The All New Zealand Acute Coronary Syndrome Quality Improvement Programme: Implementation, Methodology and Cohorts (ANZACS-QI 9)

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ABSTRACT

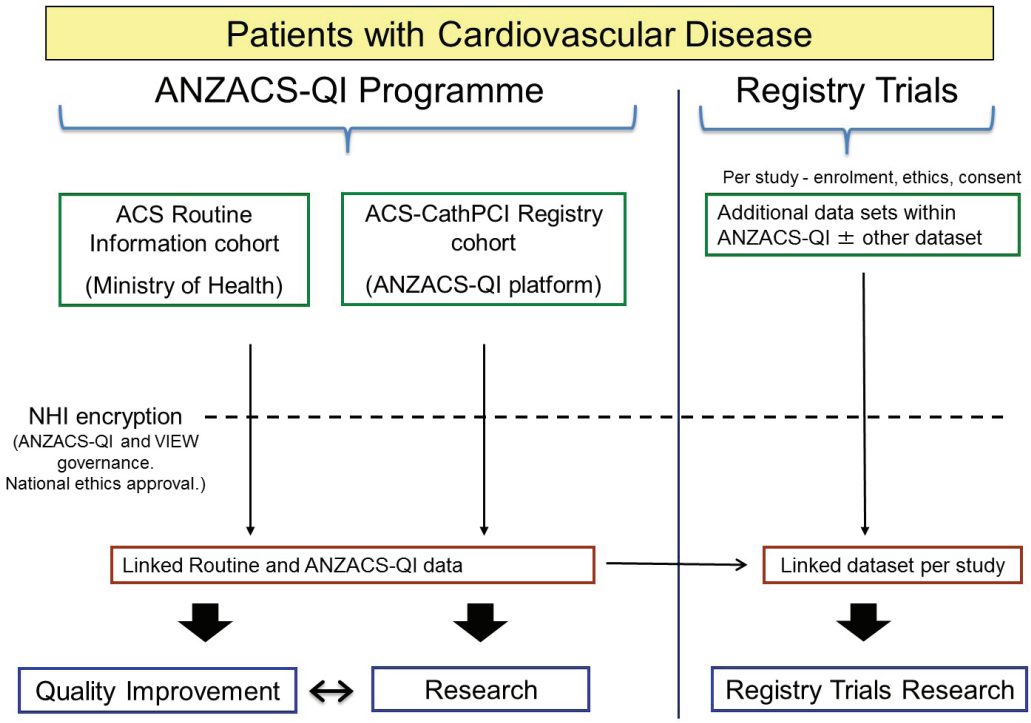
The All New Zealand Acute Coronary Syndrome Quality Improvement programme (ANZACS-QI) uses a web-based system to create a clinical registry of patients with acute coronary syndrome (ACS) and other cardiac problems admitted to hospitals across New Zealand. This detailed clinical registry is complemented by parallel analyses of, and individual linkage to, New Zealand's multiple routine health information datasets. The programme is primarily designed to support secondary care clinicians to implement evidence based guidelines and to meet national performance targets for New Zealand cardiac patients. ANZACS-QI simultaneously generates a large-scale research database and provides an electronic data infrastructure for clinical registry studies. ANZACS-QI has been successfully implemented in all the 41 public hospitals across New Zealand where acute cardiac patients are admitted. By June 2015 25,273 patients with suspected ACS and 30,696 referred for coronary angiography were registered in ANZACS-QI.

In this report we describe the development and national implementation of ANZACS-QI, its governance, the data collection processes and the current ANZACS-QI cohorts and available outputs.

Since the late 1960s, the age-standardised mortality rate for ischaemic heart disease in New Zealand has decreased from 253 to 66 per 100,000.[1] This improvement across many Western countries, including New Zealand, has been attributed to a combination of improved lifestyle (smoking cessation, diet) and utilisation of evidence-based therapies (primary and secondary prevention medications, coronary revascularisation).[2-5] Despite this, cardiovascular disease (CVD), and in particular coronary heart disease (CHD), remains the most common cause of death worldwide.[6] In New Zealand, age-standardised mortality rates for vascular disease are still higher than those in many other Western countries (www.mortality-trends.org) and, of concern, important disparities exist in the burden of CVD mortality borne by some ethnic groups and by those living in areas of greater deprivation.[7-9] In 2010, the age-standardised rate of ischaemic heart disease mortality was 55% higher among New Zealand Māori men compared with the rate for non-Māori men, while the rate for Māori women was nearly twice as high (99%) as that for non-Māori women.[10] Those living in greater deprivation also have disproportionately higher CVD event rates.

There is a formidable evidence base supporting the use of a range of lifestyle, pharmaceutical, and interventional treatments to improve outcomes in patients with acute CVD events. For example, national and international guidelines recommend timely coronary angiography and revascularisation as appropriate for patients with acute coronary syndrome (ACS).[11-15] There is robust evidence to support the use of antiplatelet/anticoagulant,[16,17] BP-lowering[18-20] and statin[21-23] medications, to improve outcomes in patients with established atherosclerotic CVD. This evidence base is constantly developing, with new treatments and technologies becoming available every year.

Figure 1: ANZACS-QI programme cohorts, data flow and outputs. The interactions with the associated ANZACS-QI registry trials are shown.



However, in practice, there is often a substantial gap between ideal treatment based on clinical trials and what is achieved in practice—the evidence-practice gap—with suboptimal initiation and longer-term maintenance of evidence-based therapy across the spectrum of CVD.[24-28] Prior studies have reported that revascularisation rates in non-Māori, non-Pacific New Zealanders are significantly higher when compared with Māori and Pacific people and in non-Māori compared with Māori.[29,30] A series of three audits of ACS patient management in New Zealand over the last 10 years have demonstrated suboptimal provision of cardiac investigation in ACS patients. Marked variation in both the use of coronary intervention procedures and delay in treatment have also been documented.[31-33] Gaps in the utilisation of secondary prevention therapy in New Zealand have been well documented.[34-36] The identification of these evidence-practice gaps, and the implementation of programmes to close them, represent an important opportunity to improve the outcomes of patients with CVD in New Zealand.

Why was ANZACS-QI established?

The primary aim of the All New Zealand Acute Coronary Syndrome Quality Improvement programme (ANZACS-QI) is to support appropriate, evidence-based management of ACS and subsequently of other cardiac patients regardless of age, sex, ethnicity, socioeconomic status, or rural or city dwelling. The ANZACS-QI programme supports this aim through its two arms—a quality improvement arm and a research arm.

ANZACS-QI programme cohorts and processes

The ANZACS-QI programme utilises two complementary data sources to generate two overlapping cohorts:

1. The ACS-CathPCI Registry cohort, generated using web-based software that enables secondary care clinicians to systematically collect data on ACS patients, coronary angiography and

percutaneous coronary intervention (PCI) procedures in all New Zealand hospitals.

2. The ACS Routine Information cohort, derived directly from national health datasets.

While the ACS Routine Information cohort includes all New Zealand ACS patients, it is relatively limited in content. In contrast, the ACS-CathPCI Registry cohort captures more in-depth data on every ACS patient who has a coronary angiogram in New Zealand, all other patients having coronary angiography procedures and on some other ACS patients. The two overlapping data sources can be linked using the National Health Index (NHI) number, as discussed further below.

The ACS-CathPCI Registry cohort (2007–2015)

Patients with a suspected diagnosis of ACS in New Zealand are admitted to one of 41 public hospitals and cared for by a mixture of cardiology and general medical teams. From mid-2012, the national goal, supported by a New Zealand Ministry of Health (MOH) indicator and directive to DHBs, was to achieve complete CathPCI registration in all patients undergoing coronary angiography regardless of indication, and a complete Cath-PCI and ACS dataset in all patients suspected by clinicians to have ACS at admission, who are referred for coronary angiography. Therefore, the goal was the registration of all New Zealand patients with a final diagnosis of ACS who had undergone coronary angiography (note: coronary angiography is indicated after ACS in most high-risk ACS patients in national and international guidelines).[11-15] Centres were also encouraged to continue including other ACS patients in the Registry, but this was not mandatory and the comprehensiveness of capture varies by centre. The Registry was also implemented in all six private hospitals that provide coronary angiography, for predominantly non-ACS indications.

Development, funding and implementation

The Registry cohort was established in mid-2007, when a web-based ACS registry was introduced into Middlemore Hospital in Auckland, New Zealand. In 2010, a 'CathPCI' registry for use in the cardiac catheterisation laboratory was added to capture data for patients undergoing coronary angiography and PCI. Electronic linkage of common data fields between the ACS and CathPCI forms allows data items to be entered in the location where it is most appropriate and therefore most accurate—coronary angiography and PCI data in the cardiac catheterisation laboratory, risk factor and in-hospital outcomes in the cardiology ward.

In late 2011, the New Zealand National Cardiac Network proposed the establishment of a national combined ACS-CathPCI Registry to be governed under the auspices of the New Zealand branch of the Cardiac Society of Australia and New Zealand (CSANZ). This initiative was supported by the then Minister of Health, Tony Ryall, and funded by the MOH, and after a competitive tender process, a partnership between Enigma Solutions (software developers) and the National Institute for Health Innovation (NIHI, University of Auckland) was contracted to implement the national roll out of the ANZACS-QI Registry.

By November 2013, the Registry was implemented in all 20 publically funded District Health Boards (DHBs) and their 41 hospitals which admit ACS patients. In New Zealand, virtually all ACS patients are admitted and managed in a public hospital.

Connected Health Network Integration

The ANZACS-QI web platform uses the Connected Health Network (CHN), a standards-based, commercial model for the secure delivery of universal connectivity across the New Zealand health sector. The CHN is a "network of networks" delivered by multiple telecommunication service providers on a competitive basis, using industry standard, commodity capability. It is overseen by the MOH. Connected Health aims to improve reliability, safety, and security of transferring health information, as only products or services certified against approved network connectivity standards, such as ANZACS-QI, will be allowed to connect to the network. All authorised users

have individual usernames and passwords allocated by a system administrator.

Who enters data?

On arrival at the Coronary Care Unit or catheterisation laboratory, patients are registered by clerical or clinical staff using an ANZACS-QI web form. The MOH Health Identity Programme (http://www.health.govt.nz/our-work/health-identity/health-identity-programme) provides the ability within the ANZACS-QI Registry for users to perform a search to find the demographic data for their patients. The data are automatically populated into the registration section of the web form. Clinical staff—medical, nursing and radiology—enter individual patient data into mandatory fields on the web form. At discharge, all fields are checked for completeness and missing data entered as required. The Cardiac Network and MOH set minimum requirements for form completion, which is assessed by monthly DHB completion reports, and provider-initiated ANZACS-QI system reports.

Data quality

This is facilitated by having a mandatory dataset, in-form definition statements, in-form automatic validation rules, automatic data capture from source datasets on demographics and laboratory results, as well as standardised user training and regular auditing. Each participating hospital is audited annually by a visiting audit nurse, with 20 randomly-selected CathPCI and ACS forms assessed, covering all data used for key performance indicator reporting. To date, the national data accuracy is 95% with a range of 83% to 99% across hospitals.

Data linkage

Audit and research activity is augmented by anonymised linkage of the Registry dataset to the national Routine Information dataset. Over 98%[37] of New Zealanders have a unique health identifier (the National Health Index number, or NHI) which identifies individuals in multiple national and regional health system databases.[38] With provider permission, patient registry data are anonymised by encrypting the NHI and then transferred from ANZACS-QI servers to the University of Auckland. The ever-growing Registry dataset can be regularly linked to national Routine Information dataset, via similarly encrypted NHIs, to measure processes (drug dispensing, subsequent cardiac procedures and laboratory monitoring) and outcomes (CVD hospitalisations and deaths).

What is measured?

A complete list of the data items in the ACS and CathPCI forms with definition statements and variable histories are available in the ANZACS-QI data dictionaries available at: https://www.fmhs.auckland.ac.nz/en/soph/about/our-departments/epidemiology-and-biostatistics/research/view-study/research.html

ACS form

This form collects demographic, risk factor, investigation, management, and in-hospital outcome data for all patients admitted with a suspected ACS.

CathPCI form

The original 2010 CathPCI form was designed to collect a basic dataset on all patients undergoing coronary angiography including demographics, procedure indication, arterial access route, extent of coronary artery disease, performance of PCI and in-hospital outcomes. In September 2014 (see Figure 2), an expanded form was introduced nationally which retained the core dataset, but also captured risk factors and coronary lesion level recording of both lesion characteristics and interventional treatment in PCI patients.

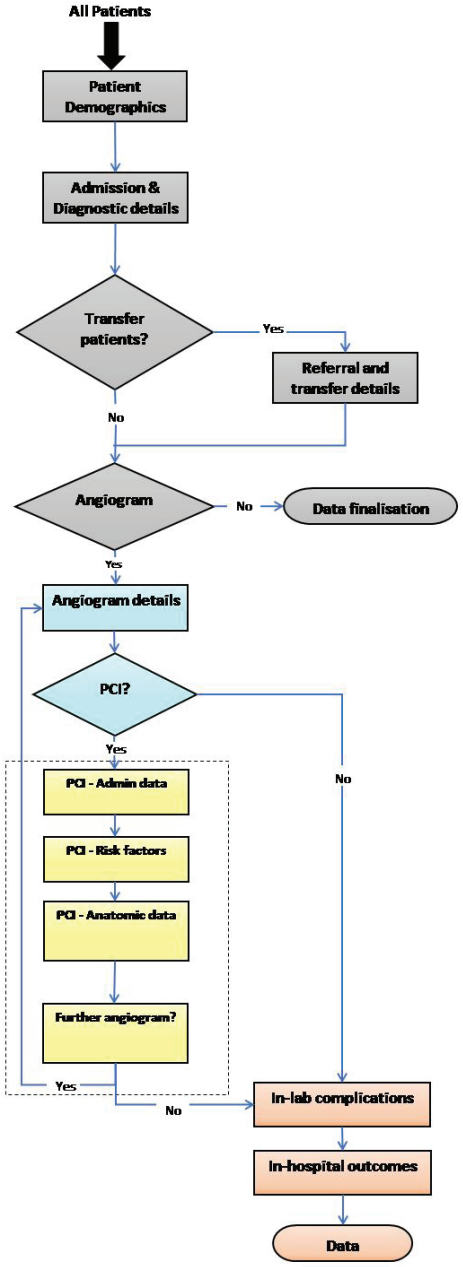
The current ANZACS-QI registry cohort

The national roll-out of the ANZACS-QI Registry across the DHBs was staggered over 6 months. The growth of the separate CathPCI and ACS admission cohorts are shown in Figure 3.

ACS registration

A total of 27,936 public hospital admissions with suspected ACS have been registered between 1 August 2007, and 20 June 2015. Complete data is available for 24,555 (87.9%) admissions, with a final confirmed diagnosis of ACS in 19,488 (79.4%) of admissions. The confirmed ACS diagnosis recorded is the clinician determined diagnosis at discharge according to standard definitions.[39,40]

Figure 2: ANZACS-QI CathPCI data collection workflow.



CathPCI registration

A total of 33,538 referrals for coronary angiography in 30,696 people have been registered since 1 November 2010. Of these referrals, complete data are available in 33,049 (98.5%).

Using the ANZACS-QI combined ACS-CathPCI Registry cohort, various sub-cohorts can be defined. In Tables 2 and 3 we show two illustrative sub-cohorts.

Sub-cohort 1 (Table 1)

All patients with a confirmed ACS diagnosis and complete registry dataset. Data from each participating hospital is included in this sub-cohort from the first month when each hospital achieved at least 90% completion of their registered ACS forms. This cohort excludes admissions before 2012 to reflect contemporary practice.

Sub-cohort 2 (Table 2)

All coronary angiograms (all episodes) in New Zealand public hospitals from November 2013 (when CathPCI registration completion rates approached 100% in all New Zealand public hospital cardiac catheterisation laboratories).

The ANZACS-QI national Routine Information (ACS) cohort

This cohort is used to describe and investigate national trends in ACS incidence, investigation, management and outcomes and can also be linked to the ANZACS-QI registries for these purposes.

The Routine Information cohort comprises anonymously linked baseline and longitudinal secondary data sourced directly from routinely collected New Zealand health datasets obtained from the New Zealand MOH (see Table 3). All New Zealand residents aged 20 years or over who are admitted to hospital with a primary or secondary International Classification of Disease 10 (ICD10) code consistent with ACS (I20.0, I21x, I22x) are included in the cohort.

All source data were subject to quality checks by the MOH prior to delivery to the University of Auckland and again by the research team following integration. These data are updated annually.

Baseline characteristics of the 100,579 subjects admitted with ACS from 1 January 2006 to 31 December 2013 with complete demographic data (144,279 ACS hospitalisations) are shown in Table 4.

Ethics approval and governance

Governance of the ANZACS-QI registry data is by the ANZACS-QI governance group on behalf of the New Zealand branch of the Cardiac Society of Australia and New Zealand (CSANZ). The governance group includes the clinical leaders of the Cardiac

Figure 3: ANZACS-QI ACS-CathPCI registry cohort growth. Admissions with completed datasets are shown.

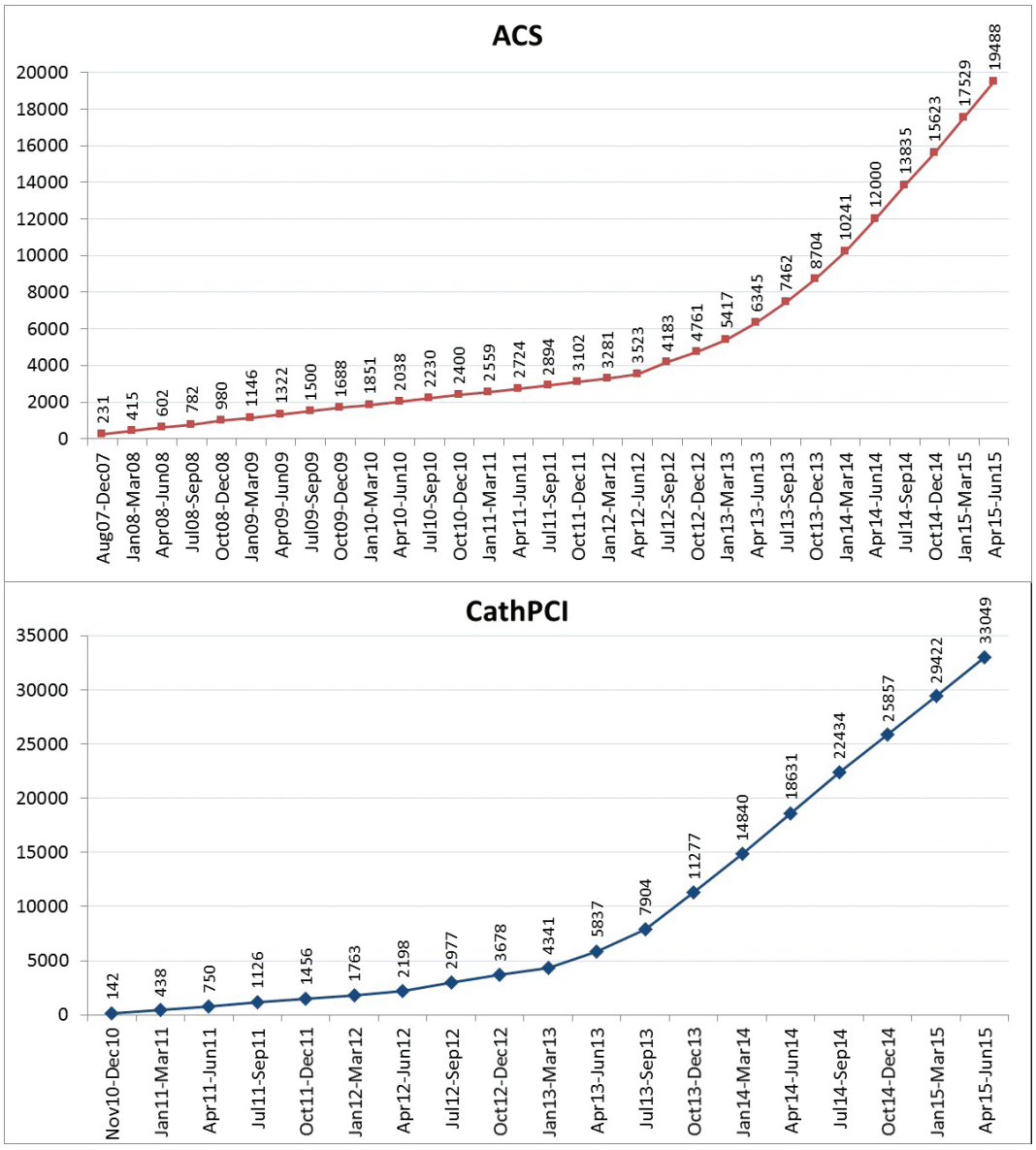


Table 1: ANZACS-QI ACS sub-cohort from 1 July 2012 to 30 June 2015.

	Overall (N=14,190)	Age Group				
		<50y (n=1,400)	50–<60y (n=2,819)	60–<70y (n=3,895)	70–<80y (n=3,666)	≥80y (n=2,410)
Demographics						
Gender, n (%)						
Male	9,426 (66.4)	1,054 (75.3)	2,123 (75.3)	2,724 (69.9)	2,279 (62.2)	1,246 (51.7)
Female	4,764 (33.6)	346 (24.7)	696 (24.7)	1,171 (30.1)	1,387 (37.8)	1,164 (48.3)
Ethnicity, n (%)						
Māori	1579 (11.1)	273 (19.5)	501 (17.8)	476 (12.2)	262 (7.1)	67 (2.8)
Pacific	803 (5.7)	187 (13.4)	252 (8.9)	221 (5.7)	125 (3.4)	18 (0.7)
Indian	633 (4.5)	113 (8.1)	185 (6.6)	171 (4.4)	119 (3.2)	45 (1.9)
Asian	357 (2.5)	52 (3.7)	95 (3.4)	108 (2.8)	75 (2.0)	27 (1.1)
New Zealand European/Other	10,818 (76.2)	775 (55.4)	1,786 (63.4)	2,919 (74.9)	3,085 (84.2)	2,253 (93.5)

Table 2: ANZACS-QI CathPCI sub-cohort (coronary angiography) from 1 November 2013 to 30 June 2015.

	Overall (N=22,445)	Age Group				
		<50y (n=2,356)	50–<60y (n=4,693)	60–<70y (n=6,898)	70–<80y (n=6,309)	≥80y (n=2,189)
Demographics						
Gender, n (%)						
Male	14,969 (66.7)	1,721 (73.1)	3,377 (72.0)	4,733 (68.6)	3,887 (61.6)	1,251 (57.1)
Female	7,476 (33.3)	635 (27.0)	1,316 (28.0)	2,165 (31.4)	2,422 (38.4)	938 (42.9)
Ethnicity, n (%)						
Māori	2,303 (10.3)	479 (20.3)	766 (16.3)	681 (9.9)	344 (5.5)	33 (1.5)
Pacific	1,068 (4.8)	267 (11.3)	329 (7.0)	310 (4.5)	149 (2.4)	13 (0.6)
Indian	899 (4.0)	155 (6.6)	272 (5.8)	282 (4.1)	166 (2.6)	24 (1.1)
Asian	719 (3.2)	98 (4.2)	175 (3.7)	231 (3.3)	174 (2.8)	41 (1.9)
New Zealand European/Other	17,456 (77.8)	1,357 (57.6)	3,151 (67.1)	5,394 (78.2)	5,476 (86.8)	2,078 (94.9)
Indication						
Suspected ACS, n (%)	12,214 (54.4)	1,501 (63.7)	2,732 (58.2)	3,578 (51.9)	3,140 (49.8)	1,263 (57.7)
STEMI <12 hrs	*2,165 (9.6)*	*373 (15.8)*	*558 (11.9)*	*591 (8.6)*	*421 (6.7)*	*222 (10.1)*
Other ACS	*10,049 (44.8)*	*1, 128 (47.9)*	*2,174 (46.3)*	*2,987 (43.3)*	*2,719 (43.1)*	*1,041 (47.6)*
Non-ACS	10,231 (45.6)	855 (36.3)	1,961 (41.8)	3,320 (48.1)	3,169 (50.2)	926 (42.3)
Suspected or known chronic IHD	*6,577 (29.3)*	*453 (19.2)*	*1,276 (27.2)*	*2,287 (33.1)*	*2,093 (33.2)*	*468 (21.4)*
Other indications	*3,654 (16.3)*	*402 (17.1)*	*685 (14.6)*	*1,033 (15.0)*	*1,076 (17.1)*	*458 (20.9)*

Table 3: Variables available in the ANZACS-QI Routine Information Cohort.

Name of dataset and data contained	Variables
National Minimum Dataset[41] (publicly funded hospitalisations)	**Admission-related data:** date of admission, date of discharge, ICD-coded discharge diagnoses, ICD-coded procedural diagnoses (including angiography, PCI, CABG), DHB of domicile. **Demographic data:** age at admission, sex, ethnicity, deprivation quintile, domicile, rurality of residence. **Previous hospitalisations:** previous ACS and ischaemic heart disease admissions; Charlson comorbidities (MI, peripheral vascular disease, heart failure, chronic obstructive pulmonary disease, connective tissue disease, ulcers, dementia, cerebrovascular disease, hemiplegia, diabetes, liver disease, renal disease, neoplasms, AIDS); total Charlson comorbidity score.
Pharmaceutical Collection[42]	Government-subsidised medication dispensing claims from community pharmacies.
Mortality Collection[43]	Date of death and ICD-coded underlying and contributing causes of death.

CABG, coronary artery bypass grafting; AIDS, acquired immune deficiency syndrome

Table 4: Baseline characteristics of National ACS cohort (2006–2013), by age group.

	Overall (N=100,579)	Age Group				
		<50y (n=8,005)	50–<60y (n=14,531)	60–<70y (n=20,967)	70–<80y (n=25,292)	≥80y (n=31,784)
Characteristics						
Gender, n (%)						
Male	58,885 (58.5)	5,969 (74.6)	10,521 (72.4)	1,3904 (66.3)	14,619 (57.8)	17,912 (56.4)
Female	41,694 (41.5)	2,036 (25.4)	4,010 (27.6)	7,063 (33.7)	10,673 (42.2)	13,872 (43.6)
Ethnicity, n (%)						
Māori	8,981 (8.9)	1,702 (21.3)	2,409 (16.6)	2,389 (11.4)	1,768 (7.0)	713 (2.2)
Pacific	4,268 (4.2)	834 (10.4)	1,086 (7.5)	1,111 (5.3)	800 (3.2)	437 (1.4)
Asian	3,737 (3.7)	593 (7.4)	870 (6.0)	895 (4.3)	876 (3.4)	503 (1.6)
New Zealand European/Other	83,593 (83.1)	4,876 (60.9)	10,166 (70.0)	16,572 (79.0)	21,848 (86.4)	30,131 (94.8)
ACS type, n (%)						
STEMI	16,645 (16.6)	2,224 (27.8)	3,522 (24.2)	3,907 (18.6)	3,554 (14.1)	3,438 (10.8)
NSTEMI	54,531 (54.2)	3,725 (46.5)	6,726 (46.3)	10,288 (49.1)	13,596 (53.8)	20,196 (63.5)
MI unspecified	5,119 (5.1)	226 (2.8)	386 (2.7)	660 (3.1)	1,217 (4.8)	2,630 (8.3)
Unstable angina	24,284 (24.1)	1,830 (22.9)	3,897 (26.8)	6,112 (29.2)	6,925 (27.4)	5,520 (17.4)
Deprivation Quintile						
1	13,178 (13.3)	952 (12.1)	1,693 (13.8)	2,869 (13.9)	3,130 (12.6)	4,264 (13.6)
2	15,595 (15.8)	1,041 (13.3)	2,108 (14.8)	3,168 (15.4)	3,916 (15.8)	5,362 (17.2)
3	20,249 (20.5)	1,364 (17.4)	2,630 (18.4)	4,151 (20.1)	5,292 (21.3)	6,812 (21.8)
4	26,125 (26.5)	1,955 (25.0)	3,460 (24.2)	5,060 (24.6)	6,732 (27.1)	8,918 (28.5)
5	23,638 (23.9)	2,518 (32.2)	4,104 (28.8)	5,363 (26.0)	5,736 (23.1)	5,917 (18.9)
Charlson comorbidity score, n (%)						
0 (no comorbidity)	57,407 (57.1)	6,443 (80.5)	10,742 (73.9)	13,587 (64.8)	12,962 (51.3)	13,673 (43.0)
1-2 (moderate)	25,225 (25.1)	1,048 (13.1)	2,529 (17.4)	4,523 (21.6)	6,870 (27.2)	10,255 (32.3)
≥3 (severe)	17,947 (17.8)	514 (6.4)	1,260 (8.7)	2,857 (13.6)	5,460 (21.6)	7,856 (24.7)

Clinical Networks for the four New Zealand regions, the Chairs of the New Zealand interventional working group, and CSANZ, Heart Rhythm New Zealand, nursing, consumer, MOH and the national Health Information Technology Board representatives. Written protocols and processes have been established to ensure appropriate data access and use through the ANZACS-QI Governance group. The ANZACS-QI Privacy Framework (available on request) has been approved by the New Zealand Privacy Commission and the ANZACS-QI governance group. Information about the ANZACS-QI Registry is available at all hospital sites, and patients may opt out of having their data being included in the cohort on request.

ANZACS-QI is also part of the wider Health Research Council (HRC) and National Heart Foundation (NHF) funded Vascular Informatics using Epidemiology and the Web (VIEW) research programme based at the University of Auckland. The VIEW research team oversee the use and governance of any audit or research use of the national routine information datasets. As all ANZACS-QI Registry data and national Routine data is anonymised before being sent to the VIEW researchers, individual patient consent is not required by ethics committees. The VIEW study was approved by the Northern Region Ethics Committee Y in 2003 (AKY/03/12/314), with subsequent amendments to include the ANZACS-QI registries, and with annual approvals by the National Multi-Region Ethics Committee since 2007 (MEC07/19/EXP).

ANZACS-QI outputs

Regular reporting

DHB- and hospital-level quality improvement activity is supported by user access to real-time reporting of evidence-based indicators using ANZACS-QI web tools which allows for the examination of individual-level data on patients not meeting particular criteria. Monthly, quarterly and annual summary reports containing nationally agreed indicator data using both the Registry and national Routine Data datasets are generated and distributed. The indicators reported are derived from national and international guidelines and agreed by the National Cardiac Clinical Network. They include process measures, such as time frames for performance of coronary angiography

and discharge medications, and outcome measures, including 28-day and 1-year rate of recurrent myocardial infarction MI and death. These reports allow comparison of DHBs and national averages.

Publications and process improvement

The ANZACS-QI Registry and Routine Information datasets have been used to better understand the pattern of modifiable risk in the ACS cohort,[44] describe the distribution of ACS risk and its relationship with appropriate investigation, management,[45,46] late outcomes,[47] and investigate the accuracy of the internationally recommended GRACE ACS risk score for the New Zealand ACS population.[48] The initial cohort was used to develop the national indicators for appropriate timing of catheterisation for STEMI and non-ST elevation ACS patients,[49] optimum vascular access for coronary angiography,[50] and to define the temporal components of pre-hospital delayed presentation in patients with ACS.[51] Implementation of ANZACS-QI has been associated with important reductions in waiting times for ACS patients to receive coronary angiography and their consequent length of hospital stay,[52] and improved rates of radial access for coronary angiography (Vascular access for invasive coronary angiography in New Zealand 2013–15 report for DHBs). We aim to develop New Zealand-specific ACS and bleeding risk equations for ACS patients which will be incorporated within the ANZACS-QI platform.

The national Routine Information datasets have been used to track the dispensing of statin medications up to 3 years post-ACS discharge,[34] investigate the 1-year outcomes after ACS presentation and their demographic determinants,[53] and to define the pre-hospital case fatality for ischaemic heart disease and explore contributing factors.[54] The Routine Information ACS cohort has been used to produce a national ACS report regarding New Zealand and DHB trends since 2006 in ACS incidence, coronary angiography and revascularisation rates and 28-day and 1-year outcomes. It is planned that a summary of this data will be made publically available through the New Zealand Health Quality and Safety Commission Atlas of Health Care Variation website.

ANZACS-QI strengths and weaknesses

The ANZACS-QI Registry aimed to achieve comprehensive capture and data completion in all New Zealand patients undergoing coronary angiography and all those with ACS referred for coronary angiography. By early 2014, this goal had been achieved for these “core” cohorts. One limitation is that other ACS patients are not systematically captured as the cohort definition in each DHB is defined by their own local quality improvement goal. Some DHBs (including the five Midland DHBs and the Waitemata DHB) aim to comprehensively capture all ACS patients, others aim to capture only ACS patients admitted under the cardiology service (eg, Auckland and Counties Manukau DBHs), while other DHBs capture only the ACS patients referred for coronary angiography. Using the national routine dataset as the reference, in 2013 71% (4,472/6,305) of all New Zealand patients under 70 years admitted with ACS had a coronary angiogram and 48% (7,316/15,202) for all age groups.

The ANZACS-QI software has predominantly mandatory data fields. This has facilitated nearly complete (99%) risk factor data collection for key variables, the addition of built-in ranges, and validity checks at the point of data entry have reduced transcription errors. While these are important strengths of the cohort, and the dataset is much richer than that available through the national datasets, it represents a compromise between an ideal ‘research’ dataset and the requirements dictated by the need for comprehensive patient capture and associated data entry staff knowledge/workload. There are also a small number of non-mandatory fields (eg body mass index and HbA_{1c}) where it was judged that requiring completion might be too burdensome.

We electronically link the ANZACS-QI baseline data, via each person’s unique NHI, to national health datasets. This ensures almost complete ascertainment of deaths and CVD events. More than 95% of patients with an acute CVD event in New Zealand are managed by public health services. However, participants who die, or have other CVD outcome events outside New

Zealand, will be missed unless these events are subsequently documented in primary or secondary care records. Participants who emigrate are also lost to follow-up.

The national ethnicity prioritisation protocol enables us to generate a single ethnicity classification across multiple databases. For example, if a patient self-identifies as Māori in any of the linked databases, they will be classified as Māori. Unfortunately, the national ethnicity coding system only allows accurate identification of Indian patients and not other South Asian ethnicities at high-CVD risk (eg, Pakistani, Bangladeshi, Sri Lankan). Other study limitations relate to the accuracy and reliability of routine information national data. IHD hospitalisations were identified using ICD-10 codes extracted from routinely collected hospitalisation data. Studies from several European countries have reported high sensitivity and positive predictive values for ICD-coded IHD events in national datasets.[55-57]

Future directions

The ANZACS-QI Registry Trials Group (RTG) utilises the core ANZACS-QI electronic platform, datasets, and outcomes linkage to cost efficiently run clinical trials in ACS patients (see Figure 1). These studies have their own separate ethics approvals. Study-dependent additional datasets are presented within the ANZACS-QI web platform with randomisation modules as appropriate. The ANZACS-QI RTG has its own coordination group to govern the development and implementation of these studies. There are currently two multicentre clinical registry studies which are recruiting patients.

The entering of Registry data by clinicians is time consuming, and requires ongoing efforts to maintain training and data accuracy. Several parallel solutions are being used to ameliorate these issues. For example, some centres are integrating ANZACS-QI with local systems to auto-populate laboratory data onto the forms. In the longer-term, it may be possible for data to be exchanged between the Registry and the electronic discharge summaries to minimise double entry. There is now regular linkage of the Registry and the national Routine Information datasets, so that where data is available in the national datasets it is not necessary for this to be entered into the registries.

Additional linked ANZACS-QI registries

Since the national implementation of the ACS and CathPCI datasets, several other modules have been added onto the ANZACS-QI platform. The first is the Device registry, which captures information on pacemakers, implantable cardiac defibrillators, and cardiac resynchronisation therapy, the Congestive Cardiac Failure (CCF) registry (building on the existing New Zealand Heart Failure Registry) and a Cardiac CT and MRI reporting tool and registry which is in the final stages of development. In the Northern region (Northland, Waitemata, Auckland, and Counties-Manukau DHBs), which admit approximately one-third of all New Zealand ACS cases, regional laboratory data is available for linkage to ANZACS-QI through the VIEW programme.

In a parallel development, the MOH funded a national Cardiac Surgical registry in 2012. Permissions have been obtained to link this registry with ANZACS-QI datasets to facilitate national reporting of cardiac surgical outcomes.

Conclusion

The ANZACS-QI programme is primarily designed to support secondary care clinicians to implement evidence-based guidelines, and to meet national performance targets for New Zealand cardiac patients. ANZACS-QI has been successfully implemented in all the 41 public hospitals across New Zealand where acute cardiac patients are admitted.

Competing interests:
Dr Kerr reports grants from HRC during the conduct of the study. Dr. White reports grants from Sanofi Aventis, grants from Eli Lilly and Company, grants from National Institute of Health, grants from Merck Sharpe & Dohm, grants and personal fees from AstraZeneca, grants from GlaxoSmith-Kline, grants from Omthera Pharmaceuticals, grants from Pfizer New Zealand, grants from Intarcia Therapeutics Inc, grants from Elsai Inc., grants from DalGen Products and Services, grants from Daiichi Sankyo Pharma Development, outside the submitted work. Dr. Grey reports grants from Health Research Council, grants from National Heart Foundation, during the conduct of the study.

Acknowledgements:
ANZACS-QI programme implementation, coordination and analysis: The ANZACS-QI software was developed and supported by Enigma Solutions. Programme implementation is coordinated by the National Institute for Health Innovation (NIHI) at the University of Auckland. The ANZACS-QI programme is funded by the New Zealand Ministry of Health. ANZACS-QI research is supported by grants from the New Zealand Health Research Council and National Heart Foundation. **ANZACS-QI Governance group:** Andrew Aitken, Gerry Devlin, Karen Evison, Andrew Kerr (chair), Peter Larsen, Kim Marshall, Chris Nunn, Mark Simmonds, Michael Williams, David Smyth, Ralph Stewart, Harvey White. **ANZACS-QI Project management:** Kristin Sutherland, Sarah Masson, Charmaine Flynn (Northern coordinator), Maxine Rhodes (Southern coordinator). **Data management and analysis:** Mildred Lee, Michelle Jenkins, John Faatui. We acknowledge all the New Zealand cardiologists, physicians, nursing staff and radiographers who have supported and contributed to ANZACS-QI ANZACS-QI hospital coordinators: Whangarei, S. Valancey; Kaitaia, R Thompson; Kawakawa, A Farland; Dargaville, K Katipa; Bay of Islands, C Lomas; North Shore and Waitakere, R Newcombe, L Gray; Auckland City: J Donald, K Marshall; Middlemore, C Flynn, A Escondo; Waikato, C Emerson, L Warner; Tauranga, J Goodson and J Money; Whakatane, E Taylor; Tokoroa, V Huitema, P Ropitini; Taupo Hospital, T Liddell; Rotorua, A. Colby; Thames, J Radonich; Taumaranui, N. Smith; Te Kuiti, T TeWano; Taranaki, J. Quinn; Hawkes Bay, P. Grant, G Brown; Palmerston North, D Kinloch, J Juyoprasanth; Whanganui, T Thompson; Masterton, T Matthews, K Lee; Wellington, D Wylie, B Scott; Nelson Hospital, J. Besley, J Tomlinson; Blenheim, M McNabb; Christchurch Hospital, M Rhodes, J Sutherland, S McLaren, R Avis, J Murphy; Grey Base, L Smith; Oamaru, M Collins, R Gonzales; Dunedin Hospital, P Sharp; Clutha, G Lindley, J McIlrea; Dunstan, M Shaw, R Klahn; Gore, F March; Southland, R Byers

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http://www.nzma.org.nz/journal/read-the-journal/all-issues/2010-2019/2016/vol-129-no-1439-5-august-2016/6959

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