history previous infarction, percutaneous or surgical revascularisation, hemodynamic condition (positive troponin release).

[¶] Australian Guidelines for the management of Acute Coronary Syndromes 2006 specifies the eligibility criteria for diagnostic coronary angiography and describes the recommended medication on patient discharge.

‡ Indigenous participant refers to Aboriginal and Torres Strait Islander Australians. Indigenous status was recorded if identified by the patient on admission.

[§§]Australian guidelines for the management of acute coronary syndromes 2006 specify the eligibility criteria for recommended discharge medications i.e. aspirin, clopidogrel, angiotensin-converting enzyme inhibitor or angiotensin receptor antagonist, β blocker and statin. If three of the five recommended medications where prescribed on discharge it was assessed as being concordant to the guidelines.



Source: SA NSTEACS Retrospective Case Note Cohort Study

The study cohort are patients who were admitted to two public tertiary metropolitan hospitals in South Australia from Jan 2008-Dec 2009.

*Indigenous status refers to Aboriginal and Torres Strait Islander Australians. Indigenous status was recorded if identified by the patient on admission.

∞ From the total of patient population admitted Jan 2008-Dec 2009, a sample sizes of 403 non-Indigenous patients and 85 Indigenous patients achieve 80% power to detect a rate ratio for each outcome measure of 1.2. From the total non-Indigenous sample (n=3941) a random sample of 750 were selected, of which 403 met the inclusion criteria. Total non-Indigenous exclusion =3,538.

†Indigenous patients was excluded because they did not meet the inclusion criteria of persistent ECG changes of ST-segment depression, haemodynamic compromise, prior coronary intervention within 6 months, presence of known diabetes and elevated level of at least 1 cardiac biomarker as well as being categorised as having a catastrophic or severe consequence/outcome.

Principal diagnosis (NSTEACS), admitting hospital and gender.

‡ Propensity score applied that controlled for cardiovascular risk factors.

Figure 1 Flow chart of study population, matched variables and outcomes of interest.

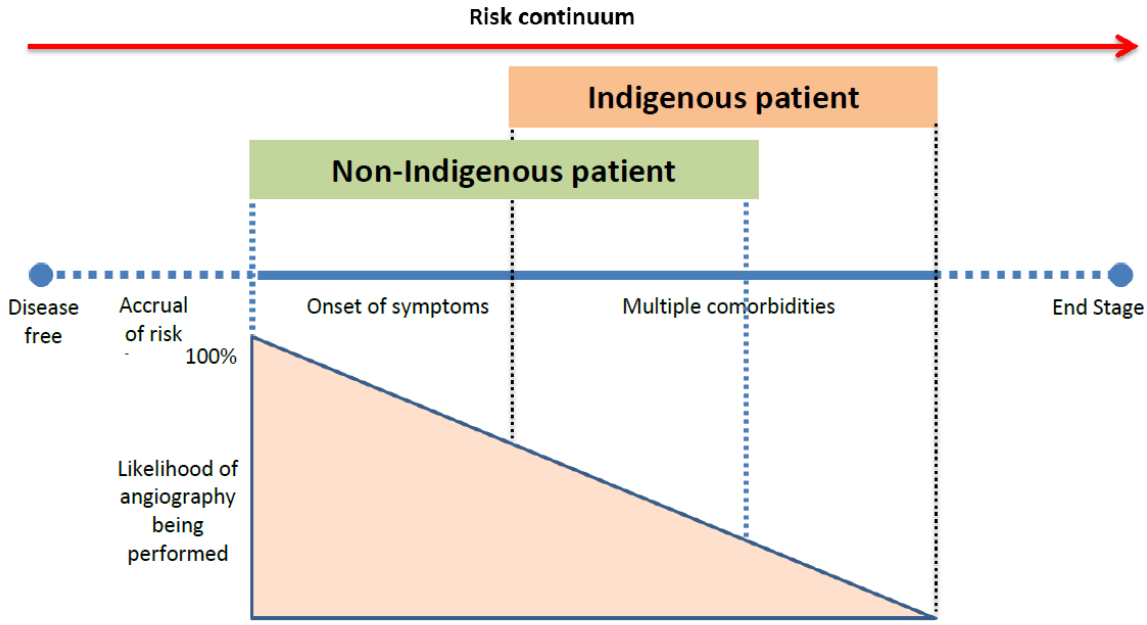


Figure 2 A schematic of the natural history of cardiovascular disease throughout life demonstrating that Indigenous patients are more likely to present at a later stage of disease than non-Indigenous subjects.