



MIDCENTRAL DISTRICT HEALTH BOARD

Te Pae Hauora o Ruahine o Tararua

The Cardiology Landscape

Final Draft

18 March 2011

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Document Management

The following records all major document revisions.

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Executive summary

MidCentral DHB commissioned an assessment of cardiology service provision and related health outcomes across the MidCentral district. This was in response to significant concerns in respect of MidCentral Health cardiology services including workforce, facilities and service access issues. As well as defining the ‘cardiology landscape’ the project sought to assess the steps required to better meet the needs of the population and in particular the capability and capacity of the cardiology department at MDHB to meet these needs.

About 50 stakeholders across the district were interviewed during the project and many others provided information, most notably other DHBs and the Ministry of Health. Examination of data and analysis was a significant part of the project.

The landscape project identified that the issues for cardiology services are significant and lie right across the service. Previous health needs assessments identified that cardiovascular mortality had improved and that the gap with national was closing. This project found that the picture is different for ischaemic heart disease which is commonly used as an indicator of community cardiac health status.

Key finding - Ischaemic heart disease mortality

Ischaemic heart disease mortality has improved but at a rate slower than New Zealand. A comparison of two periods a decade apart¹ showed a 23% decline in mortality for the MidCentral population compared to a 31% decline for New Zealand. At the beginning of the period, the rate for MidCentral was the same as New Zealand overall.

Over the last five years there have been some improvements in cardiology service provision. The 2005 MDHB cardiovascular service plan took a service wide approach and led to investment into primary care. Initiatives included the funding and roll-out of the cardiovascular assessment tool, chronic care teams including cardiac nurses and the community cardiology service (cardiologist and technician resources based in the community). A District Management Group with representation across the continuum was set up to oversee implementation and evaluation of the plan. However, there has been minimal progress towards an integrated service and service provision is still largely siloed.

Cardiovascular risk assessment is rising steadily but the rate needs improvement, especially for the ‘high needs’ population. Available indicators / information do not provide the information necessary to adequately assess management of risk such as matching prescriptions to the target group. The measure for diabetes management (an important indicator for cardiovascular disease) does not provide a clear picture because about 35% of those expected to have been diagnosed with diabetes do not currently have a diabetes annual review.

Hospital services have suffered from ‘stasis’ and despite two external reviews, progress has not been made. Stakeholders reported that the system works well for acute events and for high risk patients e.g. a positive exercise test. For those not classified as high risk, access problems for diagnostic tests and assessment have spanned years.

It was envisaged that the community cardiologist / technician services would provide additional services to the ‘at need’ areas of the district and ultimately reach people before they became high risk. Increased access has occurred in Horowhenua, Tararua and Otaki but volumes of assessment have fallen at MidCentral Health. A special list has been created for patients needing tests before assessment – in October 2010 there were 650 patients on this list going back as far as 2006. This waiting list does not feature in electives monitoring, either locally or nationally. The follow-up waiting list numbers 2,000 and patients who do not need a review within three months do not get an appointment at all (there is no room in clinic) unless they or their GP make an enquiry. Seven hundred and fifty people

¹ 1995-1997 with 2005-2007 using age adjusted rates.

are waiting for an echocardiogram² but only those prioritised as urgent are booked. Cardiology procedure and cardiac surgery intervention rates are lower than most other DHBs across New Zealand.

The facilities for the cardiology department and equipment for the angiography service are inadequate and less than 40% of angiography has been provided locally for the last two years. Staffing resources across the professional groups at MidCentral Health appears inadequate and is only slightly more than the respiratory department which has just over half the caseload. The cardiologist staffing establishment is not sufficient to provide a formal system of cardiologist cover after hours for acute complex cardiology and interventions such as temporary pacemakers. Most medical stakeholders stated that this would be expected in a place the size of MidCentral Health.

The following table provides the results of the assessment completed during the project. Some areas were difficult to evaluate as the type of indicators used and information available were not sufficient to judge performance very well. The right sort of information is not being collected to evaluate service provision. In addition, poor data quality and other data issues mean that some existing information such as community cardiology data and indicators such as hospitalisation comparisons are unable to be used with full confidence. The assessment covered the care continuum and the framework used was based on the 2008 Diabetes and Cardiovascular Quality Improvement Plan (QIP) recommendations, other recognised indicators and supplemented with the views of service providers and stakeholders. The full assessment is described in Chapter 5, 'Cardiology continuum of care' (p.33).

Summary assessment

Key for ratings

- 1 – Good performance
- 2 – Satisfactory or improving at an acceptable rate
- 3 – Needs improvement
- 4 – Poor performance

Performance indicator	Assessment
Cardiovascular risk assessment in primary care	
GP utilisation rates	Unable to be assessed
Identification of IHD	1
Identification of smoking status	3
Proportion of the population having 5 year CVD risk assessment	3
Management of risk in primary care	
Proportion of the population with satisfactory diabetes control – HbA1c	3
Prescription of appropriate medications	Unable to be assessed
Smoking cessation	3
Early disease – diagnosis and management	
Access to non-invasive tests – PN / Manawatu	4
Access to non-invasive tests – Horowhenua, Tararua, Otaki	2 - 3
Access to invasive tests	3
Access to specialist assessment– PN / Manawatu	4
Access to specialist assessment– Horowhenua, Tararua, Otaki	2
Ambulatory sensitive admissions	Unable to be assessed

² 1,000 in total are on the list but approximately 250 have an 'advance booking' e.g. commonly yearly or longer interval for monitoring of certain conditions.

Performance indicator	Assessment
Management of acute cardiovascular events	
Acute coronary syndrome - Reperfusion	2-3
Acute coronary syndrome - Risk stratification	3
Acute coronary syndrome - Revascularisation	4
Hospitalisation SDRs – IHD, Acute MI, Chronic rheumatic heart disease	Unable to be assessed
Ongoing management after acute events	
Revascularisation – elective (PCI and CABG)	3
Discharge medications	Unable to be assessed
Cardiac rehabilitation - referral	3
Cardiac rehabilitation - attendance	3
Readmissions	3
Palliative services	
End stage heart failure	2
Over all health status	
Ischaemic heart disease mortality	4

The landscape project confirms that cardiology outcomes in the MidCentral district are poor. These unsatisfactory clinical outcomes arise in part from inadequate levels of service provision across the spectrum of care. Some positive developments have occurred recently, yet the rate of improvement in outcomes remains unsatisfactory. Under current circumstances, MidCentral DHB is unlikely to match the performance of cardiology services elsewhere in meeting the needs of its district's population.

There are many steps to be taken along the cardiology care continuum and the best possible outcomes will come from attention to multiple factors across the continuum from health to disease. There has been a tendency to focus on intervention rates, a commonly held view being that resourcing hospital services better will cure cardiology's ills. However, interventions are just one aspect of cardiology services. Some people will need the basics (diet, smoking cessation, exercise), others will need the basics plus drugs, others will need basics plus drugs plus acute care, and a few will need the full house including intervention. Every part of the system is important. Cardiology outcomes will not markedly improve if a significant percentage of target people are not identified (i.e. the estimated 55,000 people in the district at risk of cardiovascular disease) or if diagnostic tools / advice and treatment are not available to manage disease when it occurs. Further, this 'at risk' group is expected to grow with the ageing population and the epidemic of obesity and diabetes in the younger population.

The precise nature of the resources and systems needed to make further improvements in primary care and reach the target population is uncertain. It is possible that currently available resources may need to be applied better. For instance, ensuring that the most at-risk people get nursing and other supports and that the people of most need are reliably and efficiently transferred for specialist investigations and/or treatments.

Investment in specialist services is needed, as this report recommends, but the rationale for this should be understood. An appropriate level of resource is required to permit an improved rate of specialised consultations and interventions. Looking beyond the desirable high-tech functions of a cardiologist, attainment of best possible outcomes for the MidCentral DHB population also requires the coordination of all providers in primary care, ED, and generalist hospital roles, to work seamlessly with cardiology specialists. These providers require guidance and timely access to advice and diagnostics. Services also need to be monitored against quality clinical standards.

District-wide delivery of a fine cardiology service can only be achieved through careful planning, and the planning process requires sound clinical leadership. This leadership is most appropriately provided by a cardiologist. A model of clinical governance is necessary which encompasses the whole care continuum from risk assessment to palliative care. This will provide the mechanism to ensure continuous quality improvement in services to prevent / address future problems in a constantly changing environment which needs ongoing examination and evaluation.

The assessment identified that improvement is needed across the whole service. In the first instance MidCentral DHB needs to address some urgent problems such as service access and reach an acceptable level of functioning. Working in new ways will be crucial. This will require clinical leadership, resources, and initiatives to manage demand including the development of roles. The integrated model of care and enhanced clinical leadership is fully consistent with the Clinical Network concept which already been supported by the Board as a model for future service planning and organisation.

A service plan should be developed with identified priorities, KPIs and allocation of responsibilities, sufficient to meet the existing requirements of the district's population. The plan should encompass ongoing service development, to enable medium to long-term service requirements to be met. The plan should be district wide and be developed and enacted within an integrated model where the parties plan, interact and work together more formally.

Once MidCentral DHB has adequate human and physical capacity for its own population it can expand and offer services regionally. This will enable Whanganui patients to have services closer to home and should help to lift service levels for this population. The Central Region Cardiac Network sees a very strong role for MidCentral Health in the region with MidCentral performing most of the assessment and diagnostic work for the Whanganui population and then referral onwards for tertiary services in Wellington.

The ultimate objective is to lift the service to an advanced level of functioning which includes the provision of PCI. This level of development would need to occur in parallel with regional-level planning and development.

Recommendations

Recommendations 1 to 3 are concerned with governance and resources and need to be implemented first in order to progress most other recommendations (save Recommendations 7 and 9). The remaining recommendations should be implemented by the end of 2012 at the latest – it will be the responsibility of the governance group to identify precise timing and responsibilities which should form part of the service plan.

Governance

1. That a clinical governance group be established to progress an integrated practice model across the continuum of care. Cardiologist leadership is fundamental to the success of this approach and dedicated time will need to be allowed. Membership will include GP, cardiologist, nursing and technical representation. The governance group will oversee the implementation of the recommendations in this report including the service plan.

Proposed targets should reflect improving inequalities and reductions in age-adjusted ischaemic heart disease morbidity and mortality, the latter target being:

- 25 fewer deaths per year by year 5; and
- 50 fewer deaths per year by year 10.

Timing: 1 July 2011
 Responsibility: Clinical Director Medical Services

Strategic

2. That the size of the cardiology department at MidCentral Health is increased to deliver on these recommendations and develop the service.

This is crucial in order to increase access, cope with demand and improve outcomes faster. Recommended staffing establishment is outlined in the following table.

		Current establishment	Additional positions	Additional FTE	New establishment
RC 320 - Cardiology	Medical	3.55 (3 heads)	Cardiologist GP Advanced registrar trainee	1.0 1.0 1.0	6.55
	Nursing	2.7 (CNS) 0.6 (RN)	Specialist nurse Diagnostic nurse (Cath lab)	1.0 1.0	5.3
	Allied	5.1	Cardiac Physiologist	1.0	6.1
	MRT	0.25	MRT	0.25	0.5
	Mngt/Admin	3.00	Service leader / admin	0.5-1.0	3.5 – 4.0
RC 528 - Ward 28 / CCU	Nursing	31.2	Nursing	-	31.2
	Mngt/Admin	1.06	Mngt/Admin	-	1.06
		47.46		6.75 – 7.25	54.21 – 54.71

Timing: 1 July 2011 (Business case submitted)
 Responsibility: Operations Director Hospital Services

3. That investment occurs into invasive services at MidCentral Health. This is crucial for recruitment of cardiologists, optimal management of patients and the possibility of providing a regional service. This will include developing a cath lab which should be PCI capable. The possible introduction of another site within the Central Region for PCI is part of the regional work programme and should be explored within this context.

Timing: 1 July 2011 (Business case submitted)
 Responsibility: Operations Director Hospital Services

4. The service will work towards providing a formal after hours cardiologist on-call roster to enable access to local cardiologist advice 24/7.
5. That an integrated service is furthered by the engagement of GP and specialist nursing resource that will work across the service assisting with service development and forming closer alignment between clinicians in primary and secondary services. This includes better linkages with community cardiac nurses and ensuring that the focus is targeted to the highest priority patients.
6. That service development include strategies to manage demand more effectively and speed the patient journey from first contact to contact with the specialised service, e.g. referral management, introduction of pathways / algorithms for common conditions (chest pain pathway, heart failure, atrial fibrillation and management of hypertension), and approaches that maximise all roles such as:
 - introduction of a GP special interest (GPSI) model of care;
 - technician reporting of tests;
 - secondary prevention clinics; and
 - reviewing waiting lists and triaging patients to the appropriate service.

The introduction of GPSIs could be linked to recommendation 5. As well as helping with demand this would have the benefit of enhancing cardiology knowledge across the district and identifying key individuals that can participate in service development initiatives.

Service delivery

7. That waiting list backlogs are urgently reviewed by 30 May 2011.
8. That priority is placed on improving access to diagnostic tests and hospital level cardiology services. This includes:
 - Exercise tests, echocardiograms, holter monitors (particularly for Manawatu and PN).
 - Cardiologist assessment (particularly for Manawatu and PN).
 - Angiograms and other cardiology procedures.
 - Cardiology procedures available in tertiary services including cardiac surgery.

Facilities

9. That MidCentral Health Cardiology Department services are co-located to improve team cohesiveness, efficiency and current and future capacity. Options presented in this document for co-location of the department should be explored and following this a preferred option agreed and progressed (refer p.63). This should occur forthwith given the urgent capacity issues for echocardiography.

Contractual arrangements

10. That the clinical leader of cardiology services (Rec 1) and the Funding Division Primary Care Portfolio Manager review the contractual arrangements for the service including:

- Price volume schedule with MidCentral Health and alternative funding possibilities which support a focus on outcomes rather than activity. Flexibility is required to move volumes to different professional groups and non-contact activities.
- Service specifications for the community cardiology service to ensure that service aims are realised such as providing regular advice and education to GPs and other professionals to improve diagnosis and management of cardiac conditions, working on shared treatment plans and acting as a source of expert advice. Roll out of community services to Manawatu is also required when cardiologist resource is in place.

Quality and audit

11. That a quality improvement approach be adopted and data quality improved in order to guide the service. A set of information necessary to manage the service and evaluate its performance should be agreed (linking to service KPIs) to facilitate audit and enable explanations for any deviations from national or international guidelines or recommendations.
12. That data processes for community cardiology are reviewed including the necessity for data to be entered into two systems by two organisations (MidCentral Health and Central PHO). Currently there are many inconsistencies with counting. As a minimum the following needs to occur:
 - Agreement on data definitions to support a DHB wide view of activity.
 - Rework the data entry process with supporting procedures and training ensuring alignment between MidCentral Health and Central PHO processes.
 - Matching of data capture to contract requirements e.g. referrers. A more specific reporting template may be of advantage.
 - Introduce regular monitoring / audit to identify early any issues that occur.

Resources

13. That resources are committed to implement the recommendations. Early indications of the level of investment required are (refer Table 27 p.84 for breakdown):
 - Cath lab and equipment \$2.6m
 - Staff \$697 – 775k
 - Co-location of department – not costed, 4 options to explore.

The additional volumes required to reach 'expected'³ intervention rates will also need to be funded. This is approximately \$880k for angiography and PCI combined. The cost for the additional cardiac surgery required has not been assessed.

³ Expected intervention rate is the average national rate for angiography. There is a national target for PCI which is 10.8 per 100,000 population.

1. Introduction

Purpose of the project

The purpose of the project was to complete an assessment of cardiology service provision across MDHB and deliver a report for internal planning, funding and investing purposes. This was in response to significant concerns in respect of MidCentral Health cardiology services including workforce, facilities and service access issues. It is envisaged that the assessment will be an input into a strategic plan for cardiology services (proposed phase 2). The objectives were:

- To define the cardiology landscape at MDHB.
- To assess the steps required to better meet the needs of the population over the next three to five years, in particular the capability and capacity of the cardiology department at MDHB to meet these needs.
- To recommend future investment and/or disinvestment required to meet identified needs.

Project approach

The project was undertaken between October 2010 and January 2011. A major input for the work was discussions with stakeholders across the district. Information was also sought from a number of other individuals and organisations including other DHBs, Central Technical Advisory Services (CentralTAS) Ministry of Health (MoH) and the National Heart Foundation (NHF). A list of stakeholders and others contacted is provided in Appendix A. A range of documentation was also reviewed. Examination of data and analysis was a significant part of the project involving multiple data sources and organisations.

The assessment was continuum wide and where possible used recognised indicators, the 2008 MoH led Diabetes and Cardiovascular Quality Improvement Plan (refer Appendix G, p.131) and the Key Performance Indicators published by the Central Region Cardiac Network. This was supplemented with the views of service providers and stakeholders.

Project management was outsourced and supplemented with the assistance of a range of DHB personnel (chiefly analysts). The Project Sponsor was Mike Grant, General Manager Funding Division and oversight was provided by a steering group made up of primary and secondary service clinicians and managers.

Feedback on the draft report

The initial draft report was reviewed by the steering group in early February 2011. The revised draft report was then circulated to a group of stakeholders for comment with a final date of 2 March 2011. One person responded. The main points were:

- Statement of support for MidCentral's commitment. The report is the first step in improving Cardiac Services at MidCentral. Noting the previous reports that had not been progressed the suggestion was made that a draft implementation plan and timelines would provide reassurance to stakeholders.
- The most important areas to consider in the development of services is the acute coronary syndrome load and timely outpatient referral. Key services for this are chest pain assessment service, echocardiography, cardiac cath lab and heart rhythm services (holters and event monitors).
- PCI is a reasonable long term goal but this puts stress on cardiology services and services should be functioning well with good staffing first.
- Expanding services to Whanganui DHB is supported by the Regional Cardiac Network.

The following timelines have been specified in the recommendations.

Recommendations 1 – 3 which are concerned with governance and resources have been given a timeframe of 1 July 2011. Responsibilities have also been identified for these important three recommendations.

Recommendation 7 concerned with urgent review of waiting backlogs has a timeframe of 30 May 2011.

Recommendation 9 concerned with exploring options for co-locating the department, and then progressing a preferred option states that this should occur forthwith given the urgent capacity issues for echo.

The governance group is the subject of the first recommendation and will oversee the implementation of the report including the service plan. Timeframes for the other recommendations will be outlined in the service plan – the report has specified that all recommendations should be implemented by the end of 2012 at the latest.

Overview of cardiac disease – Nationally and at MidCentral DHB

Cardiovascular diseases (CVDs: heart, stroke and blood vessel disease) are the leading cause of death in New Zealand and responsible for 40 percent of all deaths annually. Within the set of CVDs, coronary artery disease is the biggest single killer (second only to cancer as a single cause of death) and is responsible for approximately 22% of all deaths. The burden of heart disease is greatest among Māori where coronary heart disease is the leading single cause of death and the rate of hospital admissions for heart failure is nearly three times that of European / others.

Although age-adjusted death rates have declined steadily over the past few decades⁴ the total number of cardiovascular events is projected to rise due to our aging population and the increasing prevalence of risk factors such as diabetes and obesity. Many deaths are premature (accounting for 33% of life years lost between 45 and 64 years of age)⁵ and preventable. In fact it is estimated that 80% of the population have three or more modifiable risk factors such as smoking, physical inactivity, poor diet and being overweight⁶ and that within a few decades the elderly will outlive their middle-aged children who will die of CVD.⁷ The health and economic burden of CVD exceeds that of any other condition.

MidCentral DHB Health Needs Assessments (HNA) have identified that MidCentral's CVD mortality rate is worse than that for New Zealand overall. The 2005 HNA further highlighted the poor outcomes that occur amongst Māori, Pacific and Asian people; people from socioeconomically deprived environments; and people from communities located at a distance from the base hospital. The 2008 HNA findings included:

- Circulatory diseases remain the leading cause of death. MidCentral's circulatory disease mortality from 2002-2004 was 11% higher than for New Zealand overall. This was an improvement on the previous period (1999-2001) where it was 15% higher than national.
- Hospitalisations for circulatory disease are lower than expected suggesting service access issues although there is some evidence that health service under-use by people in most need of services is closing.

And more generally that:

- The health status of MidCentral's residents is improving.
- The health status in most of MidCentral's territorial authorities is also improving.
- Māori and Pacific peoples experience disadvantaged health status.

⁴ Heart disease death rates in New Zealand have halved and stroke death rates have almost halved since 1968 (Heart Foundation web site, Home page, 9 Jan 2011)

⁵ 2003 New Zealand Health Strategy DHB Toolkit: Cardiovascular disease (Edition 2)

⁶ CentralTAS website, Home page, 9 Jan 2011

⁷ MidCentral DHB (2005) Cardiovascular Service Plan, p. 1

The 2007 MidCentral Health Clinical Services Plan stated that:

- MidCentral's morbidity and mortality rates are generally the same as, or better than, the rates for New Zealand, except for ischaemic heart disease (IHD) and breast cancer where mortality is higher.
- Māori living in MidCentral have better health status than their national counterparts, but poorer than MidCentral non-Māori.

The document

The structure of the remainder of the document is as follows.

- Chapter 2 'Background' – an overview of the strategic environment and related national, regional and MidCentral DHB work.
- Chapter 3 'Current state' – this chapter provides a description of cardiology services delivered in primary and hospital settings. Issues identified by service providers are also covered.
- Chapter 4 'Stakeholder themes' – an overview of the perspectives of stakeholders. Further detail is provided in Appendix E.
- Chapter 5 'Cardiology continuum of care' – this is the assessment part of the document and looks at how MidCentral DHB is doing against a set of indicators. A summary table completes this chapter.
- Chapter 6 'Facilities' – options for alternative cardiology department configurations were explored as well as the requirements for a cath lab including high level costings and future revenue flows. Benchmarking of cath lab staffing, processes and facilities is also provided.
- Chapter 7 'Future environment' – changing demand is discussed along with service priorities and the merits of PCI.
- Chapter 8 'Regional service provision' – opportunities for regional expansion are discussed.
- Chapter 9 'Conclusion' – this chapter includes recommendations for action.

Appendices – contains various supporting information. Appendices A and B list who was involved. The document contains a large number of acronyms and health terminology so Appendix C, 'Abbreviations and definitions' may be helpful to the reader. Appendix D covers specific problems with data and information discovered during the project. A summary of stakeholder themes is provided in the body of the document – further detailed notes are provided in Appendix E. A substantial data supplement is the subject matter of Appendix F. The Diabetes and Cardiovascular Quality indicators which have been used heavily in the project are found in Appendix G. Appendix H presents the 2010/11 regional cardiology network action plan and Appendix I lists references.

2. Background

Strategic and regulatory environment

Organisations providing publicly funded cardiology services must meet a range of requirements. This includes legislation, ministerial directions, government policy and adherence to the New Zealand Health Strategy and other national strategies that flow on from this e.g. He Korowai Oranga: Māori Health Strategy and the Primary Health Strategy. One of the 13 population health objectives of the New Zealand Health Strategy is to reduce the incidence and disease impact of CVD.

The Nationwide Service Framework includes a Service Coverage Schedule and service specifications which set out, on a national basis, the minimum services, in terms of range, level of access and standard, which DHBs must ensure are provided to their populations. Secondary and tertiary cardiology services fall under the 'Tier one Specialist Medical and Surgical Services' specification. This specification is generic and does not specify the components of cardiology services in detail e.g. what type of diagnostic tests or interventions should be provided. In contrast, guidelines for the delivery of an organised stroke service are attached to this specification as an appendix.

A range of clinical guidelines has been published by the New Zealand Guidelines Group (NZGG), the National Heart Foundation (NHF), and the Australia and New Society of Cardiology Services (ANZSCS).

Cardiovascular Toolkit

The MoH produced a toolkit in 2003 providing evidence on each of the cardiovascular priority areas and providing information and resources to assist DHBs to reduce the incidence and impact of CVD. This includes an action plan for the following priority areas; cardiovascular risk screening and management, acute coronary syndromes⁸ (ACS), secondary prevention, cardiac rehabilitation, organised stroke care, CVD and Māori, CVD and Pacific.

Diabetes and Cardiovascular plan

In 2008 the MoH developed a Quality Improvement Plan (QIP) for CVD and diabetes to improve outcomes for these priority conditions. The aim was to provide DHBs and the health sector with a three-year plan and the document identified the following priority areas:

- Cardiovascular and glycaemic risk assessment and management
- Cardiovascular events (ACS, stroke and transient ischaemic attack (TIA)):
 - Patient and treatment delays.
 - Clinical assessment and risk stratification.
 - Revascularisation.
 - Discharge medications.
 - Rehabilitation.

National Cardiac Surgery Clinical Network

The Cardiac Surgery Network was established about a year ago to lead and oversee improvements to New Zealand's cardiac surgical services. The Network's overall goal is to reform, improve and strengthen health care around cardiac surgical systems across New Zealand and to:

- Increase delivery of publicly-funded cardiac surgery.
- Improve equity of access to cardiac surgery.
- Improve the quality of service of cardiac surgery.

⁸ ACS or acute coronary syndrome includes unstable angina (UA) and heart attacks. Heart attack or myocardial infarction is further categorised into ST segment elevation myocardial infarction (STEMI) and non-ST segment elevation myocardial infarction (non-STEMI).

- Ensure the development of appropriate systems and processes to support these goals.
- Support District Health Boards, health professionals and the MoH to enhance the provision of publicly-funded cardiac surgery in New Zealand.

Regional

Cardiology has also been a focus of work regionally. In 2006 the Central Region DHBs published a review of cardiology services. Subsequently an implementation plan was developed and a Cardiology Network formed in 2007. The Network is headed by a clinical director (clinical lead of cardiology services at Capital & Coast DHB) and supported by a project manager based at TAS. All central region DHBs are represented in the membership. A cardiologist represents MidCentral Health. The network has produced a number of documents making recommendations for improvement including 'Cardiac Technicians and Technologists', 'Heart Failure – Model of Integrated Care', and 'Cardiac Key Performance Indicators.' Refer to Appendix H p.132 for the 2010/11 action plan. The 2011/12 Regional Services Plan reports Network outcomes as having:

- facilitated the increase in cardiac elective surgery volumes;
- supported workforce development through regional physiology trainer support to DHBs; and
- reported on ethnic disparities in access to revascularisation procedures.

The latter work found that Māori are less likely than non-Māori to receive diagnostic procedures and PCI in the Central Region. These disparities were found to be driven by events in the first few days following admission and continue thereafter. There was no significant difference between Māori and non-Māori in receipt of coronary artery bypass grafts (Te Rōpū Rangahau Hauora a Eru Pōmare, 2010).

MDHB planning and reviews

There have been multiple plans and reviews locally as summarised below. This included two external reviews (Ludbrook and Ruygrok) which were not implemented.

Michael Ludbrook – 2004

Findings / recommendations were:

- Strong and clear leadership is required.
 - Cardiologist leadership to develop plans and address issues
 - Dedicated nursing leader (current team leader responsible for eight other services)
- Develop invasive services (cardiac catheterisation, percutaneous coronary intervention).
- Regional plan required to address workforce development and recruitment issues, joint appointments, peer review and support, referral guidelines, rationalisation of services and plans to introduce new services at each of the DHBs.
- Location – staff scattered throughout the organisation
- GPs, nurses and technicians should have a greater role in service provision.
- Optimising providers across the continuum of care – taking a lead role with planned investment in primary care to influence the shape of future services and relationships between providers.
- Need for a dedicated Coronary Care Unit (CCU), versus High Dependency Unit (HDU), and having no dedicated medical supervision.
- Infrastructure – inadequate access to computers and secretarial support.
- There were also numerous process improvement opportunities identified including nurse review of waiting lists, expanding the echocardiography (echo) service, GP direct access to echo / holter monitors, establishing criteria for admission to CCU, clinical guideline improvements (consistency issues and delays with introduction) and clarifying who oversees the “through door to needle process.”

Dr Peter Ruygrok – 2005

An external opinion from a clinical expert was sought on the cardiology service configuration that it should be developing and working towards to meet the health needs of its population over the coming 15 years. The report included recommendations to:

- Establish a cardiology department.
- Generate a vision and strategic plan for cardiology.
- Begin a regional planning programme with nearby DHBs) with particular emphasis on long term provision of tertiary services.
- Invest in people, space and equipment including dedicated catheterisation laboratory.
- Seek and explore collaboration with external providers – public and private, consider joint ventures for high cost technologies.
- Incorporate the Cardiac Care Unit(CCU) and some or all of Ward 28 staff into the cardiology department, cardiology/CCU nurses to assist with catheterisation laboratory work and exercise testing.
- Establish a formal after hours cardiology on-call roster.
- Employ a dedicated rotating cardiology registrar.
- Seek out and participate in research and audit projects.
- Once a sense of identity is established recruit new staff.

Cardiovascular Service Plan and initiatives – 2005

The Cardiovascular Service Plan 2005 was the DHB's response to the importance of CVD to the communities across the MidCentral district. The plan resulted from consultation and collaboration between primary and secondary care providers and community stakeholders across the district.

Across six major objectives, a total of 62 initiatives were proposed. Whilst a few of the proposals were specific to hospital services, the majority of initiatives concerned either delivery of services (either primary or secondary) in the community setting, or improved flow and collaboration between community and hospital providers.

The implementation team noted similarities between the Cardiovascular Service Plan initiatives with aspects of the other major service plans, particularly diabetes, but also the cancer and respiratory plans. Wherever synergies existed, those initiatives were implemented together. Apart from its pragmatic appeal, this approach was clinically sound. For example, a single risk factor may contribute to the development of a variety of diseases; some diseases result in the development of other diseases; and many patients have multiple conditions (co-morbidities).

Since 2005, notable major developments have occurred in the following areas:

Health Promotion

Recognising the importance of the 'upstream determinants of health' to development of many of the major diseases of our community, substantial work has occurred in health promotion, bolstered by other strategies from the MoH.

Detection of risk

Assessment of absolute CVD risk has been promoted through national guidelines since 2003. Following the Cardiovascular Service Plan, all general practices were funded to receive 'bestpractice' decision support software which includes a tool to facilitate CVD risk assessment and follow-up.

Management of detected risk

The implementation team recognised that a concerted cardiovascular risk assessment programme would increase the primary care workload, if appropriate follow-up was to be provided to people found

to be at high risk. To assist with this additional load, the PHOs were funded to set up Chronic Care Teams consisting of dietitians, physical activity advisors, and smoking cessation advisors, the services of which would be available cost-free on referral from a health practitioner (either primary or secondary care). These teams also provide an important role for patients with several important disease states including CVD and diabetes.

Diagnosis and management of disease

The Cardiovascular Service Plan provided improved access to cardiology tests and specialist advice in the community including:

- BNP tests for the diagnosis of heart failure;
- non-invasive tests (ECGs, echos, holter monitor tests and exercise treadmill tests (ETT's)) and community-based specialist clinics operating as a one-stop shop; and
- community cardiac nurses for cardiac rehabilitation, and follow-up of patients in collaboration with GPs and cardiologists.

Another initiative was the installation of automatic external defibrillators in areas of high public use across the district.

A District Management Group (DMG) comprising primary secondary multi-disciplinary membership was established to oversee implementation of the Plan. The DMG met regularly until early in 2010 when the EOI workstreams kicked off (refer EOI section on next page).

MidCentral Health Clinical Services Plan (CSP) – 2007

The CSP envisages significant change to MidCentral Health's models of care, workforce, information technology and facilities. The plan described future service delivery as more participative and based around the patient rather than the clinician or facilities. Common categories of conditions will be managed along predefined pathways, supported where appropriate by diagnostic tools and assessment. Care will be provided increasingly in non-hospital settings. Specific proposals to strengthen cardiology services included:

- Consolidating resources such as ETT's, echo and outpatient clinics in a single location in Palmerston North Hospital.
- Reviewing the demand to undertake more diagnostic angiography, temporary and permanent pacemaker insertion and pericardial taps.
- Leveraging the Chest Pain pathway to support consistent care for cardiac patients.
- Working with Capital & Coast DHB and other DHBs to ensure appropriate access to tertiary cardiology services such as angioplasty and complex angiography procedures. It was not envisaged that angioplasty would be undertaken in Palmerston North Hospital within the next 10 years due to insufficient demand to maintain a clinically and financially viable service.
- Continuing to implement the CVD District Plan initiatives by:
 - Supporting the increase in diagnostic and rehabilitation capability in the outlying areas.
 - Training the PHO nurses to proficient level in cardiology.
 - Planning the configuration of secondary level cardiology services with Whanganui and Wairarapa DHBs.

Sub-regional diagnostic Angiography Review – 2007

This paper reported on progress to date on the implementation of a sub-regional diagnostic angiography service and modelled future angiography volumes. The case for increasing capacity was presented which included being able to respond to immediate service demands, improve recruitment and retention (which would foster service identify and development) and enable MidCentral to contribute regionally by providing routine services for the Whanganui and Wairarapa populations. The main constraint identified was the facility. There was no action following on from this review.

Financial services review – 2010

As part of the financial recovery programme a financial review of cardiology services was completed prior to the landscape project. The focus of this review was to identify cost savings and the recommendations were:

1. A programmatic contract approach to be promoted and considered for the next year's contracting round.
2. 0.5 FTE CNS role is disestablished and the Cardiac Rehabilitation Programme is streamlined to increase CNS time in post interventional follow up and angiography.
3. The currently funded MidCentral Health budgeted establishment of 3 Cardiologists (headcount) is reduced to 2 Cardiologists (headcount) in the 2010/11 budget
4. The three Cardiologists (including the Community Cardiologist) will support the Cardiology Service with an enhanced primary and secondary interface.
5. Develop a strategic plan for cardiology services to ensure the future of MidCentral Health's Cardiology service is clear and covers the opportunity to recruit an additional fourth Cardiologist if this arises in the future.
6. Consider the feasibility of Clinical Cardiac Physiologists reporting low level diagnostic tests (e.g. holter readings)
7. Consider the feasibility of Clinical Cardiac Physiologists leading testing processes in Outpatients.
8. Transfer funding for the Nurse Practitioner position to General Medicine in line with the redeployment of the NP to the General Medicine line.

Expression of Interest (EOI) and Business case – 2010

In November 2009, MidCentral PHOs were successful with an EOI to the MoH to transform primary health care services to achieve the 'Better, Sooner, More Convenient' Vision. A business case was then developed to outline implementation. Programmes of activity which the Government identified in their policy documents for 'Better Sooner More Convenient' included Integrated Family Health Centres, general practice consolidation, improved access to urgent care and diagnostic services, nurse-led walk-in clinics, improved care for people with chronic conditions and the frail/elderly, self-care and services in the home, progress towards primary-secondary service integration, including the shifting of some services from hospital settings to local communities, prevention and Whānau Ora as appropriate.

The business case talks about the primary and secondary siloed nature of health care services which are often based on historic service delivery points rather than being focused on the patient. This results in inefficiencies such as treatment in ED rather than the patient's home (MidCentral DHB, Transforming Primary Health Care, 2010). Redevelopment of practice models is proposed to respond to increasingly complex challenges such as an increase in the assessment workload, case management and participation in integrated health teams. Four key programmes of activity were chosen (Integrated Family Health Centres, Acute Demand Management, Older Persons Services and Whānau Ora) that were viewed as making the most difference for health system delivery and health outcomes experienced.

Achieving the targets of the business case will impact on cardiology services across the MDHB. Targets include:

- increasing enrolment by Māori in PHOs to 100%;
- reducing presentations to the emergency department (ED) by 30%;
- reducing avoidable hospital admissions to Medical Wards and Assessment Treatment and Rehabilitation for over 65 year-olds by 20%;
- 80% of people aged over 65 with moderate complexity health needs will receive coordinated structured care through general practice teams;
- 100% of enrolled patients having access to their own health records by 2013; and
- all primary health care providers working within a common assessment and care planning framework.

3. Current state

About cardiology services

Cardiology services include comprehensive assessment and modification of cardiovascular risk, diagnosis and medical treatment of disease by drugs and non-surgical intervention, treatment of symptoms, and referral for surgical intervention as appropriate.

Primary care service providers deliver most of the day to day management of CVD. Services include disease prevention programmes, identification of people at risk of CVD, targeted services to reduce risk factors in 'at risk' people, diagnosis and treatment of symptoms, referral for investigation and intervention, ongoing management of people with identified cardiac disease, and cardiac rehabilitation programmes. Delivery of these services is principally through PHOs (and their primary care practices and member organisations) as well as through a network of other community and NGO agencies and providers. Recently the four PHOs in the MidCentral DHB district (Horowhenua, Tararua, Otaki and Manawatu) have merged to form the single 'Central PHO.'

Secondary services provide definitive diagnosis through investigation, and management of people requiring acute coronary care. At the MidCentral DHB secondary services are provided by MidCentral Health principally at the Palmerston North and Horowhenua hospitals.

Tertiary care provides specialised and complex cardiological investigation and treatment, including most aspects of electrophysiology and non-surgical and surgical intervention for coronary artery disease such as coronary artery bypass graft (CABG) and valve surgery. Capital & Coast DHB provides the majority of tertiary services received by the MDHB population.

Primary and community services

The 2006 Central Region Cardiology Services Review described strategies that many countries have developed to reduce the incidence and guide the management of cardiac disease including:

- Primary prevention through health promotion, and risk assessment and management.
- Management of ACS with an emphasis on providing timely treatment to acutely ill people.
- Secondary prevention services including drug therapy, revascularisation and cardiac rehabilitation.
- Integrated health services across all sectors for those with chronic disease.

MDHB has invested heavily in some of the above areas as described below.

Chronic care teams

In 2006 MidCentral DHB established infrastructure in the community to provide chronic disease care. Chronic Care teams are based with the four PHOs in the MidCentral District and made up of dieticians (6 FTE), podiatrist (1.5 FTE), smoking cessation coordinators (5 FTE), diabetes nurses (6 FTE) and physical activity educators (4.5 FTE).

Twenty-five additional PHO staff members are employed to work alongside the chronic care teams funded through service plan investment in the areas of cancer, respiratory illness and CVD, including 6.5 FTE community cardiac nurses (CCNs). These positions are supported by the Health Care Development Team and establishment of the roles was supported by specialist service resource.

Community cardiology services

The key components of the Central PHO contracted cardiology service include access to community cardiac care nursing services, cardiac rehabilitation services, community cardiologist and community based diagnostic services. The aim of the service is to facilitate the initial diagnosis and assessment phase with particular emphasis on those patients suspected of having IHD, and to speed the entry of

at-risk patients into secondary and tertiary treatment services. The intention was to improve access to initial evaluation services (echo and other key tests) by providing them in each region, and in close association with PHO based services such as dietician, smoking cessation and physical activity advisors. Specialist follow-up services are also provided. There is a shortage of GPs nationwide and the placement of resources has been targeted to the areas of the district with the highest need – Horowhenua and Tararua. Table 1 provides the breakdown.

Table 1: Community cardiology resources – breakdown by PHO

	Total FTE	Manawatu FTE	Tararua FTE	Horowhenua FTE	Otaki FTE
Cardiologist	1.0	0.3	0.2	0.4	0.1
Cardiac Care Nurses	6.5	1.8	1.3	2.7	0.7
Technician	1.0	0.3	0.2	0.4	0.1
Total	8.5	2.4	1.7	3.5	0.9

The model for the delivery of community based cardiac services is integration of secondary care delivery with primary care teams, supporting PHO and other community based providers and supporting PHO clinical quality structures. The service works with and supports the development of the systematic chronic care model.

Community cardiac nursing

The CCN role is a combination of cardiac rehabilitation, care of those with heart failure and those with CVD. Because resources are targeted there is variation in the number of GP practices that the nurses cover as follows:

- Palmerston North /Central PHO Manawatu locality - one nurse based at the PHO (0.8 FTE) and one nurse (0.8 FTE) based at Whakapai Hauora). The nurses cover 13 practices each including the two Māori providers.
- Horowhenua - three nurses based at the Central PHO – Horowhenua locality (2.6 FTE) and cover three practices each.
- Tararua – two nurses (1.3 FTE) based at Tararua Health Group and between them covering four GP Practices at Pahiatua and Dannevirke.
- Otaki- one nurse (0.7 FTE) is based in a general practice with five GPs.

Following are the perspectives of the nursing team.

Prioritisation

Nurses triage referrals. Service contact requirements are to make contact with the patient within 2 weeks and visit within 12 weeks. Patients who have had intervention at Wellington receive weekly visits until their specialist follow-up at 6 weeks. Priority and amount of input that the patient receives is determined by the nurse when contact is made. Nurses state that targeting of services does occur at an individual level and often there are other services that patients require e.g. a referral to the Paths programme may be appropriate. Being able to get to the ‘high needs’ population is a challenge as the service is largely based on referral. There has been some liaison with Iwi providers and participation in sessions on the Marae, particularly in Tararua. The plan is to increase education and screening efforts but there is some difficulty “getting a foot in the door.” In Otaki, guidelines for the management of cardiac conditions and identifying patients at risk have been developed in a collaborative effort between the PHO and the Otaki Medical Centre. These guidelines emphasise the importance of screening Māori and Pacifica peoples from age 35.

Two examples of care provided by the CCNs were taken from the 2009/10 annual report.

52 Māori Male with Heart failure, type 2 diabetes, sleep apnoea

The cardiac nurse has empowered this man to monitor his condition on a daily basis. Because of continued education and supportive input regarding self management strategies, he now responds early to acute changes in his heart failure condition. Whilst his readmission rate to hospital may not have reduced, his length of stay certainly has. Together with collaborative support from the GP, he has been introduced to self titration of diuretics with good results. Visiting his home has allowed the cardiac nurse to “see his reality” and make realistic suggestions to home and his whanau that can improve his quality of life.

88year old European male with Heart Failure

The cardiac nurse was able to prevent admission to hospital by liaising with the MCH Nurse Practitioner Heart Failure and the GP when the patient’s condition deteriorated. The patient was able to remain at home and have medications titrated while being closely monitored by the Cardiac Nurse who updated the GP.

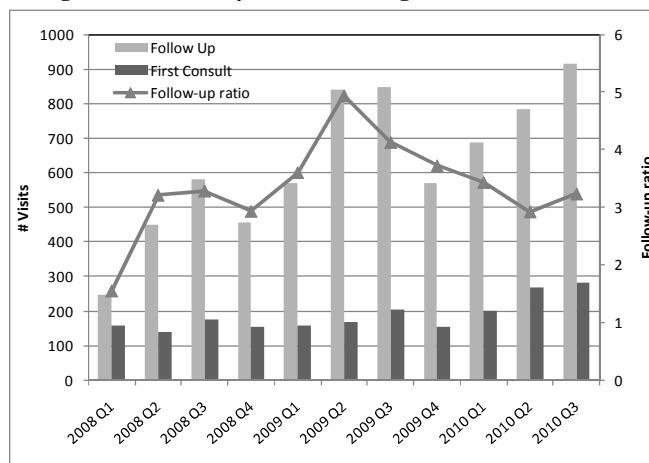
The CCNs estimate that about 75% of the role is cardiac rehabilitation. A small proportion of patients referred decline services; these people are sent information. Where it makes sense, some contacts are telephone rather than face-to-face. Nursing roles vary across the district; some nurses have been involved with cardiovascular risk assessment but in general nurses do not have a role in primary prevention. In the Horowhenua and Tararua areas, nurses support the cardiologist clinics and in Horowhenua, dedicated nursing support is provided throughout clinics.

Benefits of a community service

CCNs believe that there are significant advantages in home visiting and is important given the difficulty achieving good attendance at group sessions. They say this is supported by research which has found that home based cardiac rehabilitation is as effective as hospital based cardiac rehabilitation. \Home visiting occurs at a time to suit the client and allows members of the team to see people in their own environment. There is opportunity to learn/ understand their client’s reality more fully and issues that may impact negatively on a positive outcome for their cardiac status, such as housing, finances, social issues and isolation. Home visiting facilitates the participation of whānau and extended family and also allows ‘hard to reach’ clients to be followed up post discharge from MidCentral Health.

Statistics

Figure 1 Community cardiac nursing contacts



As the Compass system cannot be interrogated for referral source a sample of referrals between 23 November 2009 and 15 December 2010 were manually reviewed. The total number was 694 and the proportions by source were:

- MidCentral Health 63%
- MidCentral Health and Capital & Coast 15% (both sent referrals)
- Capital & Coast 11%
- General practice teams 6%
- PHO 3%
- Other (private, unknown, self) 2%

The number of referrals from general practice teams was very low. Of the 40 referrers and referrals were from Tararua. Palmerston North was next with 31% of referrals, followed by Horowhenua with 10%.

Statistics show that:

- Volumes had steadily increased since service commencement.
- The ratio of follow-up visits to initial visits had fluctuated but settled in the last 3 quarters at between 3 to 3.5.
- The over 65s made up 63% of visits for 2008/09 and 67% for 2009/10.
- The proportion of Māori has stayed relatively static across the 2 year period at approximately 12%.
- The proportion of service users in the most deprived quintile rose over the period from about 20% to 32%.
- Māori tend to have less follow-up visits than 'other' ethnicities. [It was suggested that this may be due to the younger age group of many Māori clients and their need to return to work]
- The number of group sessions is also rising. In 2009/10 1055 attended 90 sessions (average of 12 per session). This was nearly twice that of the prior year. Average numbers per session were relatively static over the two years but a significant rise was seen in the most recent quarter reported (Jul-Sep 2010) with an average of 19 people per session.

Community cardiologist and technician

The Community Cardiology clinics were established in January 2008 at Dannevirke Hospital, followed by the commencement of clinics in Horowhenua in May 2008. A community based cardiologist, supported by a cardiac physiologist and CCNs, works at both sites providing specialist consultation and diagnostic services. A one-stop-shop model of service delivery has been established for those patients requiring an exercise treadmill test as part of their specialist appointment. This diagnostic procedure is immediately followed by a consultation with the cardiologist and the patient receives a plan of care and advice regarding further consultation or referral. Holter monitor and echo services are also provided although usually not on the same day due to the nature of the test and reporting requirements.

Referrals into the Community Cardiology Service are managed by Compass Health (on behalf of Central PHO). Referrals are prioritised by the cardiologist, and appointments sent out to the patients from the office on Health on Main using the MedTech system. Urgent referrals are sent to MidCentral Health. Central PHO and MidCentral Health both contribute to the administration of the service and statistics are kept by both organisations. MidCentral Health takes responsibility for the typing of test reports and clinic appointments and attaching this information to the MidCentral Health clinical record. This information is also scanned into the patient record in MedTech.

Cardiologist and technician clinics are held weekly for Horowhenua patients (Levin), twice monthly for Tararua (Dannevirke) and four times yearly for the Otaki area (Levin).

Contract arrangement – community cardiologist and technician

Central PHO has sub-contracted MidCentral Health for the provision of cardiologist and technician resources. The rationale for this arrangement is to ensure that practitioners are supported and do not work in isolation and also to maintain continuity and flexibility of service provision (cover during absences and appropriately trained staff). Due to the inability to recruit into the cardiologist position it has been filled with 0.7 FTE locum resource and this position does not include any responsibility for acute services. Initially the community cardiologist clinic workload was shared between the locum cardiologist and one of the MidCentral Health cardiologists who provided clinics at Dannevirke (the locum cardiologist back filled these clinics at MidCentral Health). This changed in 2010 when a MidCentral Health based cardiologist retired and currently the locum cardiologist provides all community services. No clinics are provided when the consultant is on leave. A cardiologist has recently been appointed and is expected to join the team in March 2011.

The same service specification forms part of the contract between the DHB and Central PHO and the subcontract between Central PHO and MidCentral Health. MidCentral Health are accountable for providing the community cardiologist and cardiac technician components of the service specification. A set of reporting requirements are included. Although a committee comprising Central PHO and MDHB personnel met to formulate the detail of the set of information to be collected for service evaluation, this was never agreed and actioned.

The nursing roles and cardiologist clinics are viewed as hugely successful by nurses, several GPs, and cardiologists. They said the service gives a point of contact (nurses), improves access, problems are picked up earlier, allows opportunistic contact with family /whānau and is often a one-stop shop with diagnostics occurring alongside consultation (Horowhenua and Tararua).

Figure 2 below shows that cardiologist visits have steadily increased. Figure 3 shows that the waiting time for First Specialist Assessment (FSA) is longer at Tararua although showing improvement by the end of the period.

Figure 2: Total number of cardiologist visits

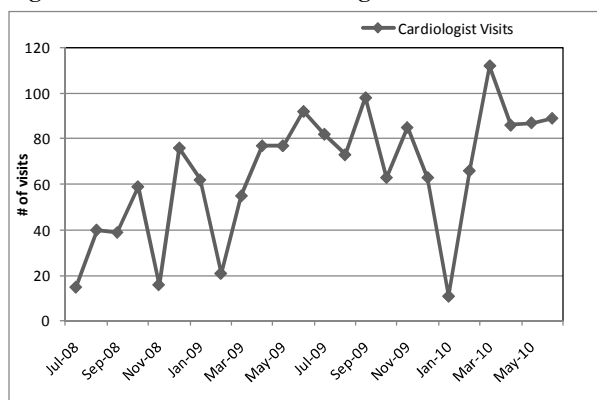
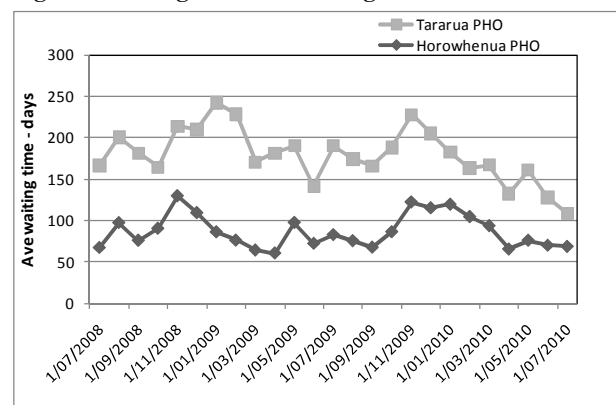


Figure 3: Waiting time for cardiologist FSA



The specialist assessment / follow-up breakdown is:

- 2008/09 FSA – 432, FU – 197.
- 2009/10 FSA – 421, FU – 336.

As expected, the number of follow-ups has increased as the service has become established. There are however data issues as explained in Appendix D – overall, volumes are likely to be slightly over-estimated.

Referral to secondary services

General practice refers patients needing secondary services. The predominant view was that acute services work well and patients with ACS get assessed quickly and receive diagnostic investigations including angiography. When specialist advice is needed reasonably quickly the options are to contact the registrar or consultant (who then advises whether the pathway is ED or outpatient clinic) or to send the patient directly to the hospital.

Issues

Primary prevention and management

There was consensus that the biggest issue was managing to get to the population most in need in services. Although there are GP shortages, some said that this was not the major issue. The view was that the knowledge and most of the necessary clinical talent already exists but the main problem is to get the business systems in place to connect all the target people or patients with the most appropriate services. One said, “we do some of the right things for some of the people (the visible ones, being those who thrust themselves into our attention), and not always in a timely manner. The hidden population misses out entirely, or until it's too late.” Practice nurses are performing risk assessment in some practices, one GP stated that nurses are better suited than GPs for this task and further that often there is no time within the GP consultation to complete risk assessment.

Some thought primary prevention was going well e.g. good tools while others pointed out that cardiovascular risk screening does not mean that management of identified risk is occurring. Whether effective management is occurring is unknown although some practices have developed policies that set requirements.

Referral process – community cardiology service

Referral process is viewed by some as slow and cumbersome and a barrier to access. The referral is processed by a non-clinical person at the PHO office and then sent to the cardiologist for prioritising. The electronic form sits outside the MedTech system and has mandatory fields which can be a barrier to completion e.g. if the patient has left the surgery and the weight measurement has not been done then the referral cannot be completed. Only 20% of referrals are made using the electronic form with usage having declined over time. Although the criteria states that urgent referrals should be sent to MidCentral Health, because of MidCentral Health's long waiting list, the referral may be sent back to the referrer with a note to refer to community cardiology. This has caused frustration with GPs, one GP stating he sent the patient to Wellington instead.

Community nursing service

- Lack of utilisation of CCN services – there are varying degrees of acceptance and utilisation of the roles although CCNs acknowledged that relationships take a long time to build and it is important to gain the trust of GPs. Referrals from MidCentral Health are sporadic and in Palmerston North / Manawatu there is a disconnect with GPs and low referrals from general practice. The comment was made that diabetes nursing services were better accepted.
- There is a lack of tools to adequately measure the service.
- Systems and infrastructure – Nursing notes not being shared with others, lack of access to view lab results and lack of space in facilities to hold clinics e.g. CCNs would like to develop services, such as holding clinics alongside the cardiologist.

Access to advice, assessment and diagnostics

- GPs generally find cardiologists approachable and some GPs ring regularly for advice. However, not all GPs feel comfortable ringing the cardiologist due to concern about their workload. GPs said that contact with a cardiologist sometimes prevents a referral or admission and means appropriate investigations are ordered.
- Long waiting times for angiograms result in extra workload for the CCNs. Clients with a positive ETT and on the waiting list are anxious regarding possible outcomes – this has

resulted in an increased need for advocacy, phone calls, discussions and liaison between MidCentral Health departments and GPs.

- Waiting lists for community cardiology are still longer than ideal. Initially they were very short and enabled management to the heart failure, cardiovascular risk and atrial fibrillation guidelines. Waiting times have extended due to the earlier unmet demand now being met.
- There are long waiting times for the sub-acute group of patients which need investigations and assessment (particularly in Palmerston North / Manawatu where there are no community clinics). GPs sometimes send a second letter for higher risk patients who are still waiting.
- Long ETT waiting list. When ETTs are positive the system works well, however other patients may not be followed up after tests. General practice does not know where the patient is in the system and who is coordinating care. An algorithm for the referral pathway which includes expected time for tests / assessment would be helpful.
- Reporting for tests is also delayed and test results may not be available when the patient next turns up at general practice.
- Cardiac surgery follow-ups are seen by the cardiothoracic surgeon in Palmerston North however many are not seen by the cardiologist at three months as requested. The same occurs following intervention in Wellington. Cardiology follow-up does not occur within the stated 4-6 weeks so many patients visit their GP instead.
- There is inequity between the waiting lists for elective and acute angiography. Some patients have died while on the waiting list.

The service is not sufficiently integrated

The predominant view was that there was insufficient primary secondary integration. Previous cardiologist involvement on the DMG together with GPs was valued and led to an increased understanding of issues on both sides. Personal contact and networking between specialists and general practice is an indicator of an integrated service, but one perspective put forward was that this has deteriorated. It was proposed that there is now more disconnect from secondary care which has been caused by changed systems such as education being run by PHOs, specialist trainees no longer being able to do locums in general practice and the removal of communication channels such as between general practice and ambulance officers.

One clinician described the problem, “at present, we are not organised on a district-wide basis; not well coordinated; and we don't have a grasp of what is going on across the district. We really can't compare performance with the standard to which we aspire. We need a District Health System, part of which is an information system that enables and facilitates service provision, and allows us to know what is going on.”

Wakefield hospital was held up as an example of a hospital that had built successful relationships with primary care. Through marketing Wakefield had provided primary care with an understanding of its cardiology related business including changes in technology and practice.

Hospital services – MidCentral Health

Cardiology is a subspecialty within the Internal Medicine service and provides specialist assessment, investigation and education for patients with cardiac disease. FTE establishment for 2009/10, inclusive of Ward 28/ CCU, was 50 FTE, approximately one fifth of the total Internal Medicine workforce (252 FTE). Currently the Service Manager Medical Services and the Clinical Director Medical Services take the major responsibility for service leadership. Significant recent changes have been:

- Cardiology Head of Department role has been temporarily relinquished by one of the cardiologists.
- Professional nursing leadership changed from the Nurse Practitioner (NP) Adult Cardiac Care to the Nurse Director, Medical Services supported by the Service Manager, Medical Services for operational reporting.
- Retirement of a 1.0 FTE cardiologist.

There are several management lines; medical staff report to the Clinical Director Medical Services, nursing staff to the Nurse Director Medicine for professional nursing and the Service Manager, Medical Services for operational performance, technical staff to the Service Manager, Medical Services, and clerical staff to the Service Manager, Elective Services.

Department communication

The following formal monthly meetings are in place:

- Cardiology department meeting.
- Cardiac Physiologist and Service Manager.
- CNS Cardiac Care, Service Manager and Nurse Director, Medical Services.
- Medical Services Service Planning meetings – attended by Cardiologist and specialist nursing representative
- Physicians meeting – Service Manager attends.

In addition there is frequent informal communication between the team members and with the Service Manager Medical Services.

Workforce

Table 2 below shows FTE changes over 5 years. The main changes are in actual FTE. Specialist nursing reduced by 1.0 FTE and inpatient nursing increased by nearly 2.0 FTE. However, budget FTE (not shown) has increased by 5 FTE over the period for medical, specialist nursing, allied and management admin (1.4, 1.8, 1.2 and 0.5 respectively). The community cardiology contract resulted in an additional 1.0 FTE medical and 1.0 FTE allied. The right hand column in the table shows the vacancy factor in the department (below budget for medical, nursing and allied). Subsequently, 1.0 FTE has been removed from the medical budget which was an outcome of the 2010 financial review.

Table 2: Cardiology department FTE

		Actual 2005/06	Actual 2009/10	Variance Actual 2005-10	Budget 2009/10	Variance Budget to Actual 2009/10
RC 320 - Cardiology	Medical	3.08	3.14	0.06	4.39	1.25 (28%)
	Nursing	4.68	3.69	-0.99	4.90	1.21 (25%)
	Allied	4.25	4.55	0.30	5.35	0.80 (15%)
	Mngt/Admin	2.48	2.59	0.11	3.00	0.41 (14%)
RC 528 - Ward 28 incl CCU	Nursing	31.72	33.66	1.94	31.59	-2.07 (-7%)
	Mngt/Admin	1.20	1.06	-0.14	1.06	0.00
		47.42	48.70	1.29	50.29	1.59 (3%)

Services

The team work together to provide the following services.

- Community cardiology services at Horowhenua (Levin) and Taraua (Dannevirke) in conjunction with Central PHO.
- Outpatient cardiologist FSA and follow-up clinics.
- Cardiac diagnostic services:
 - Electrocardiographs (ECGs)
 - 24 hour ambulatory blood pressure monitoring
 - Holter and event monitoring
 - Pacemaker and implantable defibrillator device (ICD) follow-up
 - Echo including trans-oesophageal echocardiograms (TOES)
- Procedures:
 - Diagnostic angiography
 - Permanent pacemaker implantation
 - Temporary pacing wire insertion
 - REVEAL implant/ change
 - Cardioversion
 - Pericardial drain insertion / pericardial aspiration
- Inpatient services – CCU (6 dedicated beds – also utilised for high dependency patients) and Ward 28 – 14 beds.
- Cardiac rehabilitation service for inpatients – Phase 1.
- Heart Failure service for outpatients and inpatients.

Staff and services are spread out over many locations.

- Inpatient services including CCU/HDU in Ward 28.
- Cardiologists, administration staff, technicians and most technician led services situated alongside Ward 28.
- Echo and angiography in radiology.
- Outpatient clinics in the ambulatory care centre.
- CNSs located on Ward 24.
- Pacemakers in theatre.
- TOES in gastroenterology.
- Pericardial drains, temporary pacing wire insertion and urgent TOEs in the Ward 28 procedure room.

Statistics – inpatients and outpatients

The following statistics are by 'DHB of service' so represent services provided by MidCentral Health. In 2009/10 inpatient hospitalisations with a cardiology related diagnosis code made up 7.2% of discharges and 7.6% of case weight (excluding maternity and neonatal).

About half (47% of discharges and 52% of case weight) was coded to the cardiology health specialty, as shown in Table 3. A sizable proportion of cardiology services are provided by the general medicine speciality. Figure 4 shows that cardiology related hospitalisations make up about one third of combined cardiology and general medicine volumes.

Table 3: Discharges by diagnosis code and health specialty for 2009/10

	Cardiology Specialty (M10)	Non-Cardiology Speciality	Total discharges by diagnosis code
Cardiology Primary Diagnosis Codes	929	1,106	2,035
Non-cardiology Primary Diagnosis Codes	299		
Total discharges by specialty	1,228		

Figure 4: Cardiology health specialty (M10) work, cardiology hospitalisations and relationship with General Medicine

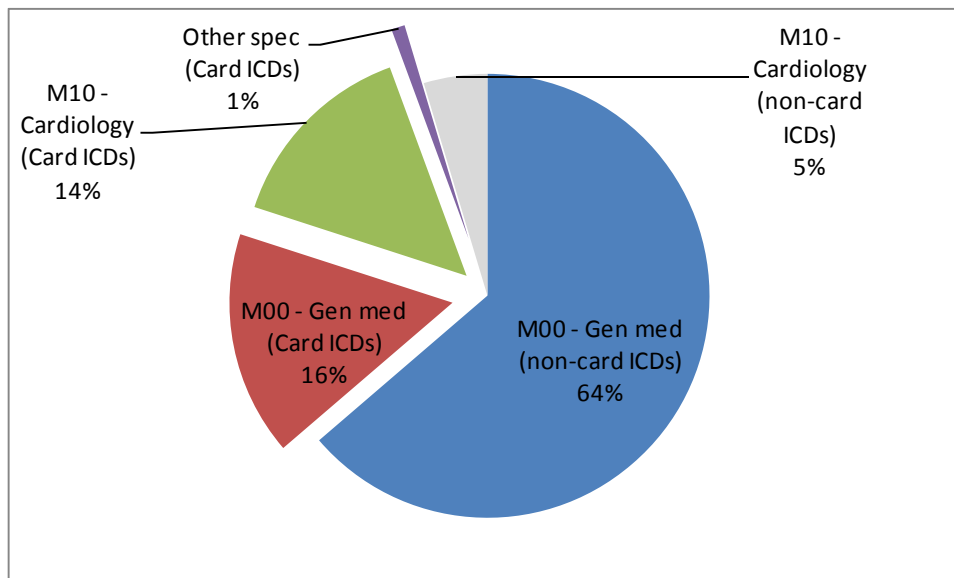


Table 4: Cardiology specialty outpatient activity (MidCentral Health)

Specialist purchase units	2005-2006	2006-2007	2007-2008	2008-2009	2009/10
M02- Specialist assessment (FSA)	1,115	853	1,041	889	783
M03 - Specialist follow-up	880	740	676	731	764
Total	2,148	1,838	2,017	1,982	1,798
Follow-up to FSA ratio	0.93	1.15	0.94	1.23	1.30
Other cardiology purchase units					
M10004 – Cardiac education and management	1,559	1,451	823	1,363	1,090
MS001001 – Nurse Led Outpatient Clinics	173	146	0	74	55
CS04001 - Community referred tests - cardiology	3,837	3,509	3,137	3,850	2,019
M10012 – Pacemaker checks					708

Note – Pacemaker checks were included in CS04001 volumes until 2009/10

Specialist volumes (M02 and M03) include those provided by the NP. This was 55 assessments and 95 follow-ups for 2009/10. Heart failure consultations are identified as a separate clinic group (providers are the NP and the cardiologist with an interest in heart failure) and comprise about 15% of first assessments and a quarter of all follow-up visits. FSA volumes are likely overestimated by about 50 each year for 2007/08 and 2008/09 (see Appendix D p.91 – Data and information). Overall volumes have been trending down with a decrease in FSA volumes being responsible (especially when the volume overestimation is taken into consideration). The follow-up ratio has increased.

The referral source for just over half of FSA referrals (55%) is GP. This has been trending down from 67% in 2005/06. Referrals from ED have remained fairly static at just under 5%. The remainder are either coded as 'Internal' or 'Outpatients,' the latter category increasing from 2 – 16% over the last five years.

Cardiac education and management volumes include all non-clinic nursing contacts such as heart failure and preadmission clinics. The volume has also decreased over the period.

Cardiology department perspectives

General issues raised

Cardiology department staff expressed a high degree of frustration with the current situation. The consensus was that the service had been reviewed to death with very little action resulting. The service has no dedicated service leader / administrator – a service leader was appointed in October 2004 post the Ludbrook review and then disestablished in March 2007. The Medical Head of cardiology stood down because she felt powerless to effect change to improve the service. Clinicians and other staff feel that they have to continually fight for the tools necessary for service provision – adequate staff for the size of the service, adequate facility and appropriate session times, equipment being repaired or replaced. The consensus is that the current state of affairs has impacted on being able to recruit cardiologists to MidCentral Health.

Some service improvements have been made but the focus has predominately been on trying to get the basics. This has meant there has been little attention to service planning and monitoring and introducing processes and initiatives that would improve service provision and resolve problems (such as increasing waiting times). There is no service plan to guide the service.

Most raised the lack of co-location of the team and services as an issue, saying this led to poor communication within the department and inefficiencies e.g. when scripts are required. Several attempts have been made to co-locate staff. On one occasion planning had progressed to the stage of room selection when plans floundered.

Service improvement plans (when there are sufficient resources)

- Referrals – providing more guidance about expectations. The quality of referrals is variable and could be improved. Many referrals do not provide sufficient information and often GPs send a print out of GP consultations off the system with the comment “refer attached.” The triage process needs to be stricter with tests completed prior to appointment.
- Chest pain referral pathway including consideration of non cardiac causes. A decision support tool could be used like the TIA pathway.
- Algorithms for common conditions such as heart failure, atrial fibrillation and hypertension – guidelines can be up to 25 pages so are not user friendly. Education would be needed to support the release of algorithms.
- Review of the MidCentral Health chest pain pathway with a view to achieving same day ETTs, review and management plan.
- Nurse led clinics (post PCI / CABG) and technician led valve clinics.

- Increasing the proportion of patients with cardiac conditions being seen by cardiologists at least once (additional cardiologist FTE would be required).

Highlights achieved to date

- Collaboration with the Palliative Care team and development of guidelines for the management of symptoms when cardiac patients are terminally ill.
- A multi-centre prospective audit on the use of sub-cutaneous Furosemide.
- Refurbishment of a procedure room for the insertion of temporary wires and pericardiocentesis.

Medical team

Until July 2010 the medical team comprised four cardiologists; three cardiologists based at Palmerston North hospital (one a longstanding employee and two joined the department in 2006) and a locum 0.7 FTE cardiologist who commenced in 2008 and employed to deliver the community cardiology services contracted by Central PHO.

A cardiologist retired in July and an outcome of the financial review was to reduce the MidCentral Health budgeted cardiologist establishment from three heads to two. The retiring cardiologist has been employed back as a locum (0.6 FTE) providing outpatient services to reduce the work load of the remaining two resident cardiologists who now have a higher acute workload.

Inpatient workload is by referral and handover to the cardiology service occurs weekdays at a daily internal medicine meeting. No formal after-hours service is provided, however, cardiologists are often contacted for advice and if available will provide this.

A cardiologist team of four permanent cardiologists (including the community cardiologist) would enable community cardiology and acute responsibilities to be shared and possibly an after-hours service.

A house surgeon and registrar are assigned to the service on rotation.

Inpatient services

Fourteen inpatient beds are located in Ward 28 which also houses the combined six bed CCU and HDU. This unit was originally a dedicated cardiac unit but now admits and manages HDU patients. A procedure room located in the unit is used for inpatient procedures such as TOES and temporary pacing wire insertion.

The financial review reported that cardiac patients were often located in general medical or surgical beds depending on hospital capacity and that the establishment of the new medical assessment and planning unit (MAPU) in August 2009 had improved this. The data shows some change in this direction. In 2008/09 50% of patients with a cardiology primary diagnosis code were discharged from either CCU or Ward 28. For 2009/10 30% of cardiology patients had an admit ward location of MAPU and 57% were discharged from CCU or Ward 28 – in quarter 4 the percentage had risen to 69%.

Issues raised with inpatient services

- At times there are inappropriate admissions and delays in discharge. One reason for this is difficulty accessing beds in Wellington for CABG, angiography / PCI, ICD or EP studies.
- The Ruygrok review recommended that inpatient nursing staff assist with Cath lab work and EITs however staffing levels have not allowed this to occur.
- There is no resident medical resource assigned to the unit so multiple medical teams may be in the unit simultaneously. The Charge Nurse of the cardiology inpatient service advocates for a higher level of medical support based in the CCU – e.g. Medical Officer Specialist Scale (MOSS). Cardiologists support an advanced trainee attached to the service.

Administration

Booking of MidCentral Health outpatient and testing clinics and community cardiology clinics is currently performed by 1.5 FTE booking clerks. A full-time clerk takes responsibility for outpatient clinics (cardiologist, registrar and nursing) echo and inpatient elective procedures. The 0.5 FTE position was introduced in 2007 for the purposes of looking after community cardiology administration tasks. This staff member does the medical typing and clinic statistics and enters these into the MidCentral Health system. Other responsibilities recently added to the position are technician testing clinics such as ECGs, ETTs, holter and event monitors and pacemaker checks. A full-time typist is responsible for typing of the MidCentral Health outpatient clinics and cardiology tests including sending information to Wellington for patients being transferred

Issues raised with administration

- Waiting lists are a significant issue and are covered in chapter 5 'Cardiology continuum of care.'
- There have been empty slots in testing clinics. Diagnostic testing clinics have been historically booked by the full-time booking clerk however the increasing workload within this role resulted in the decision to shift some clinics to the person responsible for community cardiology which caused workload problems in that role as well. It is agreed that there is capacity within the role of the Ward 28 ward clerk. The scope of practice associated with that role is currently being reviewed and updated to include this responsibility.
- Tasks associated with the community cardiology service such as reporting and waiting list maintenance is not occurring. The Med Tech programme on the laptop necessary for entering information and attaching typing record of the visit has not been accessed for several months due to technical issues. This also means referral data is not entered.
- The location of the administration office in the ward doesn't work well, especially for the typist due to frequent interruptions.

Specialist nursing services

At the time of the financial review, specialist nursing resources comprised 1.0 NP Adult Cardiac Care, 1.0 FTE CNS Cardiac Rehabilitation, 0.8 FTE CNS (Heart failure 0.4 FTE and angiography 0.4 FTE) and approximately 0.8 FTE RN (angiography). The NP headed the team and reported to the Director of Nursing.

As identified in the background, one of the outcomes of the financial review was to transfer the NP to the medical line. Specific responsibilities are still being worked through but the role will include supervision of ETTs (to replace registrars), visiting inpatients, particularly in MAPU, outpatient clinics for MAPU patients under physicians, project work and teaching responsibilities. One of the NP's two weekly outpatient sessions are held alongside a consultant heart failure clinic. The CNS heart failure also holds a clinic at this time.

A number of proposals for nurse led clinics were provided to the reviewer as listed below. They have not been progressed.

- May 2008 – Chest pain clinic
- May 2008 – Management of heart failure patients presenting at ED on IV Frusemide
- May 2008 – Cardioversion service
- July 2009 – Post discharge acute ACS clinic
- Feb 2010 – Horowhenua outreach clinic

Issues raised with nursing services

Liaison with primary care

The CNS roles have had limited involvement with the community cardiac nursing team. They stated that this was not supported by MidCentral Health due to the differing funding streams. However, recently the CNS have joined the community cardiac nurse monthly meetings and there is the intention to develop relationships further.

Underutilisation of cardiac rehabilitation role

Prior to the establishment of community cardiac nursing services the cardiac rehabilitation role was responsible for providing support and education for phase 1 cardiac rehab (inpatient) and phase 2 (up to 12 weeks after discharge). The role is currently underutilised.

Heart failure

The CNS believes that there is inadequate nursing time for this service. She also commented that there is no separate process for recording and identifying the patients she sees for heart failure management, as opposed to those seen by the other CNS for cardiac rehabilitation post myocardial infarction (MI). All volumes including contacts for heart failure are counted under the “Cardiac Education and Management” purchase unit. This does not support aligning resources with service need.

Insufficient rooms for outpatient clinics

Access to clinic rooms has been historically problematic – room scheduling is determined by the Charge Nurse of Ambulatory Care and additional clinics or specific room requests need to be negotiated, this can at times affect clinic volumes. Preadmission clinics for angiography are done in the eye room with no bed.

Cardiac physiology and echocardiography service

Cardiology tests are a significant part of the service as indicated by the volumes shown in Table 5. Technical services provide the majority of the non-invasive tests. Overall, volumes have declined by 11%. Further breakdown by test modality is provided in Appendix F – Data Supplement, p.114.

Table 5: Cardiology tests (non-invasive)

	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010
ECG (mainly ECGs provided in ambulatory care)	5933	5490	5100	5028	5004
Echo	1878	1432	1801	1987	1334
WD28 clinics (ETT, hollers etc)	2276	2351	2506	2504	2593
Total	10087	9273	9407	9519	8931

Note - The above does not include activity in the community clinics

ECG tests in ambulatory care have decreased significantly over the period. The drop has mainly been in services for inpatients. ECGs for GPs have been fairly static at about 1100 annually. The rise in Ward 28 throughput has mainly been for pacemaker checks. The volume of ETTs and hollers has remained relatively static across the period hovering around 1,000 per year. Echos fluctuated considerably between 1,400 and 2,000 per year with a marked dive seen between the last 2 years volumes (a one third drop in volume). The size of the drop is a little larger (36%) when Central PHO volumes are added.

This service has expanded significantly since 2005 when there was just one staff member. In 2006 the Central Region Cardiology Services Review found that the shortage of technologists in the region was at crisis levels and a major block in access to cardiology services. A strategy of ‘growing our own’ and decreased reliance on overseas technologists was recommended. Subsequently a regional training coordinator was appointed to support trainees and qualified staff maintain competency. MidCentral

Health establishment now includes a training position. Technologists are an integral part of community cardiology services and senior technologists travel to Levin weekly and Dannevirke fortnightly for clinics.

Skill mix

Table 6 below shows the skill mix of the staff. Staff do not necessarily perform all services that they have been trained in e.g. the ECG technicians perform the majority of ECGs and 24 hour ambulatory blood pressure monitoring at present. As can be seen there are many different tests which staff must be trained in and the technologist training programme provides the means for this. Currently the focus is on broadening staff skills across more tests e.g. ICDs and echo which will improve throughput and cover during absences. Only three regular outpatient echo sessions a week are possible with the current FTE and skill mix. The 0.6 FTE Cardiac Physiology technician is currently vacant and recruitment is in progress. Applicants to date have varying degrees of experience – echo experience is viewed as a major advantage.

Table 6: Description of technician / technologist skill mix

	Senior Cardiac Physiologist (1.0 FTE)	Senior Cardiac Physiologist (1.0 FTE)	Senior Cardiac Physiologist (0.4 FTE)	Cardiac Physiology Technician (0.6 FTE)	Cardiac Technician (0.6 FTE) Vacant – currently recruiting	ECG Technician (1.0 FTE)
ECG	√	√	√	√	√	√
24 Hr BP monitoring	√			√		
ETT	√	√	√		√	
Holter monitoring	√	√	√*	√	√	
Event	√	√	√	√		
Echo	√	√				
Paed Echo	√					
Pacemaker implant		√	√			
Pacemaker follow-up		√	√		√ limited	
ICD follow-up		√				
Angiography	√	√	√			

Issues raised with technical services

Skill mix issues

Development in cardiology testing services such as practice standards and additional modalities require a multi-skilled team. Staff members need to progress to the level of cardiac physiologist in order to perform ETTs, pacemaker checks, angiography and train in echo etc. The first step is completing a one year training programme to qualify as a cardiac physiology technician. The ECG technician has not successfully completed this programme which prevents progression. The recent financial review recommended that ECG services be changed included halting ECG services to GPs and redirection of responsibilities for inpatient and outpatient ECGs.

Accreditation standards

An application was made to the Society of Cardiopulmonary Technology (SCT) to attain accredited status for the cardiac technologist training programme in 2010. This is necessary in order for the student to train in technologist modules such as exercise testing, coronary studies (Cath lab) and echo. Accreditation was declined as standards for two fundamental modules; ‘exercise testing’ and ‘resuscitation’ were not met which has stalled training. The recommendation for exercise testing was that two persons be present in the exercise room at all times and that one must be a suitably qualified and registered medical practitioner. Guidelines are now being met and a registrar now supervises all

ETT's. However this has reduced test throughput (weekly scheduled slots have reduced from 40 to 16) and increased waiting lists. Plans are in place for the NP to provide nurse led ETT's and she is currently undergoing training.

The ETT service for paediatric patients lapsed in 2010 and restarted in January 2011. Monthly ETT's are now performed with a paediatric registrar supervising. The technologists provide a technical report and the test results and notes are reviewed by the paediatric consultant.

Echocardiography

The SCT committee also raised concerns regarding echo, claiming that the cardiac sonographers were unsupported with minimal application of reporting / analysing skills critical to the Cardiac Physiologist role. The committee recommended that the cardiac sonographer "be allowed to practice to recognised standards and guidelines that include documenting technical comments that are accepted without unauthorised editing." They pointed out that two reviewers provide the quality control that reduces the likelihood of missed pathology. The cardiac physiologists agree that their roles are not being used to full potential – provisional reporting is common place elsewhere and this practice reinforces technologist accountability. Practising to standards and providing provisional reporting is expected to extend the appointment time from 40 to approximately 60 minutes for an experienced sonographer. Provisional reporting is being trialled for echo provided in the Taraua community clinics.

Training in paediatric echo was being provided by the regional trainer but was stopped during 2010 after a difference of professional opinion. This has impacted on service provision and paediatric echo was not provided between July 2010 (when the cardiologist with an interest in echo retired from his full-time post) until November after a senior technologist returned from training at Starship. An urgent scanning service is now being provided, studies are put onto a CD and sent to Auckland. A scanning service is provided for the visiting paediatric cardiology clinic.

Delays in reporting have occurred due to the higher volume of echo reporting since the community cardiology contract was introduced (relies on cardiologist availability). Additional cardiologist time has been contracted to clear the backlog however availability of the workstation is also an issue.

Historically, shortened echo studies of about 20 minute duration were completed. Since staff have attended various echo conferences it has become apparent that some parts of this service are out of date. A full echo is now performed on the majority of patients which has increased the slot time to 40 minutes (and will go to 60 minutes as mentioned above). As the echo service cannot be staffed all week, echos which could be done during an inpatient stay have to be done after the patients have gone home (now 1,000 on the list although this includes the 250 advance echos). The senior technologist states that another echo machine and staffing is needed to rectify the problem.

Facilities and equipment

Despite moving to a larger area in Ward 28 there is insufficient space to deliver technical services. It is not an ideal environment for outpatients either who must sit in a chair in the ward corridor waiting for their appointment. The echo service is provided in cramped conditions in the radiology department and there is not enough room in Ward 28 for the service. Unduly long service interruptions have occurred due to equipment problems e.g. a holter monitor was not replaced when it failed and an echo machine took six months to replace. An additional exercise treadmill may be required. It needs to be evaluated whether a machine is purchased for use at MidCentral Health or whether to more fully utilise the equipment in Levin and Dannevirke. This would require additional staffing.

Demand

The demand for cardiology tests has risen over recent years and this is reflected in the waiting lists (refer p. 38) which often fluctuate according to where resources are targeted. Volumes of pacemaker follow-ups are increasing, once a pacemaker is inserted it is usually there for life. Similarly ICDs are a relatively new technology and increasing. ICDs are inserted at Capital & Coast but technician input is

required for assessment at times and also to enable / disable prior to surgery and radiotherapy. These changes have created workload and skill mix issues – currently only one technician can currently look after ICDs. Training to look after ICDs is provided by Wellington and the physiologists would like additional support locally.

These additional volumes / new service are affecting department workload but must be absorbed if patients are to receive services locally. Information on these modalities has not been available on the IT system until recently. Pacemaker follow-ups are a separate purchase unit for 2010/11.

Administrative support

The system for managing pacemaker follow-ups is time-consuming and managed manually by a technician. A software package PaceArt is used by a number of DHBs (this is currently on Capex for 2011/12). Lack of administrative support has led to unfilled appointments after cancellations.

Invasive services

Cardiologists provide invasive services (with the support of a team). The number of angiograms performed for the MidCentral population has been rising however MidCentral Health has not been able to increase volumes provided locally as shown in Table 7. Figure 5 shows that an increasingly higher proportion of patients have to travel for this service – more than 60% of the MidCentral population in the last two years. Conversely, data showed that only three pacemaker procedures were performed by other DHBs in 2009/10.

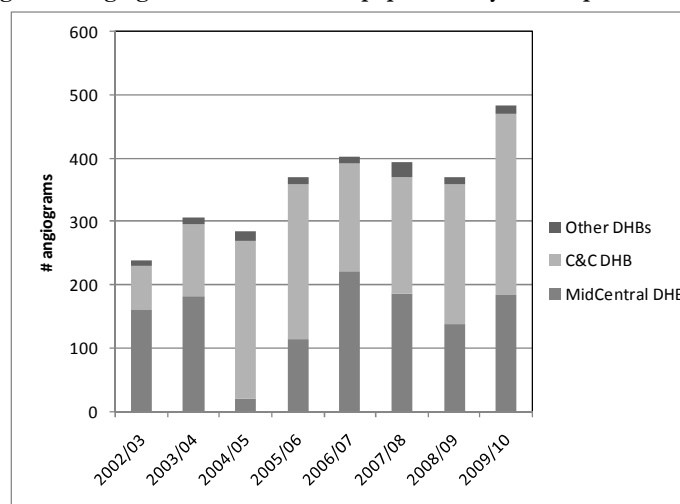
Table 7: Cardiology procedures provided at MidCentral Health

	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
Angiograms	168	189	22	120	236	198	144	192
Pacemaker procedures	23	33	29	57	77	49	61	72

Note: Volumes for MidCentral and Whanganui populations only – do not include volumes for people domiciled elsewhere. In 2009/10 MidCentral provided 9 angiograms and 4 pacemaker procedures for Whanganui patients.

Angiography

Figure 5: Angiograms for the MDHB population by service provider



Angiography is a diagnostic procedure to investigate patients with known or suspected coronary artery disease and with valvular problems. The procedure is usually a day case procedure and undertaken to assess a patient's need for further intervention and or their suitability to undergo other cardiac surgery. The provision of this service requires the co-ordination of cardiologists, cardiac physiologists, specialist nursing personnel, Medical Radiation Technologist (MRT), clinic and facility availability, pre and post admission care and monitoring. Angiography is an advanced secondary service and provided routinely

in 12 DHBs across the country (refer p.123). In the Central Region this service is offered by the Capital & Coast, Hawke's Bay and MidCentral DHBs. Hutt Valley cardiologists utilise Wellington hospital's facility for a weekly half day session.

Following angiography, patients may need CABG, valve replacement or percutaneous coronary intervention (PCI). Patients are referred to Wellington Hospital at Capital and Coast DHB for these services which are provided at tertiary centres across New Zealand. Nelson Marlborough DHB is the exception and has provided PCI since 2007. Angiography, PCI and cardiac surgery is also available privately at Wakefield Hospital in Wellington.

Angiography at MDHB is provided through a shared facility in the radiology department and was first provided about 2002. There have been lapses in the service. In 2004 this was due to technician availability and no radiation protection screen and more recently in 2009 there was no service for 6 months when the haemodynamic system failed. The DSA machine which is used for angiography is unreliable and has broken down several times, causing the procedure to be abandoned on occasion. The cardiologists state that image quality is sub-optimal especially with centrally obese patients and would not be good enough for a local PCI service. Capital & Coast DHB have supported the service throughout and in 2004/05 assisted with upskilling a new nursing team and technician.

At present the cardiology service runs two angiography sessions per week in the radiology department. One session is held in the morning (three elective patients booked plus one slot for an acute patient) and one in the afternoon (two elective patients booked and one slot for an acute patient). A radiology nurse and MRT form part of the team.

Issues raised with angiography service

- Not being able to keep up with rising demand which has required some patients to be sent to Wellington. The MoH 'expected' number of angiography discharges for the MidCentral population in 2009/10 was 590. Only 183⁹ patients received services at MidCentral Health. More sessions would be needed to study a higher number of patients locally and demand will increase with the aging of the population.
- Long waiting times – an example was given of a patient with a positive ETT on 15 April 2010 not sent to Wellington until September 2010.
- Equipment problems – the DSA (angiography) machine was out of action from December 2008 to July 2009 requiring some patients to have procedures at Wakefield. The view was given that the procurement process was overly long.
- Limited sessions and timing – The DSA room is primarily used for radiology interventions and the machine was upgraded in order to provide angiography. There are only two sessions per week available (a Friday afternoon session was offered but this was not possible for cardiology) and a lack of flexibility to change sessions if the scheduled session cannot take place for any reason. Morning sessions would be better to enable four patients to be done per list. Radiology cannot provide nursing staff after 4.30 which limits the number of patients on the afternoon list. Having only two sessions per week also limits the number of acute angiographies performed.
- Cardiologist, nursing and technical staffing levels are insufficient to cover leave (annual, CME, sick) or run additional sessions. The issue has worsened since July this year when a cardiologist retired leaving two cardiologists to manage acute services.
- Training requirements for nursing staff are extensive. Maintaining an adequate number of trained staff across the cardiology and radiology nursing team has been difficult as there has been high turnover.
- Acute procedures taking priority e.g. pacemakers and causing cancellations (procedures involve many of the same staff).

⁹ There were 192 angiograms in total, 9 for Whanganui domiciled patients

Results of angiography session analysis is provided in the following box. It was agreed that throughput is less than optimal. In the sample reviewed only 44% of lists included acute procedures.

Analysis of angiography sessions for 42 weeks, 7 Jan – 21 Oct 2010

No. of sessions held (1 patient or more)	63
No. of sessions not held	18
Number of patients	160 (131 elective, 29 acute)
Average no. patients per session held	2.5

The breakdown of the number of patients per session was one patient (10 sessions), two patients (21 sessions), three patients (26 sessions) and four patients (6 sessions).

Over the period throughput was affected by patient and organisational reasons as follows.

Patient reasons

- 10 patients were not fit for procedure (BP-5, INR-3, illness-2).
- 5 patients failed to attend.

Organisational reasons

- 23 sessions were affected by leave, 15 cardiologist and 8 nursing. In the case of nursing only 1 session was cancelled completely, others were reduced to 1 or 2 patients per session. There were 4 occasions when 2 nurses were off at the same time.
- 3 sessions due to managing acute load.
- Other – pacemakers (1 session plus 1 patient), meeting (1 session), strike (1 session), surgical note not at hand (2 patients) and late start (1 patient).

There was particularly low throughput in August and September with only 15 patients receiving procedures. This was mainly due to consultant leave but also due to the change in acute load (after retirement of cardiologist in July) and the strike fell in this period as well. Three sessions in October affected by cardiologist sick leave were covered by the other cardiologist.

Acute procedures were performed on 28 of the 63 sessions. For the remaining sessions the possible session throughput (before any cancellations) was 3 on the morning session and 2 on the afternoon session.

Pacemakers

One cardiologist performs permanent pacemaker implants in the operating theatre. Elective implants are scheduled weekly and acute patients are managed in the acute theatre. The team includes a senior technologist, operating theatre support staff and a CCU nurse. More implants are acute than elective, of the 60 – 70 implants performed annually at MidCentral Health over the last two financial years, 60-65% were acute or arranged (within 7 days).

Issues raised with pacemakers

Theatre availability and throughput

The service is hampered by theatre availability. The weekly list is shared with the respiratory service which does not allow sufficient time for two implants to be performed. Sometimes another session is offered but this usually clashes with other elective service commitments e.g. TOES on a Monday afternoon which must then be rescheduled. The waiting time is longer than ideal and in October 2010 was sitting at two months.

Service flexibility

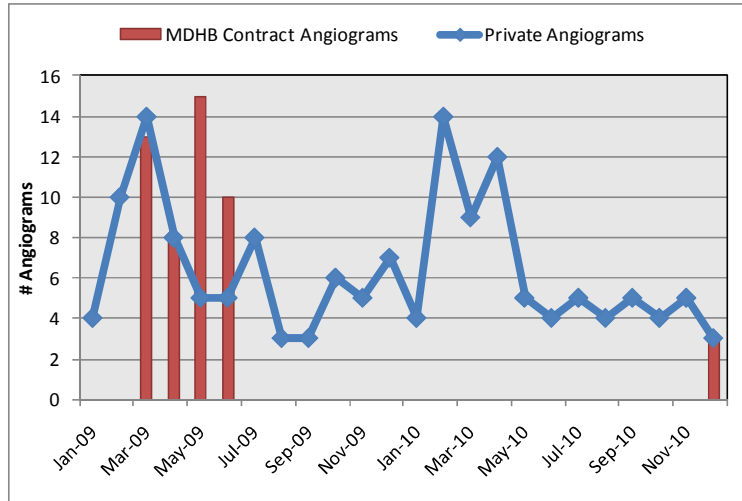
Acute pacemaker procedures may necessitate cancellation of other clinics, outpatient clinics, technician testing clinics or angiography. This is because the service must be delivered around theatre, consultant, technologist and nurse availability. There is only one consultant, two technologists and one nurse trained in this procedure.

Private services

The MidCentral district is relatively well serviced by private cardiology service providers. A cardiologist not employed by MidCentral Health provided services for private clients based from Palmerston North and the two resident MidCentral Health cardiologists each provide one half day session per week.

The local private hospital does not provide cardiology services, however MidCentral residents travel to Wakefield hospital in Wellington. Figure 6 shows angiogram volumes and also highlights that Wakefield provides publicly funded angiograms for MidCentral Health at times. A contract for 20 angiograms was awarded to Wakefield in December 2010. Annual volumes have been static the last 2 years (78 in 2009 and 74 in 2010). PCI and CABG volumes were not available at the time of request.

Figure 6: Angiograms for the MDHB population provided by Wakefield Hospital



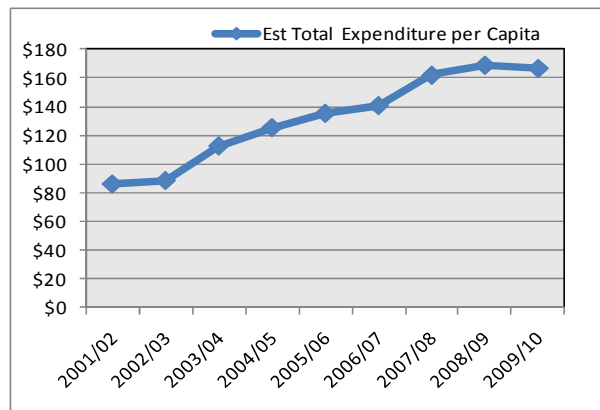
Estimated expenditure

Table 8 below shows the estimated cost of publicly funded cardiology services for the financial years 2006/07 – 2009/10. Methodology was sourced from the 2006 Central Region Cardiology Services Review. Results from the 2006 analysis have been combined with results in the table below to provide the 9 year view shown in Figure 7 adjacent. This shows that costs have roughly doubled over the period.

Cost proportions are roughly evenly divided between primary and secondary care which is similar to the situation found in the 2006 analysis.

Percentage rises over the last four years was similar for specialist services (18%) and primary care (23%). The cost of pharmaceuticals makes up over two thirds of total primary care costs and 36% of total costs (also similar to the 2006 work).

Figure 7: Estimated cost of cardiology services



Note: Data for 2001/02-2004/05 was extracted from 2006 files provided by CentralTAS

Table 8: Trend in five year costs for Cardiology services

	2006/07	2007/08	2008/09	2009/10	% change over 4 years	% of 2009/10 cost
Population	164,105	164,970	166,410	167,595		
Specialist Cardiology Services						
Inpatient Services	4,590,969	4,932,661	4,835,504	5,275,717	15%	19%
Outpatient Services	640,466	762,088	897,009	1,011,879	58%	4%
Community Referred Tests	603,127	606,802	785,323	416,277	-31%	1%
Net Inter District Flows (IDFs)	2,159,535	2,216,834	2,800,149	2,452,330	14%	9%
Total Specialist Cardiology Value	7,994,097	8,518,385	9,317,984	9,156,204	15%	33%
Cardiology Expenditure per Capita	48.71	51.64	55.99	54.63		
Other Specialties						
Other Spec Cardiology Discharges	2,923,487	3,362,937	3,514,864	3,755,034	28%	13%
Estimated Related OP Services	107,410	83,082	116,230	147,867	38%	1%
Estimated Total Other Spec Services	2,923,487	3,362,937	3,514,864	3,755,034	29%	14%
Other Spec Expenditure per Capita	18.47	20.89	21.82	23.29		
Primary Care						
Pharmaceuticals	9,181,186	10,093,471	10,609,594	10,051,914	9%	36%
Laboratory	1,031,161	1,145,772	1,239,354	1,332,609	29%	5%
General Practice	1,877,399	2,245,895	2,428,104	2,566,712	37%	9%
Cardiology contract	-	1,289,740	929,520	969,929		3%
Total Primary Care	12,089,746	14,774,878	15,206,573	14,921,165	23%	53%
Estimated Primary Care Expend/Capita	73.67	89.56	91.38	89.03		
Est Total Cardiology Service Value	23,114,740	26,739,283	28,155,652	27,980,269	21%	100%
Est Total Expenditure per Capita	140.85	162.09	169.19	166.95		

Inter District Flows

MidCentral DHB purchases a considerable volume of cardiology services from other DHBs. Together with cardiothoracic and specialist paediatric services, cardiology makes up nearly one third (30%) of total MDHB outflows as shown in Table 9. MidCentral Health provides a very low volume of cardiology services for other DHBs and inflows comprise just under \$400k or 0.3% total inflow revenue.

Figure 8 shows outflow costs for the last three financial years. The cost of cardiothoracic services for the 2009/10 year was 6.4% more than for 2007/08. However there has been a substantial rise since 2005/06 (about 60%) when cardiothoracic outflow costs were just over \$2.5m (CSP, 2007). Cardiology outflow costs were about \$2.4m in 2005/06 so have risen slightly. Paediatric cardiology outflow costs have doubled since 2005/06.

Table 10 shows that the main provider of services purchased elsewhere is Capital & Coast DHB. Auckland is a significant service provider in respect of paediatric services (100%) and also provided 13% of inpatient cardiology services purchased from other DHBs in 2009/10.

Table 9: Breakdown of 2009/10 cardiology related inter-district flows (IDFs)

Inpatients – Purchase unit		Outpatients – Purchase unit			
Cardiothoracic - Inpatient Services (DRGs)	\$4,120,756	Cardiothoracic - Subsequent attendance	\$52,123		
Cardiology - Inpatient Services (DRGs)	\$2,780,751	Cardiology - Subsequent attendance	\$48,078		
Specialist Paediatric Cardiac - Inpatient Services (DRGs)	\$804,110	Specialist Paediatric Cardiac - Subsequent Attendance	\$16,229		
		Cardiology - 1st attendance	\$13,670		
		Cardiothoracic - 1st attendance	\$3,058		
		Other	\$3,763		
Total cardiology	\$7,705,617	Total cardiology	\$136,921	\$7,842,538	29.7%
Total MDHB	\$22,937,997	Total MDHB	\$3,478,833	\$26,416,830	

Figure 8: Outflows – Trends in IDF outflows (\$)

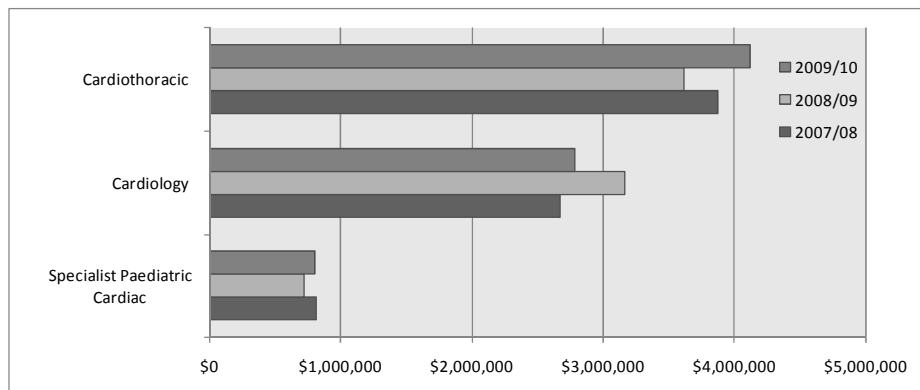


Table 10: Outflows by DHB - 2009/10 cardiology related inter-district flows (IDFs)

DHB	Total \$	%
Capital and Coast	\$6,404,787	81.7%
Auckland	\$1,320,703	16.8%
Canterbury	\$54,027	0.7%
Other DHBs	\$63,022	0.8%
Total cardiology	\$7,842,538	100%

4. Stakeholder themes

About 50 stakeholders across the continuum were interviewed, including representatives from the community cardiology service, general practice, PHOs, secondary service cardiology department staff and other services that interact with cardiology (e.g. general medicine, paediatrics, emergency department, medical imaging, anaesthetics, intensive care unit and palliative care). Those contacted external to MDHB included other DHBs, CentralTAS and the MoH. Following the introductory general comments a summary is presented of the themes from the interviews under the headings of 'leadership, team and strategic,' 'access and quality,' 'workforce,' 'demand' and 'infrastructure.' Refer to Appendix E for more detail.

General comments

Some stakeholders gave the viewpoint that the historically conservative approach of the cardiology department had affected referral rates from primary care. Initially the focus of the department was on the ultrasound service and the introduction of coronary angiography did not have much support. Over time the department became fractionated and an opportunity for a co-located department was not taken up 10 years ago during the reconfiguration of Ambulatory Care. In recent years there have been considerable manpower problems (particularly cardiologists and technicians) which stakeholders believe have affected service levels.

Some stakeholders thought that while cardiology service provision in the community was going relatively well (risk assessment, more nursing services and cardiologist and technician services in some TLAs) there had been a lack of investment in secondary cardiology with capacity being a long term problem. Problems accessing services, or providing sufficient services, was the main health outcome issue raised during the interviews.

Within MidCentral Health the view by many was that "cardiology is not taken seriously," and "there is no sense of department" and that identified problems have not been resolved.

Leadership, team and strategic

- Investment and support for clinical leadership is required.
- A decision is required on the size and future parameters of the secondary service including, 24/7 acute cover, PCI and regional service provision (Whanganui).
- Despite the investment into nursing, technician and cardiologist resources via the community cardiology contract there is limited primary secondary integration.
- The department needs to move forward in an integrated way.
- Personalities have affected service development and team cohesion needs improvement.

Access and quality

- Many patients are sitting on lists ('awaiting tests' and 'repeat' waiting lists) which leads to a lack of clarity about the responsibility for care.
- Waiting time is excessive for sub-acute outpatient assessment and investigations (mainly echo and angiography) – particularly for the Palmerston North and Manawatu populations but also longer than ideal for Horowhenua and Taraua.
- The waiting time for nuclear scans is too long and impacts on assessment / management.
- There is difficulty accessing timely cardiologist assessment prior to elective surgery.
- More angiography should be performed locally.
- There is inadequate cardiologist availability after hours – physicians have to take responsibility for complex patients and those needing intervention e.g. temporary pacemaker insertions. This can impact on management plans.
- Echo services are not available after hours and there is a lack of provisional reporting.

- Outpatient consultation and investigation reports are not timely (or in the case of the latter may not be furnished at all).
- Service audit is lacking.

Workforce

The weight of opinion was that the MidCentral Health workforce needed expansion in order to improve services. This was particularly to improve service access however developing the service was also seen as needing resource e.g. integration with primary, introduction of initiatives to better manage demand and progress service quality through audit. The need to increase the number of cardiologists was seen as particularly important in order to improve access to cardiologist assessment and interventions such as angiography.

An issue viewed as significant by a number of stakeholders was the lack of a formalised after-hours cardiology service. Although the cardiologists are willing to provide advice or come in if available, this availability cannot be relied on. Most general physicians wanted reliable cardiologist availability to manage acute complex cardiology and interventions such as temporary pacemakers. However, they emphasised the importance of continuing to admit cardiology patients in order to maintain a good level of competence with cardiology conditions. The main points were:

- More cardiologist FTE is required to provide acute cover and meet angiography demand.
- More technologist FTE is required to meet echo and cardiac physiology service demand (particularly support for ETTs, pacemaker and ICDs).
- Technologists need to be trained in a broader range of modalities to ensure service continuity e.g. paediatric echo and support for implantable devices (ICDs).
- The nursing workforce is not able to adequately support angiography (has caused cancellations) due to cover, training, management line reporting and working hours constraints.
- The nursing workforce, DHB wide, is not being fully utilised.
- No cover for community cardiologist absences which affects service continuity.

Demand and future service provision

- Inadequate beds in CCU at times (particularly winter).
- The need for cardiology opinion pre-surgery is increasing.
- Interventional demand is rising - e.g. angiography, implantable devices (ICDs), pacemakers (affects follow-ups and support required for procedures even when done elsewhere).
- Some of the paediatric conditions that used to kill have now been fixed. Now there is an "Adult Congenital clinic." The volume of paediatric cardiology is increasing.
- Managing demand requires better integration, guidelines and utilising the team across the continuum better.
- Stakeholders supported the provision of more invasive services locally with some promoting the development of PCI services. Others were concerned that MidCentral may not have the critical mass to justify PCI.

Infrastructure

- The facility for angiography is inadequate – insufficient availability of sessions and no flexibility.
- Equipment problems – this caused angiography services to be suspended for 6 months in 2009. It took 6 months for the echo machine to be replaced in the 2009/10 year.
- There is inadequate routine theatre time for pacemakers – this causes cancellations for cardiologist and technician elective services at times.
- Staff and services are spread out over many locations and insufficient capacity.

5. Cardiology continuum of care

CVD develops over a long period of time, presenting several opportunities for an organised health system to intervene. These may be summarised as:

1. Risk assessment
2. Management of risk
3. Diagnosis and management of early disease
4. Management of acute cardiovascular events
5. Ongoing management after acute events
6. Palliative services

This chapter provides an assessment of cardiology service across the continuum of care. The 2008 Diabetes and Cardiovascular QIP recommendations (p.131) and other recognised indicators are used where possible. Except for mortality the indicators are proxy indicators.¹⁰ This is supplemented by other information including the views of service providers and stakeholders. A summary table is provided at the end of the chapter (p.61).

Cardiovascular disease risk assessment

The *Assessment and Management of Cardiovascular Risk Guidelines* recommend an integrated approach to risk reduction based on assessment of absolute risk. The assessment is based on age and gender categories and includes diabetes together with other risk factors. Management of risk where identified may lead to a number of interventions such as smoking cessation support, dietary advice and green prescriptions. Experts have chosen a 15% risk of a cardiovascular event within the next 5 years, as their indication for the most intervention – evidence has shown that this level of risk is halved by treating people with certain combinations of medicines (aspirin + statin + BP lowering drug such as ACE Inhibitors).

Diabetes and Cardiovascular QIP recommendations (2008)

- Systematically implement the Assessment and Management of Cardiovascular Risk Guidelines (NZGG 2003) through primary care.

There are a substantial number of national indicators now in place to measure cardiovascular risk assessment/management performance indicating the escalating priority of CVD. 'Better cardiovascular and diabetes services' and 'Better help for smokers to quit' are two of the six national targets and this area also forms a substantial part of the PHO Performance Management Programme (PHO PMP) – see adjacent box for an

Cardiovascular risk assessment and management

National targets

Better cardiovascular and diabetes services.

Measures are:

- Increased percent of the eligible adult population will have had their CVD risk assessed in the last five years.
- Increased percent of people with diabetes will attend free annual checks.
- Increased percent of people with diabetes will have satisfactory or better diabetes management (as indicated by the HBA1c blood test)

Better help for smokers to quit

- 80% of hospitalised smokers will be provided with advice and help to quit by July 2010, 90% by July 2011 and 95% by July 2012.

PHO PMP

Applies to PHO enrolled populations
Funded indicators.

- The proportion of the population estimated to have IHD
- The proportion of the eligible population having their CVD risk recorded within the past 5 years
- The proportion of the population estimated to have Diabetes
- The proportion of the expected population with diagnosed diabetes having a diabetes annual review

Information only indicators.

- The number of people with smoking status ever recorded
- The percentage of eligible population whose most recent smoking status is recorded as current smoker
- The % of current smokers given brief advice to stop smoking in the last 12 months
- The percentage of current smokers who have been given or referred to cessation support services in the last 12 months

¹⁰ In the absence of a direct measure an indirect measure or sign is used which is thought to approximate or represents the phenomenon in question e.g. it is thought that high levels of cardiovascular risk assessment in a population equates to better cardiovascular health.

overview. The national target for cardiovascular risk assessment uses blood tests as the measure whereas the PHO PMP indicator is more accurate as it captures actual assessments completed.

Two other sources of information providing an indication of performance in this area are the 'best practice' reports¹¹ and pharmaceutical spend. The following section provides an overview of MDHB performance using a selection of the indicators and information available.

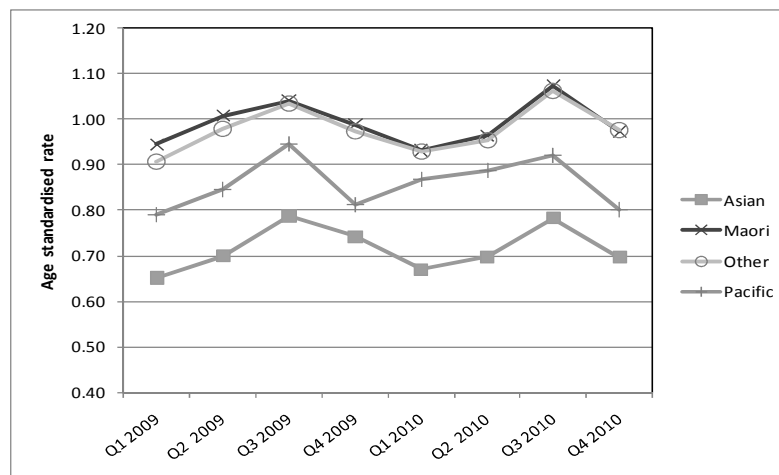
The degree to which the guidelines have been implemented in the MidCentral District is unknown, but it is thought to be patchy and interviews identified variation in approaches across the district. Some practices are taking an opportunistic approach and perform assessments as people present to general practice while others have progressed to a more structured approach of contacting people via mail outs. Firstly overall general practice consultation rates are shown.

General Practice consultation rates

The precise volume of consultations that are cardiology related is not known; the 2001/02 National Primary Medical Care Survey (MoH, 2004) estimated that the percentage of cardiovascular consultations was between 5 to 13.7% (depending on definitions). A random sample undertaken in 2010¹² of 500 doctor consultations in MidCentral DHB practices identified 42 of the sample (8.4%) where the main purpose of the visit was obviously cardiology related. This appears to be a low proportion of visits for such a high priority disease.

Figure 9 below shows that overall consultation rates fluctuate over the year. Māori have a marginally higher consultation rate than 'other' when data is age standardised while Asian and Pacific peoples are markedly lower. Unless extra capacity is increased in general practice or there are alternative ways of working (better systems / higher use of other roles) then risk assessment must be undertaken within the existing number of consultations.

Figure 9: Trend in age standardised general practice consultation rates – 2009-2010



Source: Central PHO

Proportion of population with CVD risk assessed in the last 5 years

In June 2010, 43,147 people were enrolled with MidCentral's PHOs who were recognised to be eligible for risk assessment using age/sex/ethnicity criteria. This compares to 55,000 people in the district who were estimated to be eligible overall.

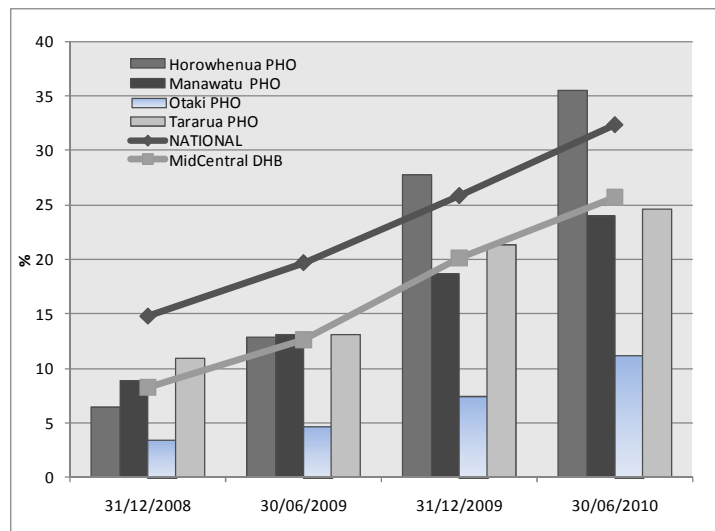
Altogether, 11,060 people had CVD risk recorded in the past 5 years. Most (8,400) were completed over 2010, representing 26% of enrolled eligible persons or 20% of estimated eligible persons. Figure

¹¹ 'Best practice' decision support software supports CV risk assessment / management and was progressively rolled out into MDHB general practice from 2007.

¹² The leader of the Compass Health analytical team undertook the analysis

10 shows that the highest rates are in Horowhenua and the gap with national is closing. Results for the 'high needs' population also sit at 26% of enrolled eligible persons. The national 'high needs' rate is 36%.

Figure 10: Percent of CVD risk assessment



The rate of known risk assessments using the 'best practice' software has steadily risen, currently being 76% of the rate required to cover all people over a 5 year period or 98% of the enrolled eligible population (the actual rate of assessments may be higher than this, through use of other methods). The Ministry's goal is to have over 80% of the population assessed over 5 years.

The results presented above are surprisingly low when compared to the national target for CVD assessment. This indicator uses a fasting lipid group test and a serum glucose or HBA1c test to signal CVD assessment. MidCentral DHB was top nationally at 84% (total population) and 76% (Māori) for the first quarter of 2010/11.

Diabetes management

People with diabetes are at very high risk of eventually developing CVD and most of the mortality from diabetes arises from CVD. Diabetes, with its concomitant effect on CVD mortality, is forecast to become more of a problem globally.¹³ This trend is likely to be more marked in New Zealand due to the marked effect of the aging 'baby boomer' cohort. Furthermore, CVD risk assessments may cause the proportion of people recognised as having diabetes to rise if guidelines are followed, as this provides the opportunity to undertake a diabetes screening, almost cost-free, in the major population groups who are at highest risk of having diabetes.

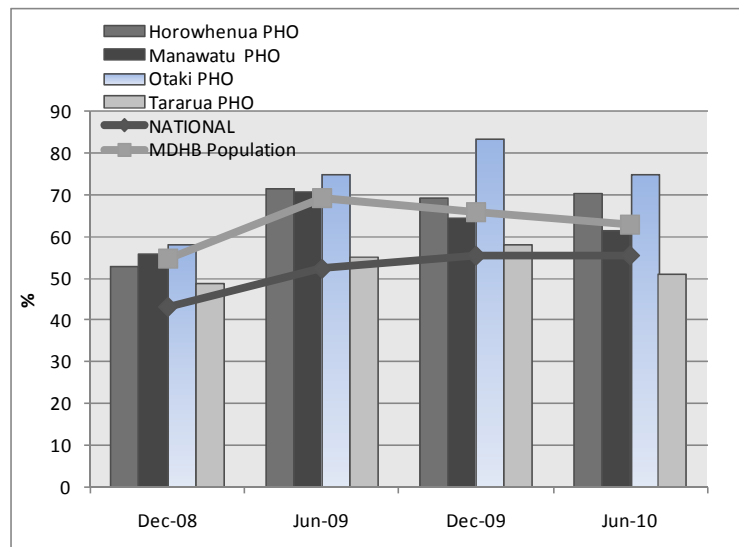
The Ministry's objective is to improve diabetes control. As part of this objective, the Ministry aims to increase the number of people with diabetes who have free annual checks. A health target and the PHO indicator programme both measure performance in this area and give slightly different results. Presented below are results from the PHO programme.

In June 2010, the total number of MDHB people known to have diabetes was 87% of the number the Ministry estimates would have diabetes in the district (the Ministry target is to have 90% of people with diabetes identified). Of the people known to have diabetes, 63% had a diabetes annual review, compared to the Ministry target of over 80%. Figure 11 shows this rate is slightly above the national average with a slight decline seen over the last 18 months. Rates for the 'high needs' population are slightly higher (67% in June 2010) which compares to the national rate of 59%. This has been relatively

¹³ Sarah Wild and colleagues in 2004 estimated that 2.8% of all population groups in Western countries had diabetes in 2000, rising to 4.4% in 2030, due to the combined effects of population growth, aging, urbanization, and increasing prevalence of obesity and physical inactivity.

static over the two year period. In comparison, the health target results for Q1 2010/11 were 71% for the MDHB population (rank 3rd nationally) and 54% for Māori (rank 11 nationally). Again the pattern over the last two years is relatively static. The results indicate considerable room for improvement.

Figure 11: Diabetes annual reviews (of those expected to have diabetes)



Smoking

Smokers are at significantly increased risk of CVD as well as other conditions including respiratory tract cancers and chronic airways disease. The Ministry's objective is to assist people to quit smoking. For that to occur, providers first need to identify smokers. In June 2010, 49% of people enrolled with the PHOs had ever had their smoking status recorded. 22% had their current smoking status recorded. The Ministry target is 90%.

Management of known risk

CVD risk management

National guidelines set out measures which should be offered to those with identified cardiovascular risk. In particular, those at 'high risk' (greater than 15% risk of an acute event in the next 5 years) should be prescribed a particular combination of pharmaceuticals. Data is not available to match prescribing to individual risk so it is not possible to ascertain the appropriateness of medications or the proportion of high risk people on appropriate medications. A New Zealand study found that more than two thirds of people with CVD were not receiving recommended medications (Rafter, 2005). Similarly, a study in the US found that only 55% of the sample of nearly 7,000 received recommended care (Asch et al., 2006).

Figure 12 and Figure 13 show that since the year 2005/06 MDHB's expenditure in medicines known to reduce cardiovascular incidents (antihypertensive and lipid lowering medicines) has been more than the national average. The dip seen at the end of the period is not due to a reduction in the volume of medicines but rather shows PHARMAC's success in reducing the cost of these medicines.

Figure 12: Change in DHB community pharmaceuticals expenditure since 2005/06 - Antihypertensive medicines

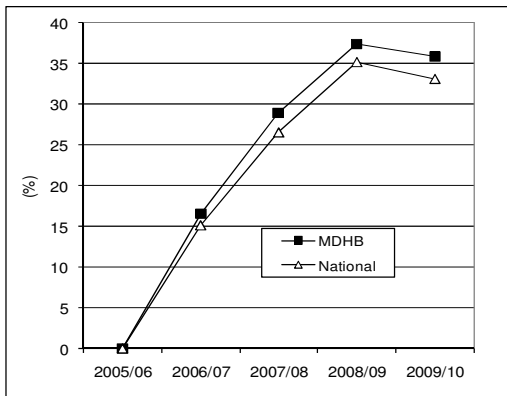
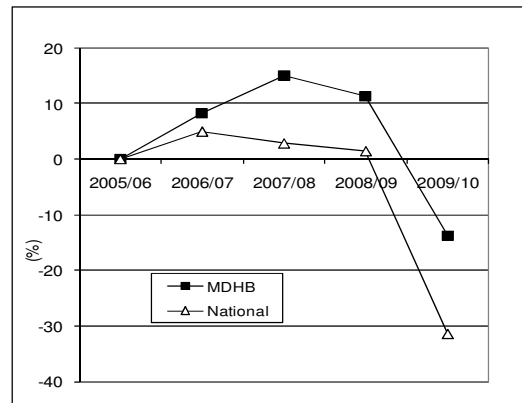


Figure 13: Change in DHB community pharmaceuticals expenditure since 2005/06 - Lipid lowering medicines



Diabetes management

Health target information showed that in June 2010 75% of the people who had an annual review were judged to have satisfactory control or better (as indicated by the HBA1c blood test). The proportion for Māori was notably lower at 61%. The pattern over the last two years is relatively static with national rankings improved and sitting at 10th for the total MDHB population (up from 17th) and 15th for the Māori population (up from 21st). Of note is that this indicator measures control in only those who have an annual check, this means that there is known ‘satisfactory control’ in about half of the total number of people known to have diabetes. This reduces to one third for Māori where the percentage of annual checks (and satisfactory control) is even lower. Also of note is that the expected numbers of people with diabetes are estimations only; it is thought that approximately 5 to 6% of the New Zealand population have diabetes, with Māori and Pacific people rates about three times that of ‘other ethnicities.’

Smoking cessation

Smoking cessation data (how many people have actually quit) is not available. However it is clear that more people are getting advice and support. Figure 14 below shows health target results for offering smokers brief advice to quit while in hospital. Although the proportion is rising, performance is quite low compared to national. The target is 90% for 2010/11. Figure 15 shows that referrals to Quit Services almost doubled in 2010.

Figure 14: Proportion offered brief advice (in hospital)

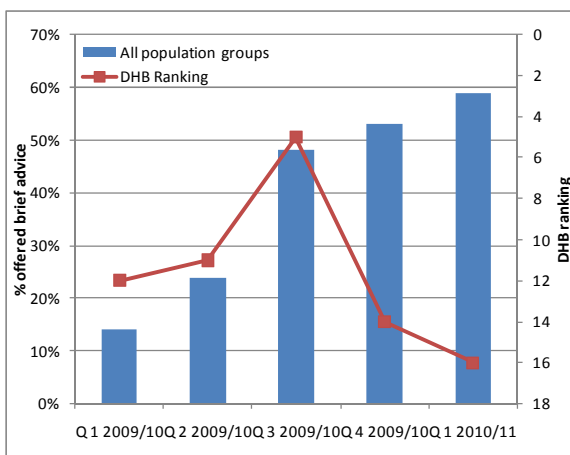
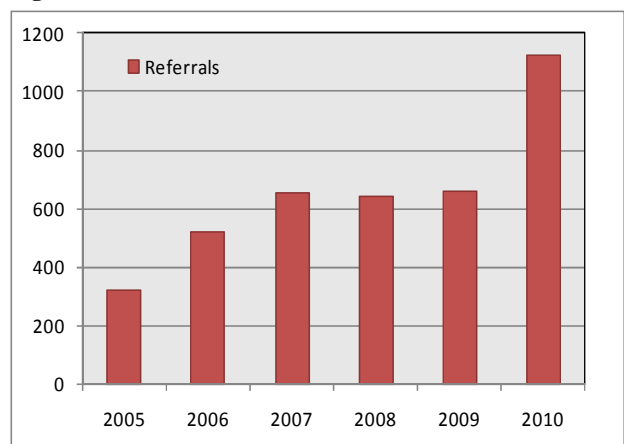


Figure 15: Number of referrals to Quit Services



Diagnosis and management of disease

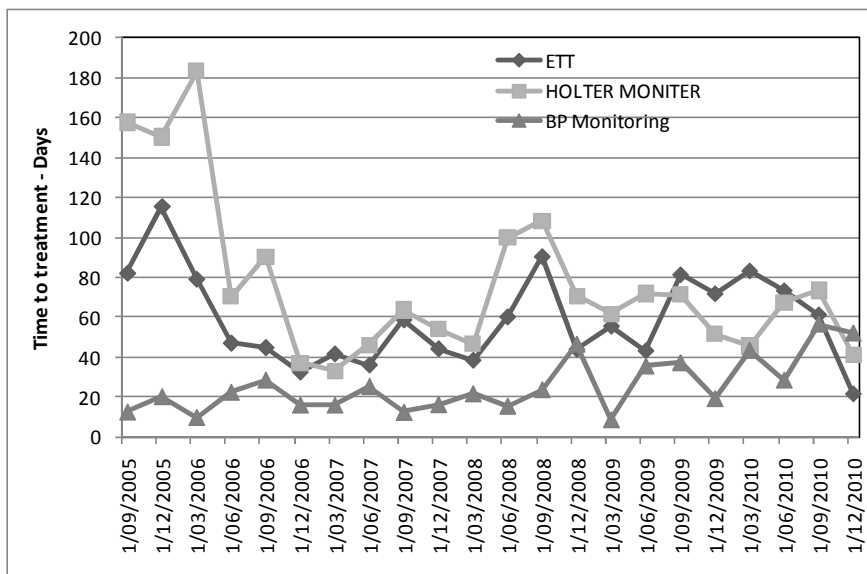
Initially, when problems arise they need to be diagnosed. Some diagnostic tools are available to primary care e.g. blood tests and radiology however some can only be accessed through secondary care such as echo and ETTs. Most of the management of conditions such as hypertension, diabetes, and chronic kidney disease occurs in the primary care environment. If these conditions become complex, difficult to control, or more advanced, they may require episodic or regular secondary care advice or management.

Waiting time for tests

The demand for cardiology tests has risen over recent years. Although MidCentral Health test throughput has not increased (with the exception of pacemaker checks) the demand is reflected in the waiting lists and stakeholder feedback. See also Appendix F, p.114.

Figure 16 shows average waiting time for key tests completed at MidCentral Health. For ETTs the average time will lengthen over the next quarter as the current waiting time is 2 ½ months. It is clear that waiting time for these tests has been an issue over time. ETTs are not able to be performed according to guidelines and the chest pain pathway, or on the same day as the one-stop shop arrangement in the community clinics. In contrast, ETTs and holter monitor tests were up to date in Horowhenua. In Tararua, ETTs were up to date but the wait for a holter monitor test was 5 months. There is only one holter monitor so only two tests can be done per month given the fortnightly clinics.

Figure 16: Average waiting time for tests completed at MidCentral Health

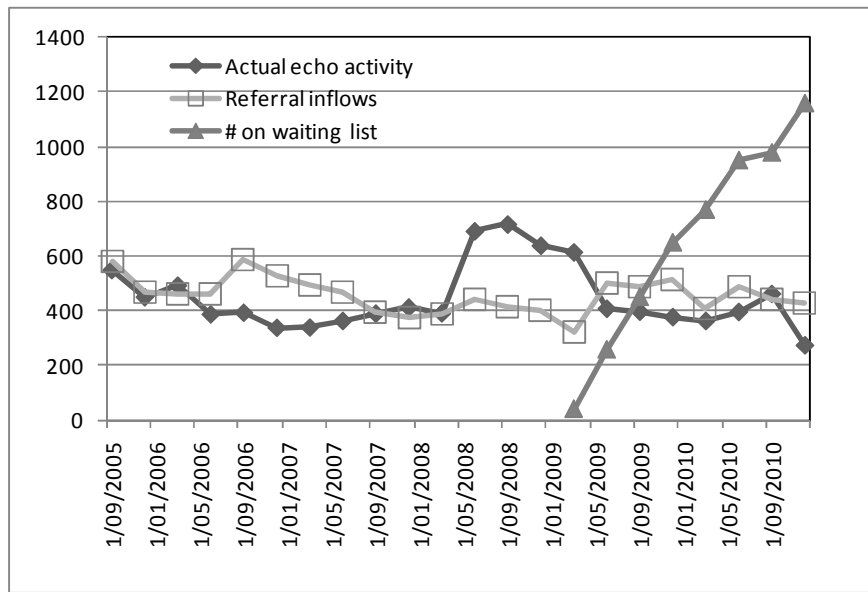


Echo referral inflows are shown against activity in Figure 17. During the 2008/09 year there were 2378 echos performed which was much more than the referral inflows of 1635. The situation reversed in 2009/10 when only 1522 echos were performed but inflows were 1904. Numbers on the waiting list do not show before September 2009 due to a system change. There are just over 1,000 patients on the echo waiting list and semi-urgent patients wait over a year for the test – currently only urgent patients are being booked. This includes groups of patients who require echos at regular intervals, commonly yearly or three-five yearly.¹⁴ There are currently approximately 250 patients for these ‘planned’ echos on the waiting list. The community cardiology echo waiting lists are much shorter – in Tararua the

¹⁴ Patients with valve diseases such as aortic / mitral stenosis (parameters may need monitoring to assist with determining timing for surgery), complex corrected congenital heart disease in adults and children, hereditary cardiac conditions such as hypertrophic cardiomyopathy, Marfans syndrome

waiting list has been cleared following extra clinics in January 2011. Horowhenua's echo waiting list is longer and was three months even after several extra clinics.

Figure 17: Echo volumes /referrals / waiting list (includes community volumes)



The appropriate level of cardiology tests was not determined in the review. However the indication is that key tests such as ETTs and echos are not timely and in many instances are not performed according to guidelines. A survey of clinical echocardiography in New Zealand completed in late 2005 (Bridgman, Ashrafi, Mann, & Whalley, 2008) found there was wide disparity in the population adjusted rates of echos performed across the DHBs. Echo was the most frequently utilised cardiac investigative tool after the basic ECG but only 30% of patients with ACS had an echo despite its proven diagnostic and prognostic benefits in such patients. Seventy-five percent of echos reported abnormal findings.

A standardised process for data collection was recommended in the central region DHB Cardiac Technicians and Technologists Report (CentralTAS, 2008) to allow improved monitoring and benchmarking. This process was commenced mid 2008 however the information was not able to be used due to data quality issues, the failure of some DHBs to submit information and difficulties with the web portal. The process has since been revamped and preliminary results will be reviewed soon by the Network. MidCentral's echo rate at 43 per 100,000 was lower than the majority of the Central Region DHBs with most sitting between 60 and 73 per 100,000.¹⁵ The current state and stakeholder theme chapters present the issues associated with the provision of tests. In respect of echo this includes patients having to return for outpatient echo due to the inability to provide this test during the inpatient stay. It appears essential that MidCentral Health reverse the decline in echo throughput and improve service levels for echos and ETTs in particular.

A number of recommendations made in the CentralTAS 2008 report are outstanding and need revisiting. This includes phasing out the practice of cardiac technicians undertaking routine ECGs for inpatients and outpatient clinics to enable this FTE to be used more effectively and improving access to ECGs within primary care.

Nuclear medicine service

Nuclear perfusion scans are a diagnostic tool useful for patients unable to undertake ETT, with Left Bundle Branch Block and also where there is difficulty making a diagnosis (pain on exercise but no ischaemic changes). The test involves an injection of radioisotopes at rest followed by a scan; then about 3 hours later 'stressing' by either treadmill, exercycle or drugs followed by another scan. The team comprises the nuclear medicine physician, MRT, nurse and cardiac technologist. Cardiologists

¹⁵ General echos performed between Jul-Dec 2010.

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view this as an excellent service, scans have a high degree of sensitivity, and positive scans are followed by positive angiograms to about 95% accuracy. GPs can refer directly into the service.

This service is not offered at some DHBs and advice provided during the review was that the most likely alternatives for this test are angiography and stress echo (not provided at MidCentral). European guidelines confirmed that there is good evidence supporting the use of nuclear scans for symptomatic patients with an intermediate pretest likelihood of obstructive coronary artery disease while angiography was best for symptomatic patients with a high pretest likelihood of obstructive disease.

Angiography is more invasive and costly than nuclear medicine scanning.¹⁶ Stress echo is likely cheaper than nuclear scans and may be attractive to cardiologists as they can provide this service themselves. However stress echos can be less accurate and sometime cannot be done for patient reasons.

Bottlenecks in the nuclear medicine services can be caused by equipment issues or availability of team members. Camera issues have affected throughput at times as has shortages of nursing / MRT staff. The major current influence is doctor availability and no cover for the 'stressing' component of the test. Doctor input is needed to supervise / perform the stressing and to report on the scan. While at MidCentral the nuclear medicine physician does the stressing and reporting, this does not have to be the case. MidCentral has a contract for remote reporting in Perth when necessary. The writer was informed that in the majority of centres in NZ and around the world, the stressing component is performed by cardiology and the scans are reported by nuclear medicine.

Throughput has generally been in the region of 400 scans per year, however reduced to 300 for 2010 due to the nuclear medicine physician taking accrued leave. Waiting time has escalated to four months. The inappropriate waiting time was raised by consultants during the review. Referrals have subsequently decreased as often happens when there are service capacity problems. Waiting list and waiting time data is provide in Appendix F, p. 126.

The nuclear medicine physician is likely to retire soon so a plan is needed. In the absence of a nuclear medicine physician it would be possible to maintain the service if stressing was performed by cardiology and reporting was outsourced.

Tests for heart failure

BNP (blood test) and echo are diagnostic tools that may assist in the diagnosis of heart failure. Echo is more expensive and prior to community cardiology clinics was available only through the hospital (often with delays of months). BNP is available to GPs rapidly so an algorithm was developed by local GPs and MIPA (about 2005) where the pathway was for BNP to be done first, then referral for specialist assessment and/or echo if above a certain level. Subsequently, with the commencement of community cardiology, the idea was to have more immediate access to echo without necessarily needing to involve the cardiologist first. The volume of BNP tests between 2006-07 and 2009/10 as follows:

- Community 1611-3479 (116%)
- Hospital 2231-3597 (61%)
- Total 3842-7076 (84%)

The volume has increased substantially over the four years; however it is not known how closely BNP test requests match guidelines.

¹⁶ 2010/11 charge out rate was \$882 per scan.

Waiting time for specialist services

Access to cardiology first specialist assessment (FSA)

The cardiology service meets the national Elective Service Performance Indicator (ESPI) of FSA occurring within six months. However cardiologists and referrers are of the view that the waiting time is too long for high priority patients. In May 2010, cardiologist review of the waiting list identified 78 patients with possible IHD waiting. Sixty-two were prioritised urgent and required ETT as work up, however at that time the ETT waiting list was significant with 205 patients waiting. As of 28 January 2011 there were 111 patients waiting with an approximate waiting time of 2 ½ months. This illustrates the impact of poor access to cardiology tests on specialist assessment.

Outpatient 'awaiting tests' waiting list – 650 patients waiting

This waiting list was created about 2006 for patients referred for cardiologist assessment that needed tests first. The rationale was that once the cardiologist requested a test prior to assessment, then the patient was waiting for a test rather than assessment. As the waiting times for some tests are significant e.g. over a year for a semi-urgent echo as identified earlier, then leaving patients on the cardiology waiting list would have meant that MidCentral would not meet the national ESPI of assessment occurring within six months. The most common tests requested are echo, ETTs, holter monitoring, respiratory tests and nuclear medicine scans.

After the test is performed only high priority patients have a time frame for an appointment identified by the cardiologist. The date of referral on the computer system is altered to the date of the test. Lower priority patients do not get a booking unless they or their GP make an enquiry. Occasionally patients are discharged after negative tests but practice is not consistent. The number of patients on this waiting list has been steadily increasing – at the beginning of this review in October there were 650 patients on this list; Priority 1s (113), Priority 2s (481) Priority 3s (56). 450 patients have been on the list since 2009 or earlier and go back as far as 2006. No information was available for these patients about the type of test required or whether tests had been completed and this is not captured on the system.

In January 2011 there were renewed efforts to address this problem and approximately 90 referrals have been reviewed. From a sample of 27 'awaiting tests' referrals reviewed by the cardiologist, one third were identified for appointments and one third discharged. Outcomes in detail were: discharged (8) request notes for review (8), urgent appointment (2), clinic appointment following echo (1) heart failure clinic (3) follow-up appointment (3) deceased (1).

The above system appears to 'work around' national ESPI requirements and the waiting list does not feature in electives monitoring, either locally or nationally. In the opinion of the writer this waiting list obscures the situation and should not be used. The waiting list needs urgent review and processes need to be changed; many patients will not need specialist assessment as indicated by the sample above.

On 26 January 2010, in Horowhenua, the waiting time was 2 months for a semi-urgent consultation and three months for routine. In Tararua, the waiting time was 3 months for semi-urgent and 4 months for routine consultations.

Cardiologist follow-up waiting list - Over 2,000 patients waiting.

This is a longstanding issue and numbers waiting have risen since a 'cull' about 2004. Currently patients with a requested follow-up period of less than 3 months get booked directly into clinic. Others are put onto the follow-up waiting list but are not given a booking unless they or their GP make an enquiry.

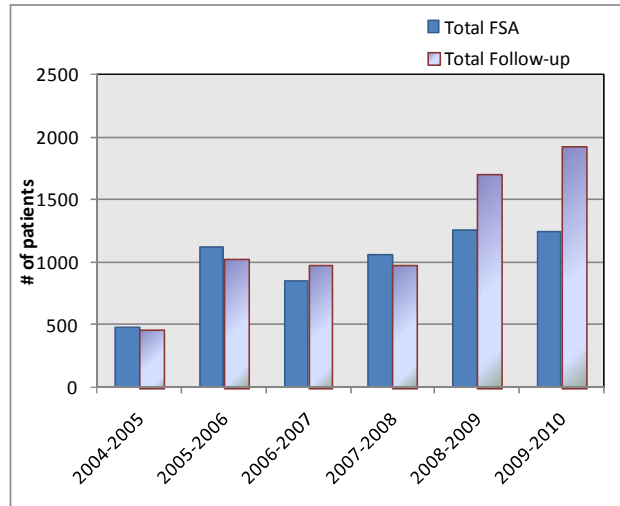
A follow-up waiting list system is also in place for heart failure patients previously seen by the cardiologist, NP or CNS. In contrast to the cardiologist follow-up waiting list, this list is monitored / managed and the CNS regularly prints out the list and gives instructions for booking.

The follow-up waiting list needs urgent review and ongoing monitoring.

Specialist outpatient activity

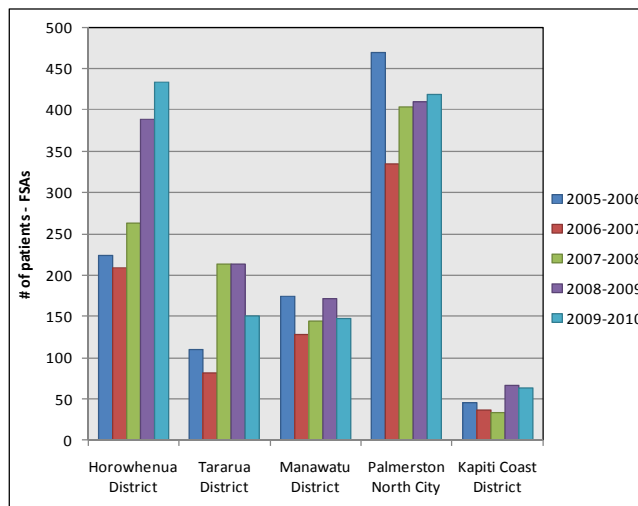
Statistics in this section include MidCentral Health and Central PHO volumes combined. Data quality issues which affect both MidCentral Health and Central PHO data should be noted as outlined in Appendix D, p93. However, ‘double-counted’ volumes have been removed.¹⁷ The trend in total volumes across the district is shown in Figure 18. Assessment volumes have risen slightly and follow-up volumes substantially. These volumes include NP consultations which were 7% and 12% of MidCentral Health FSA and FUs respectively for 2009/10.

Figure 18: Trend in cardiologist FSA and follow-up



The current state assessment identified that specialist volumes have risen for community services and fallen for MidCentral Health. Figure 19 provides a TLA view which shows access has improved for Horowhenua, Tararua and Otaki residents (Horowhenua’s volume is double that of 5 years ago) and been static to worse for Palmerston North and Manawatu residents.

Figure 19: FSA volumes by TLA for the MidCentral population

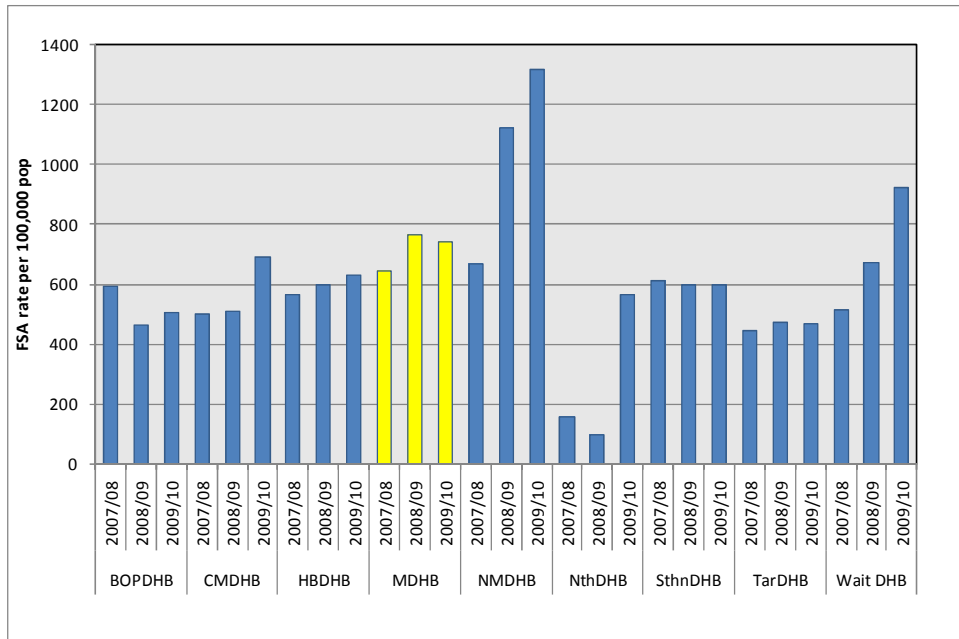


Volumes of cardiologist assessment per 100,000 population (by DHB of service) were compared to other DHBs and are presented in Figure 20.¹⁸ This is a crude ratio so does not factor for the different make up of the DHB populations and MidCentral DHB’s relatively older proportion.

¹⁷ MidCentral Health counted some Central PHO volumes as MidCentral Health volumes in error

¹⁸ The 2009 “National Pricing Programme – Role Delineation Model” work was used to select DHBs. This model placed MidCentral as a Level 5 DHB for cardiology services along with Otago and Counties Manukau. Volumes were also benchmarked against Level 4 DHBs (Hawke’s Bay, Northland, Bay of Plenty, Nelson Marlborough, Taranaki, Waitemata).

Figure 20: Rates of FSA volumes per 100,000 population (Level 4 and 5 DHBs)



Nelson Marlborough DHB has significantly higher rates and Northland DHB significantly lower rates of specialist assessment compared to the other DHBs. MidCentral DHB rates appear comparable to the remaining DHBs.

While the review has indicated that the level of staffing resources are an issue for MidCentral Health and impact on adequate diagnosis and management of disease, there is also evidence that the service would benefit from better utilisation of existing resources, initiatives to manage demand including development of roles and better service organisation.

Management of acute cardiovascular events

This area of cardiology is primarily managed by secondary services. The most common problems that occur acutely are ACS (angina or MI), arrhythmias and heart failure. In 2009/10 the proportions of hospitalisations in these areas were:

- ACS - 52% (angina 20%, NSTEMI 27%, STEMI 5%)
- Heart failure - 19%
- Arrhythmias - 18% (two thirds are atrial fibrillation)

The data supplement (Appendix F, p.107) provides an overview of a selection of hospitalisations statistics.

Patients may be referred to hospital via general practice or may go directly to hospital by ambulance or presenting to ED. The top presenting complaint for cardiology is chest pain which makes up 63% of all cardiology related presentations. Heart failure ranks second at 6%.

ACS has been identified as a priority nationally. This next section looks at the management of ACS using the recommendations provided in the *2008 Diabetes and Cardiovascular Quality Improvement Plan (QIP)*.

Management of Acute Coronary Syndrome (ACS)

Time to treatment

Following clinical presentation with ACS there is an urgent need to identify eligible patients with ST elevation MI (STEMI) who may benefit from acute coronary reperfusion achieved through thrombolysis or, in some major centres, through percutaneous coronary intervention (PCI). The benefits of such interventions are substantial but diminish progressively during the hours following symptom onset. The health outcome sought is improved survival rate and reduced disability following ACS presentation.

Diabetes and Cardiovascular QIP recommendations (2008)

- Where patients present with ACS [and acute stroke] conduct an emergency room assessment of them immediately
- Provide immediate thrombolysis in eligible ACS patients with STEMI according to standard emergency room and coronary care protocols
- Provide immediate access to coronary angiography and PCI in major centres where specialist cardiology staff and facilities exist

Like other secondary hospital services (except Nelson Marlborough DHB) thrombolysis is the treatment available at MDHB. The nearest centre offering PCI is Wellington. Thrombolysis can be delivered in the hospital (usually ED) or before arrival (usually by ambulance personnel). In New Zealand pre-hospital thrombolysis is provided in Northland, Kapiti Coast and Hawke's Bay. Some hospitals (Nelson, Blenheim and Kaikoura) have commenced transmission of ECGs from the ambulance to reduce the door to balloon time when primary PCI is indicated. Following is an overview of pre-hospital thrombolysis and MDHB progress.

Pre-hospital thrombolysis

Pre-hospital thrombolysis is particularly of benefit in avoiding delays that arise as a result of distance from the hospital and there is clear evidence that this practice saves lives e.g. the Scottish Intercollegiate Guidelines Network (SIGN) ACS guidelines state that meta analysis found that pre-hospital thrombolysis reduces all cause hospital mortality when compared to in-hospital thrombolysis (p 14, 2007). In Australia, a recent study of paramedics delivering pre-hospital thrombolysis supported by cardiologist interpretation of ECG, found that it was feasible for paramedics to deliver thrombolytic

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therapy prior to transfer to hospital. The median time from paramedic arrival at scene to thrombolysis was 30 minutes (Pemberton, NHF national conference, 2010).

Pre-hospital thrombolysis was a recommendation in the 2006 Central Region Cardiology Services Review and has been on the Central Region Cardiology Network work programme since 2007. A proposal was submitted to the Executive Management Team (EMT) that St John's Ambulance be assisted to deliver pre-hospital thrombolysis for appropriate MI patients who present in outlying areas (Tararua, Otaki, Horowhenua). The proposal did not progress at that time due to technology issues which St John's has since resolved.

Pre-hospital thrombolysis in eastern Hawke's Bay commenced approximately 6 months ago. St John's Medical Director Central stated in February 2011 that seven patients had been appropriately thrombolysed in the Hawke's Bay. Northland has expanded its service. Further, the Medical Director stated that he had approached MidCentral Health sometime last year to progress pre-hospital thrombolysis but there had been no interest to date. Communication channels for pre-hospital thrombolysis could not be identified in the review – it is not clear who is championing pre-hospital thrombolysis at MDHB. The investment for pre-hospital thrombolysis is relatively small involving mainly drug packs for the ambulances and sim cards. A recall system will be needed to ensure drugs do not expire. Cardiologist guidance will also be necessary in order to introduce pre-hospital thrombolysis.

Thrombolysis at MidCentral

Five years ago thrombolysis was provided in the CCU. At the time this was not common practice internationally so monthly audits were commenced to assess whether door-to-needle times met standards. Subsequently, a new procedure of automatically thrombolysing patients in ED rather than CCU became practice. This occurred in consultation with CCU and the cardiology team and was supported by a MI pathway with an ED checklist to ensure safety and consistency of practice.

Results are provided to the senior nursing team and the clinical director at the ED Quality meetings as part of Clinical Governance group. Unacceptable delays are identified on the audit sheets and these cases are followed up by the clinical director with individual doctors and teams. There is recognition that in some cases delays are appropriate, for example, patients may require CT or Xray prior to thrombolysis to exclude cerebral events or abdominal aortic aneurysm. The New Zealand standard for door to needle time is 20 minutes (30 if going to CCU) and the UK standard is 60 minutes. The person responsible for the audit monitoring stated that the audits have proven that current practice provides time-critical standardised treatment that is recognised as best practice and therefore audits have been reduced to twice yearly.

Monthly thrombolysis audit sheets were reviewed between January 2008 and September 2009. The main points were as follows (refer Appendix F, p.119 for further detail).

- 117 patients were thrombolysed over the period (there was no audit information for December 2008). The number of delays that were identified as unacceptable was 15 (13%).
- The patterns of thrombolysis volumes and inpatient admissions with STEMI are aligned, particularly for the last three months of the period.
- Door to needle times reduced over the period. Between January and September 2009 50% (n=19) were thrombolysed within 20 minutes of arriving, 63% (n=24) within 30 minutes and 95% (n=36) within 60 minutes.

Evaluation of thrombolysis performance should have cardiologist input.

The MI Integrated Care Pathway (ICP) collects a range of information about the patient event including thrombolysis and this goes to PPU to be entered into a database. The only report to be produced from this pathway is related to thrombolysis, however there are many gaps in the data and

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the volumes are much less than recorded on the ED audit sheets. The reports are distributed to the NP Adult Cardiac Care and the ED staff member in charge of audit.

It did not appear that the information collected as part of the MI ICP was being used. The use of the MI ICP requires review given the impact on staff's time to collect the information and manage the database. This could be part of implementation of this review and determining the information necessary to guide the service.

Clinical assessment and risk stratification for ACS

Following clinical presentation with ACS important determinants of outcome are the underlying severity of coronary artery disease, the amount of myocardium remaining at risk of ischaemia and the extent and presence of impairment of pump function. Best practice requires cardiological assessment of all these determinants to guide clinical decision-making related to coronary intervention and medical treatments. Health outcomes sought are symptomatic benefit, reduction in risk of recurrent events, reduction in rate of hospital readmissions and improvement in survival rate.

Diabetes and Cardiovascular QIP recommendations (2008)

- Make clinical classification of ACS in the categories of unstable angina (sub-classified high and low risk), non-STEMI and STEMI
- Routinely assess left ventricular function before discharge using echocardiography
- Routinely assess severity of CAD using exercise stress testing and/or coronary angiography before discharge
- Routinely refer all MI patients who are smokers for smoking cessation support before discharge

Following is a summary of practice at MidCentral Health, as described by a cardiologist, in respect of the above recommendations.

- Cardiologists routinely classify patients into troponin negative ACS (i.e. unstable angina), troponin positive ACS (i.e. non-STEMI) and STEMI. The practice of general physicians is not known and was not explored.
- Echos are not routinely done to risk stratify. The proportion of patients having an echo are not known.
- Most non-STEMIs under the care of cardiologists should have an angiogram unless there is a contraindication (e.g. very elderly, known disease not amenable to revascularisation, other significant co morbidities). Therefore the majority would not need ETT to risk stratify. Most troponin negative ACS patients should have an ETT to confirm / exclude IHD. Similarly most STEMI should have pre-discharge ETT to guide further management. (This is not occurring).

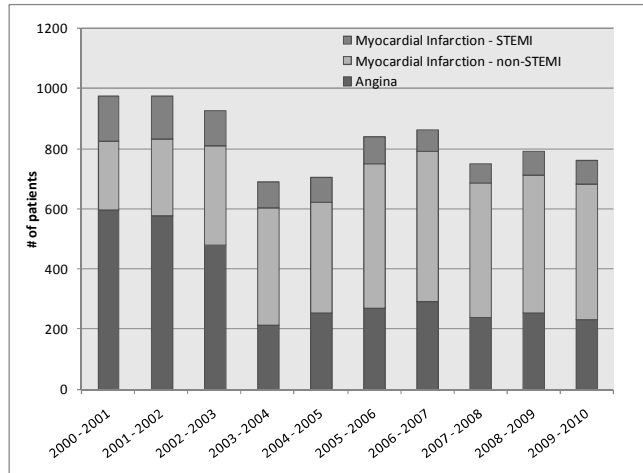
Cardiologists report that most patients with non-STEMI have angiography prior to discharge. However only small numbers have the procedure at MidCentral (one slot is kept each session for an acute) but most are transferred to Wellington Hospital. The proportion was not determined by data analysis during the review. The analysis of angiography sessions presented in the current state chapter identified that acute procedures were performed on 44% of sessions. Benchmarking identified that other DHBs had much higher volumes of acute procedures. The high proportion of unused slots may be due to the difficulty matching patient need to the available session slot / day.

Whereas a Dunedin study found there was good adherence to the use of evidence-based management for ACS (Tang, 2005) practice at MidCentral Health cannot be determined from the information collected.

Profile of ACS admissions

Figure 21 shows trends in the proportions of the main diagnosis groups within ACS – angina, STEMI and nonSTEMI. Overall ACS admissions are trending down.

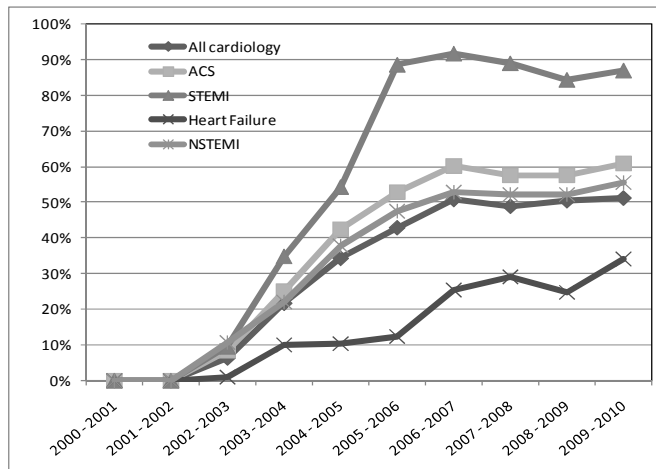
Figure 21: Trend in ACS admissions



Note: Excludes admissions with a LOS=0 and M05s (Emergency Medicine discharges)

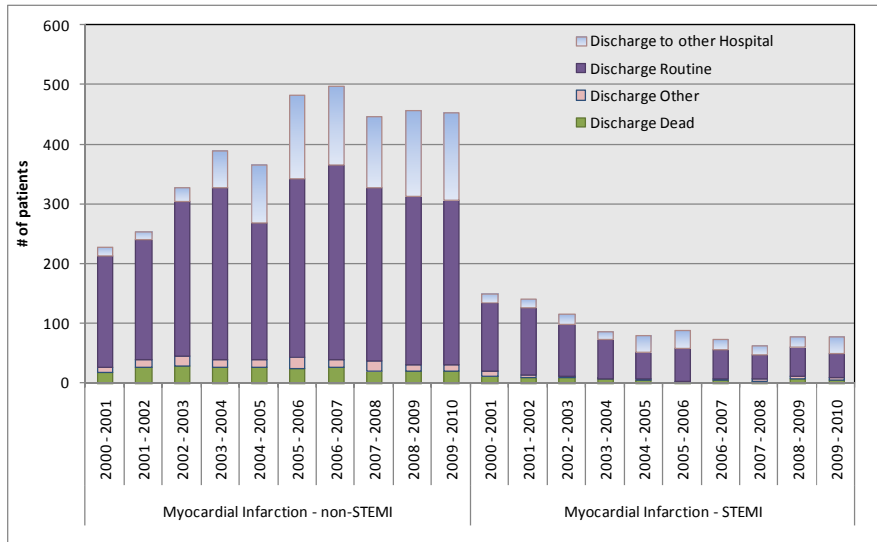
The number of acute cardiology patients being discharged under cardiology has increased as shown in Figure 22 below. While cardiologists care for most STEMI patients, the proportion is much lower for those with a diagnosis of NSTEMI. Most heart failure patients come under general medicine although the proportion has been trending upwards.

Figure 22: Percentage of acute cardiology discharges



Discharges to other hospitals have increased as shown in Figure 23. This is mostly to Wellington Hospital (range 82 - 91%) but a small proportion of people are discharged to Horowhenua Hospital (range 5-12%). NSTEMIs comprise most of the volume of discharges to other hospitals but similar proportions of STEMI and NSTEMI were discharged to other hospitals in 2009/10 (about one third). Numbers of deaths in hospital have decreased over the period.

Figure 23: Discharge outcome – STEMI and NSTEMI



Revascularisation (ACS)

PCI or CABG is of proven benefit in improving outcomes in selected high-risk patients which may necessitate the transfer of such patients to another (tertiary) hospital. Health outcomes sought are symptomatic benefit, reduction in risk of recurrent events, reduction in hospital readmissions and improvement in survival rate.

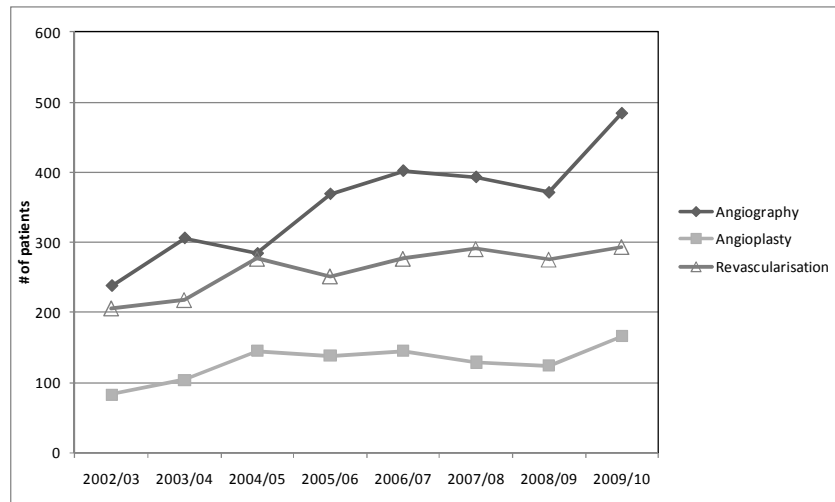
Diabetes and Cardiovascular QIP recommendations (2008)

- Base revascularisation of high-risk ACS patients on cardiological assessment

A cardiologist described MidCentral Health practice. PCI is performed prior to discharge for high risk patients. The case for surgical revascularisation depends on disease severity. Where this is indicated, patients are transferred to Wellington hospital. Some patients have PCI during the same hospital stay and the remainder have as outpatients.

The trend in angiogram, PCI (angioplasty) and revascularisation volumes for the MidCentral population are shown in Figure 24 below, illustrating increased volumes over time. Revascularisation volumes capture PCI and CABG together.

Figure 24: Trend in cardiology procedure intervention rates



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Cardiology procedures – Targets and standardised discharge ratios (SDRs)

Access to a set of cardiology procedures is monitored 6 monthly by the MoH. Targets have been established for cardiac surgery and angioplasty (PCI). Cardiac surgery targets were first set in 2009/10 at 5.9 per 10,000 population and will reach 6.5 per 10,000 population in 2011/12. DHBs must provide a report when procedures are significantly below the target level. Other procedures such as angiography are monitored via standardised discharge ratios (SDRs). The MoH website explains that intervention rate analysis is a comparison of individual boards with the national average and does not indicate what the right rate might be and “does not give information as to why the local rate may differ from the national average.” The SDR is the ratio between the number of procedures completed and the number that would be expected to be completed if the DHB was providing the service at the national average rate. The expected number is worked out by taking the national rate and applying it to the board's population, adjusting for age, sex, social deprivation and ethnicity.¹⁹

Following is analysis of cardiology interventions for the 5 year period 2005/06 – 2009/10 (refer also to Appendix F, p.121 for detailed graphs).

National SDR rates for cardiac surgery and cardiology procedures have steadily increased in all areas over the period. MDHB SDR rates have also increased and for 2009/10 were higher than at the beginning of the period. However all MDHB rates except cardiac surgery were statistically ‘significantly below’ the national rate (or target in the case of PCI) for the whole period and ranked in the bottom three to four DHBs as shown in Table 11. A high level of correlation is seen across the cardiology SDRs. The differing pattern seen for cardiac surgery, which exhibited a hump above the national rate in 07/08 and 08/09, is likely due to the concerted effort by C&CDHB to clear the waiting lists.

If national discharge rates had been achieved, additional discharges over the 5 year period for cardiac surgery, angiography and angioplasty would have been 39, 699 and 311 respectively. For 2009/10 the number of discharges in these three categories below the national rate was 24, 114 and 54 respectively.

Table 11: Standardised intervention rates - MDHB ranking (out of 21 DHBs)

Year	Cardiac Surgery	Angiography	Angioplasty (PCI)	Revascularisation	Interventional Cardiology
2005/06	18	17	16	17	18
2006/07	12	14	15	15	15
2007/08	6	18	20	18	19
2008/09	7	21	20	16	21
2009/10	17	19	17	18	19

Angiography is delivered locally but the majority is provided by Capital & Coast DHB as seen in Table 12. An additional 9 angiograms were provided for Whanganui patients in 2009/10. Pacemaker services which form part of interventional cardiology procedures are also delivered at MDHB (about 70 p.a).

Table 12: Angiography for the MDHB population by DHB of service

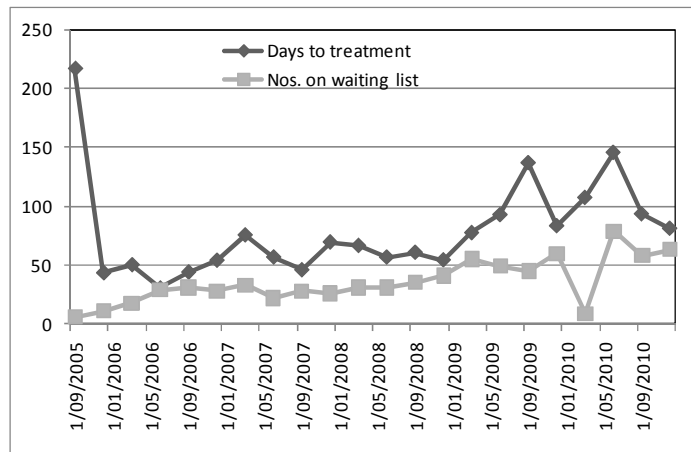
Agency name	2008/09		2009/10	
	#	%	#	%
Capital and Coast DHB	222	60.0%	285	59.3%
MidCentral DHB	137	37.0%	183	38.0%
Other DHBs	11	3.0%	13	2.7%
	370	100.0%	481	100.0%

¹⁹ If all DHBs were providing services at the same level, then all SDRs would be at 1. A rate higher than 1 indicates that the population from that district is receiving more than the average rate for New Zealand, and a rate lower than 1 indicates that the people resident in that district are receiving less than the average rate. A SDR of 0.9 for a service means that people who live in that district receive 90% of the national average for the group of specified procedures in that service.

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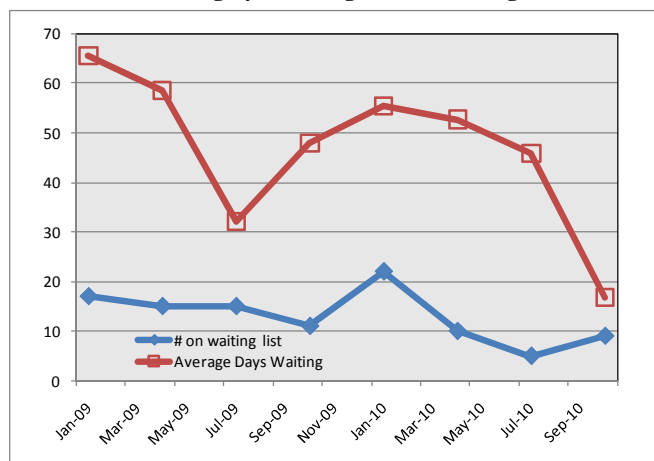
The waiting time for angiography procedures provided at MidCentral Health has been increasing steadily as shown in Figure 25 below.

Figure 25: MidCentral angiography waiting times and waiting list



Conversely the waiting time for cardiothoracic surgery at Capital & Coast has reduced following clearing of the waiting lists as shown in Figure 26. About two thirds of Capital & Coast’s waiting list is cardiac surgery; the breakdown by procedure type was not identified.

Figure 26: Cardiothoracic surgery - Waiting times / waiting list for MDHB patients



Reasons why MDHB interventions may be lower than average include the nuclear medicine service (angiography SDR) and no PCI service locally (angioplasty and revascularisation SDR). DHBs with PCI services ‘reperfuse’ many STEMI patients with PCI rather than thrombolysis. The positive correlation between population size, local provision of PCI services and PCI intervention rates is highlighted in Appendix F p.122. Several studies have also identified that patients admitted to a hospital without cardiac interventional facilities receive fewer investigations and less revascularisation (Ellis et al, 2004) and delays accessing investigations and subsequent revascularisation (Ellis, 2010). However, over half the country’s DHBs do not offer PCI (Table 46, p. 123) and MidCentral is statistically ‘significantly below’ the target intervention rate.

Waiting list information and stakeholder feedback present the same picture as the low intervention rates – access to angiography is unquestionably an issue. This in turn impacts on PCI and revascularisation rates (diagnosis of coronary artery disease is required before treatment). Better access to ETT and echo and better facilities in particular will be required in order to resolve this problem.

Evidence gathered in the review confirmed that there is opportunity for improvement in the management of acute cardiovascular events. This is particularly related to access and timeliness to assessment, diagnostics and cardiology procedures.

Hospitalisations

Hospitalisation information is used locally and nationally to help assess hospital performance and health outcomes. MDHB has used hospitalisation data heavily in their HNAs and the MoH have produced standardised discharge ratios (SDRs) for a range of common conditions since 2002. Like the SDRs produced for cardiology procedures discussed earlier, the purpose of SDRs for hospitalisations is to identify significant differences from the national rate. A commonly held view has been that higher than expected rates (higher than national) may signify higher levels of community illness.

However, MidCentral has pointed out that hospitalisation rates need to be examined in conjunction with mortality rates in order to make conclusions and that sometimes a higher hospitalisation rate is a good thing. The executive summary of the last HNA stated that:

Increasing hospitalisation rates for disease groups linked with long term conditions (for example, heart disease) and falling mortality rates for the same disease groups suggest improving health service access for people experiencing long term conditions (MDHB, 2008).

At the time of the 2008 HNA there appeared to be a trending up of hospitalisations for circulatory disorders and IHD and this was interpreted to be a possible sign of improving access to health services (given that mortality was trending down).

Hospitalisations analysis was completed for circulatory system diseases and the main cardiac conditions: IHD, ACS, heart failure and arrhythmias. Age adjusted rates were calculated for the years 2002-2009 to see trends. Indirect age adjustment was also completed for 2005 to 2009 combined. The analysis included all ages. Emergency medicine discharges (M05s) were excluded because when the analysis was first completed, this appeared to distort the results, e.g. MidCentral’s indirect age adjusted ratio for IHD hospitalisations had climbed from 6% above New Zealand (2008 HNA) to 24% above. In 2009, 16% of cardiology hospitalisations were M05s compared to the national average of 6%. This change had occurred since 2004. At that time MidCentral’s proportion was similar to that of New Zealand (2% and 1% respectively).

Firstly, Figure 27 and Figure 28 show the trends in circulatory disease and IHD side by side (note the different axes). Rates are age adjusted to the WHO standard population.

Figure 27: Circulatory Hospitalisations 2002 to 2009 Age Adjusted (all ethnicities and Māori)

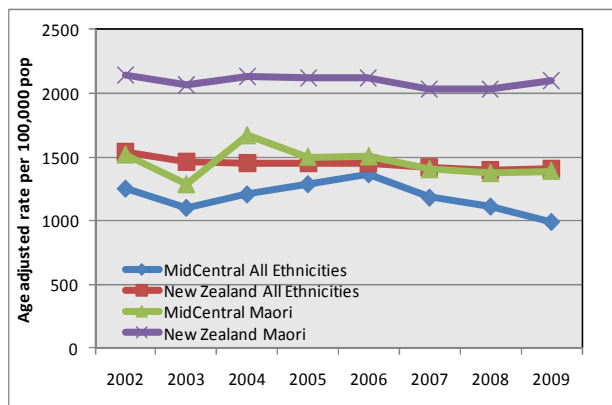
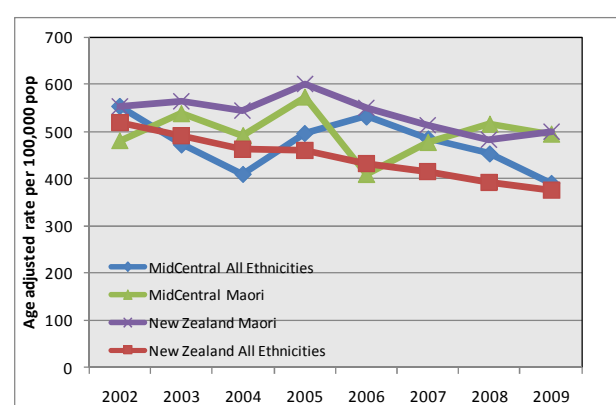


Figure 28: IHD Hospitalisations 2002 to 2009 Age Adjusted (all ethnicities and Māori)



Circulatory disease and IHD hospitalisation trends – key points

- Circulatory system disorders and IHD ‘all ethnicities’ hospitalisations are trending down nationally – a bigger reduction was seen for IHD hospitalisations which declined 28% over the period. In contrast, circulatory disorders hospitalisations declined by 9%. MidCentral is

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following the same trend as New Zealand 'all ethnicities' although a hump is seen for the years 2005-2007.

- MidCentral circulatory disease hospitalisations rates are considerably **lower** than national. MidCentral IHD rates show a different pattern and were **above** national for the second half of the period and converged with the New Zealand rate in 2009.
- When compared to New Zealand 'all ethnicities,' New Zealand Māori have comparatively much **higher** hospitalisations for circulatory disease than for IHD.
- MidCentral Māori had slightly **higher** rates of hospitalisations than MidCentral overall for circulatory disease but were **similar** to MidCentral overall for IHD. The patterns for both circulatory disease and IHD appeared to be level rather than declining.
- MidCentral Māori had **much lower** rates than New Zealand Māori for circulatory disease but were only **slightly below** for IHD and were **similar** to New Zealand Māori by the end of the period.
- These patterns are similar to that seen in the 2008 HNA.

Following are the main observations from the indirect age adjustment analysis of circulatory system disorders and the major cardiac conditions.

Indirect age adjustment – by condition and ethnicity

IHD and acute coronary syndrome (ACS)

- Compared to New Zealand, MidCentral 'all ethnicities' have **higher** hospitalisation rates for IHD and ACS (15% and 18% respectively) and for Māori (34% and 38% respectively). The rate for Māori is the **same** as for New Zealand Māori.
- Hospitalisation rates have **risen** significantly for MidCentral overall and for MidCentral Māori since the 2008 HNA which included the years 2000-2006 (this is true whether or not M05s are included or not).

Circulatory disease, heart failure and arrhythmias

- MidCentral has **lower** hospitalisation rates for 'all ethnicities' when compared to New Zealand 'all ethnicities' (12%, 11% and 26% respectively).
- MidCentral Māori also have **lower** hospitalisation rates when compared to New Zealand for circulatory disease and arrhythmias (11% and 26% less). This is contrary to the pattern nationally; New Zealand Māori rates for these conditions are 26% and 34% respectively above the New Zealand 'all ethnicities' rate. For heart failure MidCentral Māori have a **higher** rate than New Zealand all ethnicities (78%) however this considerably less than for New Zealand Māori which was 255% more than New Zealand overall.

Analysis for Pacific did not yield statistically significant results due to the small numbers.

Analysis by TLA

The small numbers in some TLAs produced fluctuations which affected the ability to see patterns in the age adjusted trend analysis. The main observations from both types of analysis were:

- Horowhenua and Tararua TLAs had the highest rates of hospitalisation for all conditions. This was irrespective of whether rates were above or below New Zealand overall.
- Manawatu and Kapiti tended to have **lower** hospitalisation rates than MidCentral overall.
- There appeared to be some **convergence** across the TLAs at the end of the period for all conditions.

Further detail is presented in the data supplement (Appendix F, p.109).

The 2008 HNA suggested that if service use (represented by hospitalisations) matched circulatory disease health needs (represented by mortality) then age adjusted ratios for hospitalisation should be similar to the age adjusted ratios for mortality. And further that the lower hospitalisations ratios pointed to service access issues.

MidCentral IHD mortality is 10% **higher** than New Zealand and hospitalisations are 15% **higher**. The hospitalisation rate has risen markedly in a few years (the hump seen in Figure 28). MidCentral circulatory mortality is 8% **higher** than national and hospitalisations are 12% **lower**. If hospitalisations represent service use then this might indicate that there is now less of a service access issue for IHD than for circulatory disorders. This does not appear to be in line with other findings.

If instead, hospitalisations were viewed as a marker of illness then we might expect to see IHD mortality rates worsen (hospitalisations data is 2 years ahead of mortality data). In general, compared to New Zealand Māori, MidCentral Māori have lower levels of hospitalisations for cardiology conditions. IHD mortality for MidCentral Māori is slightly better than New Zealand Māori. This lends support to linking hospitalisation rates with illness. However there is significant variation in hospitalisation rates across the major conditions, despite most being acute. MidCentral arrhythmias and heart failure rates are lower than New Zealand and comparatively much lower than IHD and ACS – this needs further investigation in order to understand the underlying reasons. This includes exploration of data issues as discussed on the following page and Appendix D, p.91.

MoH Standard discharge ratios (SDRs)²⁰

Table 13 shows the SDR ratios for IHD, acute MI and chronic rheumatic heart disease. These ratios were calculated by the MoH. Figures that have been greyed mean that the rate was significantly different to the national rate (99% confidence interval). SDRs for MI were high over the whole period while SDRs for IHD and chronic rheumatic heart disease declined. Actual discharge numbers for chronic rheumatic heart disease were very small and varied between 18 and 23 for the first four years and then dropped to eight in 2009/10. MidCentral rates for Māori were generally similar to the New Zealand Māori rate.

Table 13: SDRs for IHD and acute MI

	Condition	2005/06	2006/07	2007/08	2008/09	2009/10
MDHB total population	Ischaemic Heart Disease	1.18	1.23	1.19	1.01	1.09
	Acute MI	1.22	1.24	1.17	1.21	1.29
	Chronic rheumatic heart disease	1.14	1.15	1.01	0.84	0.39
MDHB Māori	Ischaemic Heart Disease	1.47	1.53	1.46	1.26	1.10
	Acute MI	1.17	1.49	1.30	1.56	1.02
	Chronic rheumatic heart disease	2.74	2.52	2.02	1.81	-
New Zealand Māori	Ischaemic Heart Disease	1.33	1.40	1.34	1.32	1.29
	Acute MI	1.28	1.37	1.27	1.28	1.24
	Chronic rheumatic heart disease	2.25	2.15	1.94	1.99	2.14

MI makes up about 40% of IHD hospitalisations. SDR results for IHD and MI are generally aligned with the hospitalisations analysis in the previous section. Four DHBs in the Central Region had significantly high SDRs for IHD and MI in 2010 – Hawke’s Bay, MidCentral, Wairarapa and Whanganui (CentralTAS, 2010).

Ambulatory sensitive hospitalisations (ASH)

The MoH also monitors ambulatory sensitive hospital admissions (ASH). These are defined in the indicator as “usually unplanned admissions that are potentially preventable by appropriate health services delivered in community settings, including through primary health care. The indicator seeks to achieve a reduction in the variation between DHBs and between different population groups in the

²⁰ Standardised discharge ratio is the ratio of observed to expected discharge rates. Expected rates are calculated on the age and socio-economic deprivation structure of each DHB region, with socio-economic deprivation determined using NZDEP scores from the 2006 census. For total (ethnic group) ethnicity is also used to calculate expected rates. Discharges are for people from each DHB region of domicile. The data excludes events with a health specialty of M05 and a LOS of 0.

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rate of admissions to hospital that are avoidable or preventable by primary health care for 0-4 year olds, those aged 45 - 65, and those aged 0 – 74.” Indirect SDRs are calculated for each ethnic group for various conditions adjusting for age and NZ deprivation quintile. Like the condition SDRs in the previous section, ASH data excludes M05s with a length of stay of 0.

The last 3 years results for ASH for cardiology conditions were examined. MidCentral ASH data showed **low** results for angina and chest pain and **high** results for MI (MI was added as an ASH condition for 2009/10). Possible explanations proffered for the low angina and chest pain SDRs were ‘model of care’ changes such as the Emergency Department Observation Unit (EDO). The EDOA opened in 2006 and patients such as those with minor to moderate head injuries, overdoses, those having Trop T (diagnostic test for MI) can be observed for periods up to 24 hours with the idea that admission may be prevented. It was suggested that MidCentral may do more Trop T testing than other places or manage patients more efficiently.

The unusual patterns observed (low angina and high MI SDRs) and a recent change in the definition for angina and chest pain which affected the ability to look at results over time, led to an additional piece of analysis completed by the MoH. SDRs for the 15-74 year age group were calculated for the last decade as shown in Table 14. The same analysis was repeated with M05s included as seen in Table 15. Statistically significant high results are greyed and low results are in bold. Angina and chest pain SDRs were very different in the two scenarios. See also Figure 40 (p.92) for a visual representation. When M05s are included it can be seen that both conditions rose to the level of statistical significance for the second half of the decade.

Table 14: ASH SDRs for MI and Angina and chest pain 2001 – 2010 (M05s excluded)

Condition	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
MI	0.92	0.96	0.86	1.00	1.06	1.18	1.23	1.26	1.25	1.34
Angina and chest pain	0.77	0.77	0.69	0.57	0.95	0.86	0.82	0.50	0.48	0.61

Note: The raw NMDs data was passed through the WIESNZ09 Casemix and ASH filters. The count was set to ONE for each event. Age 15-74 years. M05 events where the event start date and end date are the same were excluded

Table 15: ASH SDRs for MI and Angina and chest pain 2001 – 2010 (M05s included)

Condition	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
MI	0.91	0.94	0.87	1.00	1.09	1.18	1.24	1.27	1.27	1.34
Angina and chest pain	0.73	0.71	0.63	0.52	1.03	1.19	1.24	1.30	1.27	1.37

Note: Definition as in Table 14 but M05s are not excluded

This led to an examination of the actual discharges which is shown in Figure 29 and Figure 30 on the same axes. This shows the marked variation and also that the total discharges for angina and chest pain (when including M05s) has roughly doubled over the decade. This compares to a much lesser increase of 21% for New Zealand over the same period.

Figure 29: Total angina / MI discharges 15-74 years

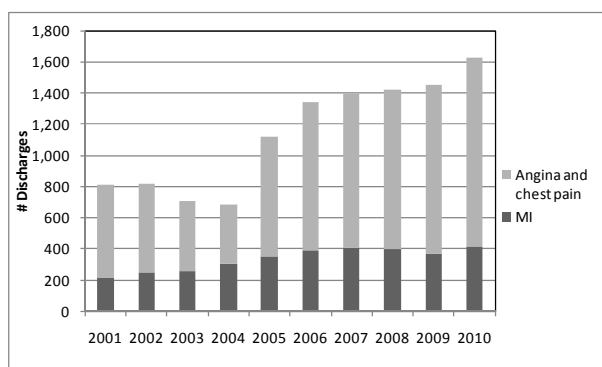
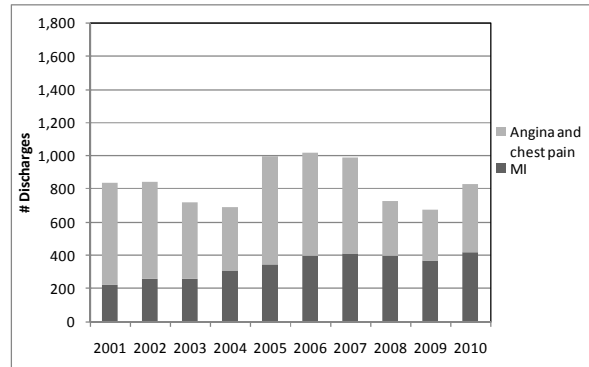


Figure 30: Total angina / MI discharges 15-74 years (excl M05s)



MI SDRs were similar, irrespective of M05s, however actual discharge volumes also showed a ‘step’ increase between the years of 2004 and 2006 which was responsible for the jump in SDRs at this point. MI volumes over the decade nearly doubled (90%) compared to 31%-41% nationally (M05s excluded and included respectively). Refer Table 28, p.93.

The result of this analysis led the writer to the conclusion that these SDRs and hospitalisation data could not confidently be used as indicators of cardiology performance.

There are clear differences in hospitalisation rates across the district and between MidCentral and New Zealand. It is not clear whether these differences reflect service access issues or community health need – data issues appear to confuse the picture and impact on the ability to form conclusions. A more sophisticated indicator for hospitalisations is likely necessary to measure progress.

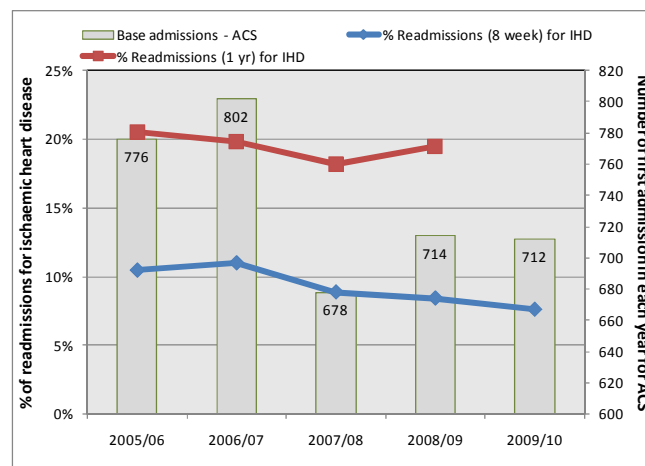
Ongoing management after acute events

A decrease in readmissions is a desired outcome of management and is used nationally as an indicator. A range of analysis was completed looking at readmissions.

Readmissions for ACS

Trends in 8 week and 1 year readmissions were analysed for ACS. Readmissions were defined as acute admissions for IHD (I20-I25). Figure 31 shows the results. There were declining rates for readmissions at 8 weeks, the pattern at one year was less clear. There was a marked decline in the number of first time admissions in each year however this could be due to the exclusion of emergency medicine discharges which have increased markedly over the period for angina (refer Appendix D p.). Analysis by TLA did not identify any differences (refer Appendix F, p.126) however the volumes for Otaki and Tararua were very small).

Figure 31: ACS - trend in readmission rates for IHD at 8 weeks and 12 months



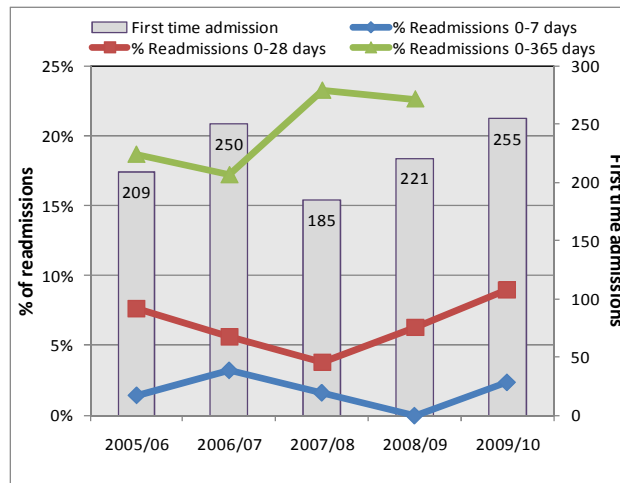
Excludes elective and emergency medicine discharges

About half of ACS base admissions were under cardiology; readmissions were no more likely to be under cardiologist care.

Readmissions for heart failure

Trends in 8 week and 1 year readmissions were analysed for heart failure. Base admission and readmission were defined as acute admissions for heart failure (I50). Figure 32 shows a trending upwards of 1 year readmission rates. There was no clear pattern in the number of first time admissions for heart failure in each year. However the pattern was different when looking over a decade which showed the proportion of first time admissions for heart failure declining over time (so indicating an increase in readmissions (refer p.127).

Figure 32: Readmissions for heart failure



Excludes elective and emergency medicine discharges

Community cardiology readmissions - nursing

Readmission analysis was completed on a cohort of patients receiving community cardiology nursing services. Firstly, individuals with an acute admission of ACS prior to the nurse visit were identified (n=381). Readmissions for IHD or arrhythmias within a 12 month period were identified and the number of nurse visits over this period was compared to the group that were not admitted. The same exercise was repeated for those with an acute admission of heart failure prior to the nurse visit (this analysis looked at readmissions for heart failure only). The thesis was that the readmission groups might have a lower average number of nurse visits than the group where there was no admission. However, the reverse was found to be true (Refer Appendix F, p.127).

Several explanations may account for this finding including that severe and complex cases are likely to have had more contacts with community-based nursing service, as well as a greater likelihood of hospital admission. No control group was available for comparison (that is, a group of identical patients who did not potentially have access to community nursing).

It was noted that about one third of each group (ACS and heart failure) had readmissions during the 12 months after the first nurse visit. Those readmitted for heart failure had a much higher rate of nurse visits (10.6) than the ACS readmission group (7.6).

Discharge medications (ACS)

Extensive clinical trial data has proven that a number of cardiovascular medications are highly effective in improving long-term outcomes for patients following presentation with ACS. The majority of hospitalisations for coronary heart disease are readmissions while the rate of first admissions is declining; many are likely to be due to lack of adherence to recommended treatments. Health outcomes sought are reduction in risk of recurrent events, reduction in rate of hospital readmissions, reduction in need for coronary intervention and improvement in survival rate.

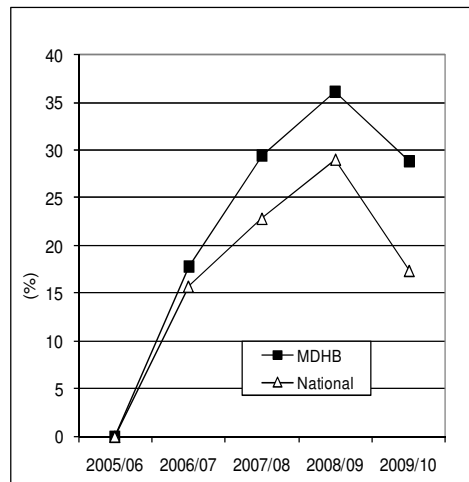
Diabetes and Cardiovascular QIP recommendations (2008)

- Establish all ACS patients on treatments with the appropriate individual combination of aspirin, statin, beta blocker, ACE inhibitor and smoking cessation aid
- Record discharge medications and communicate them to the patient's primary care practitioner to ensure long-term adherence

A cardiologist reported that MidCentral practise is to adhere to the above recommendation. Clopidogrel is prescribed as well for a 6 month period. Most scripts are done by junior doctors which are reviewed by cardiologists on ward rounds. The practice of general physicians was not known and

not explored. The below graph indicates that prescription of cardiovascular medications is rising. However, it was not possible during this project to determine appropriateness of prescribing.

Figure 33: Change in DHB community pharmaceuticals expenditure since 2005/06 - All cardiovascular medicines



Rehabilitation (ACS)

Cardiac rehabilitation can significantly improve long-term outcomes to patients with CHD and the benefits of a post discharge programme include support for lifestyle changes and improved adherence to treatments. The 2008 QIP states that referral and attendance nationally is poor with barriers to attendance cited as transport and programme timing. And further that a home based approach using a self-directed manual with nurse guidance is being introduced on a trial basis. Health outcomes sought are improvement in physical and psychosocial wellbeing, return to employment, reduction in risk of recurrent events, reduction in rate of hospital readmissions, reduction in need for coronary intervention and improvement in survival rate.

Diabetes and Cardiovascular QIP recommendations (2008)

- Refer all ACS patients to a cardiac rehabilitation programme for discharge from hospital
- Provide cardiac rehabilitation programmes in all regions, with sufficient resources to ensure patients are referred and to support their attendance and completion of the programme.

The MidCentral cardiologist project representative stated that patients should have cardiac rehabilitation for 6 months. Ideally there should be contact in hospital (Phase 1) plus referral to Phase 2 in the community.

There were about 760 people discharged with ACS each year in the last two financial years (530 with MI and 230 with angina excluding day 0s and M05s). Data could not be extracted to demonstrate the number of patients receiving visits in hospital for cardiac rehab. Nursing contacts are captured but not the reason for the visit; the purpose of an inpatient nursing visit could be heart failure.

Regarding Phase 2 cardiac rehab, data kept by the MidCentral nursing team showed that 486 referrals were made to community cardiac nurses over 2010. Nine percent were referred by the NP and the remainder from the CNS Cardiac Rehabilitation (231) and the CNS Heart Failure (212). Breakdown by area was as follows:

- Manawatu 221 (45%)
- Horowhenua 108 (22%)
- Tararua 69 (14%)
- Otaki 22 (5%)
- Area not specified 66 (14%)

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Compass Health manually reviewed all referrals to community cardiac nursing services (Phase 2) between 23 Nov 2009 and 15 Dec 2010. This identified that the source of most referrals was secondary and tertiary services; only six percent of referrals were from general practice teams. There were 694 referrals in all. However, the reason for referrals was not collected so it is not possible to link referrals with type of services provided e.g. cardiac rehab, heart failure or support for surgical procedures. There were 526 or 77% referred from MidCentral (this included 101 people that were referred from Capital and Coast as well). There were 176 referrals in total from Capital and Coast.

It appears from the above information and interviews with service providers (described in the current state chapter) that there are gaps in referral to cardiac rehab. The size of the gap cannot be determined as the relevant information is not being collected.

Cardiac programmes are provided in all regions however there is no information available on attendance and completion. CCNs reported that this is generally poor.

Palliative services

MidCentral Health provides a palliative care consultation service comprising one consultant and two CNSs. About 30% of the palliative care workload is non-malignant and cardiology make ups about one third of this (so about 10% overall). Cardiology, respiratory and renal services have provided regular input into palliative care services for several years and there are now formalised meetings.

End stage heart failure has been the main area of attention with the aim of improving care and meeting palliative needs from an earlier stage. Most end stage heart failure patients are managed by general medical. It was suggested that management in a dedicated cardiology ward would improve care. The areas of action have been:

- Development of guidelines for management of end stage heart failure patients and introduction as a pilot in Ward 28.
- Participation in a multi-centre prospective audit to assess the frequency of use of sub-cut Furosemide in the management of end stage heart failure which may provide an option for some patients to be managed at home or hospice. Palliative care is working with other palliative care and cardiology services across the country to look at research into this.

Cardiology service provision in the palliative care area is improving but needs ongoing support and education.

Health status - mortality

This section provided a high level summary of mortality analysis (Appendix F, p.102 provides further detail). There were two distinct pieces of mortality analysis completed during the project. The first looked at recent trends in circulatory system disease and IHD mortality.

Recent trends in circulatory system disease and IHD mortality

Analysis of age adjusted trends for circulatory system and IHD mortality between 2000 and 2007 was completed by ethnicity and TLA. The trends for MidCentral 'all ethnicities' compared to New Zealand are shown in Figure 34 and Figure 35 using the same axes for comparison. Age adjusted ratios were also calculated with 2003-2007 data combined (this is more appropriate where there are small numbers).

Figure 34: Circulatory Mortality 2000 to 2007 Age Adjusted Using WHO Standard Population

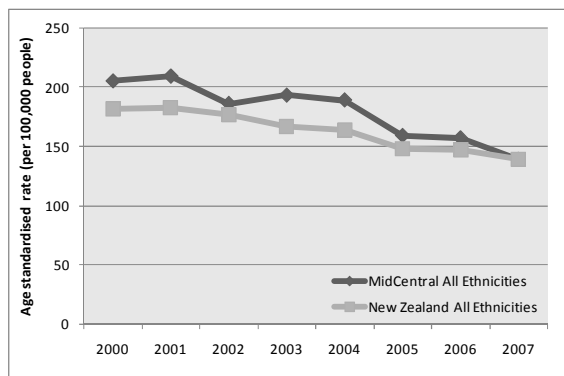
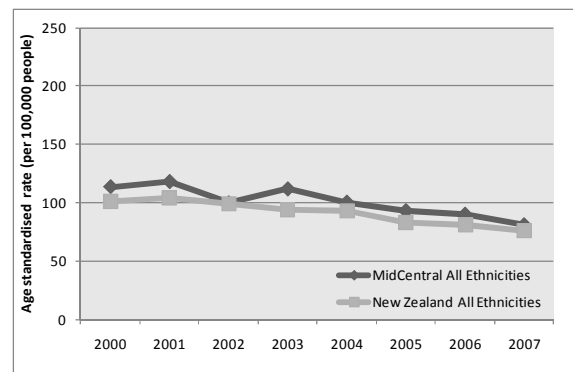


Figure 35: IHD Mortality 2000 to 2007 Age Adjusted Using WHO Standard Population



Key points from the first piece of analysis were:

- Between 2000 and 2007 absolute numbers of deaths declined for circulatory disease and were relatively static for IHD.
- There were improvements in the mortality rates both for circulatory disease and IHD for MidCentral and New Zealand across the 7 years period. Rates had almost converged by the end of the period. The improvement was marked for circulatory disease where the gap was larger at the beginning of the period.
- Non-direct age adjusted analysis supports the picture seen with age adjusted trends for circulatory disease. MidCentral's circulatory disease mortality rate has continued to improve with a result of 8% above the New Zealand 'all ethnicities' rate. The gap with New Zealand has continued to shrink when looking at the results presented in the 2005 and 2008 Health Needs Assessments (15% and 11% respectively for 'all ethnicities').
- Age adjusted trends for circulatory disease also showed improvements for Māori (Figure 44, p.103) and were below the New Zealand rate for Māori by the end of the period. This improvement was also seen in the non-direct age adjusted analysis. The MidCentral Māori rate was about double (98%) that of New Zealand 'all ethnicities' and had improved from 122% in the 2008 HNA. The MidCentral rate for Māori is slightly better than for New Zealand Māori (128% above the New Zealand 'all ethnicities').
- IHD age adjusted trends for MidCentral Māori also improved and appeared to be very close to rates for New Zealand Māori. The indirect rate for MidCentral Māori was also about double (105%) that of New Zealand 'all ethnicities' and slightly better than for New Zealand Māori (124% above the New Zealand 'all ethnicities')
- MidCentral Pacific rates were not able to be analysed due to small numbers. The New Zealand age adjusted trend for Pacific also shows declining rates for circulatory disease and IHD and sat at nearly double the 'all ethnicities' rate by the end of the period. The non-direct age

adjusted rates were 98% above New Zealand overall for circulatory disease and 76% above for IHD.

- Most TLAs did not achieve significance in the TLA non-direct age adjusted analysis due to small numbers. Horowhenua had high rates for both circulatory disease and IHD mortality (19% and 17% above New Zealand overall) and Manawatu had a high rate for IHD mortality (15% above New Zealand overall).
- TLA trend analysis showed some convergence by the end of the period for circulatory disease and IHD mortality. However, Horowhenua yearly rates were still higher than the other TLAs for circulatory disease mortality across the whole period. This was less marked for IHD where the higher rates for Horowhenua and Tararua at the beginning of the period had somewhat converged with the other TLAs by the end of the period.
- IHD mortality results were worse than circulatory disease and were 10% above the New Zealand 'all ethnicities' rate.

The analysis above indicates an improving picture for cardiovascular outcomes. However, cardiovascular mortality includes cerebrovascular conditions (such as stroke) – IHD mortality is commonly used as a more targeted indicator of cardiology service provision.

IHD mortality across a decade

IHD mortality was not analysed in the 2008 HNA so the level of improvement was not clear for IHD. Internationally, as judged by age standardised rates, mortality from coronary heart disease has been falling for several decades. The rate of decline in mortality varies from country to country. Frequently the decline has been of the order of 20% to 30% per decade. Therefore, a progressive fall in mortality in the MidCentral district is to be expected. If the decline in mortality does not exceed 20% per decade, then MidCentral is actually falling behind the international trend.

Therefore a second piece of analysis was completed looking at the change in IHD mortality over the last decade.

The analysis found that the reduction in IHD mortality for the MidCentral district was less than for New Zealand.

Mortality across a decade

IHD mortality has improved, but at a rate slower than New Zealand. A comparison of two periods a decade apart (1996-1997 with 2005-2007) using age adjusted rates showed:

- 23% decline for MidCentral; compared to a
- 31% decline for New Zealand overall.

At the beginning of the period MidCentrals' age adjusted rate for IHD mortality was the same as for New Zealand overall.

This analysis also showed that despite the decline in the age adjusted rate, crude rates for the second period were static and the number of deaths rose. New Zealand crude rates and raw deaths decreased. This suggests that mortality has been affected by MidCentral's ageing population structure. This is a trend that is likely to continue given the expected increasing proportions of older adults. So even further improvement in IHD outcomes are not likely to reduce the work burden for our cardiology health services. The numbers of patients they see may remain the same or even increase, due to the ageing population.

Summary assessment

Table 16 provides a summary assessment of the areas covered in the preceding pages.

Key for ratings

- 1 – Good performance
- 2 – Satisfactory or improving at an acceptable rate
- 3 – Needs improvement
- 4 – Poor performance

The assessment clearly identified that there is much to work to do across the whole cardiology pathway. However a theme was that some indicators and existing information are not sufficient to judge performance adequately.

Table 16: Summary assessment of cardiology service performance

Performance Indicator	Assessment	Comment
Cardiovascular risk assessment in primary care		
GP utilisation rates	Unable to be assessed	Little information on cardiology related utilisation rates, a sample identified 8.4%.
Identification of IHD	1	
Identification of smoking status	3	Smoking status of patients is not always recorded in a retrievable manner.
Proportion of the population having 5 year CVD risk assess	3	Based on “bestpractice” decision support software use, steady improvement is occurring. However, the current rates are below the average necessary to provide timely coverage of the target population.
Management of risk (mostly in primary care)		
Proportion of the population with satisfactory diabetes control – HbA1c	3	Good control has been achieved in an unsatisfactory proportion of patients who have had annual checks. The percentage of people with known diabetes who have had annual checks in the last year needs improvement. Increased CVD Risk Assessment and other strategies will further increase the number of people known to have diabetes.
Prescription of appropriate medications	Unable to be assessed	Available data does not allow assessment of appropriateness of the prescriptions that have occurred, nor what percentage of at-risk people have received recommended treatment.
Smoking cessation	3	Support and ‘brief advice’ % in hospital and referrals to Quit services increasing. Considerably below Ministry targets. Cessation information is not available.
Early disease – diagnosis and management		
Access to non-invasive tests – PN / Manawatu	4	Long waiting times over a number of years.
Access to non-invasive tests – Horowhenua, Tararua, Otaki	2 - 3	An issue in some modalities but ETTs up to date.
Access to invasive tests	3	Angiography waiting time as been increasing. Low proportion delivered locally.
Access to specialist assessment– PN / Manawatu	4	Urgent patients get seen, wait too long for many others. A large group of patients have languished on a list not visible in the system.
Access to specialist assessment– Horowhenua, Tararua, Otaki	2	Waiting time better than PN / Manawatu.
Ambulatory sensitive admissions	Unable to be assessed	Data issues mean that SDRs cannot be used with confidence.
Management of acute cardiovascular events		
Acute coronary syndrome - reperfusion	2 - 3	The percentage of patients receiving thrombolysis is difficult to assess from available data. Pre-hospital thrombolysis would be an opportunity to shorten reperfusion timeframes.
Acute coronary syndrome - risk stratification	3	Insufficient ETT / angiography / echo availability to support this. Information on clinical practice across patient group not available.

5. Cardiology continuum of care

Performance Indicator	Assessment	Comment
Acute coronary syndrome - revascularisation	4	PCI in MidCentral district is not available on site. Patients can be referred to Wellington if thrombolysis contraindicated or failed (STEMI). Limited capacity to do pre-discharge diagnostic angiography at PN – majority transferred to Wellington (NSTEMI).
Hospitalisation SDRs – IHD, Acute MI, Chronic rheumatic heart disease	Unable to be assessed	Data issues mean that SDRs cannot be used with confidence.
Ongoing management after acute events		
Revascularisation – elective (PCI and CABG)	3	Rates are below the expected proportion. Approximately one third of MI patients are discharged to Wellington hospital.
Discharge medications	Unable to be assessed	Available data does not allow assessment of medications prescribed.
Cardiac rehabilitation - referral	2 - 3	Likely that referral rate is reasonable but unable to identify whether referrals are for cardiac rehab or other services.
Cardiac rehabilitation - attendance	3	Some patients complete a full series of rehab sessions but this was reported as low by CCNs. Sessions in 2009/10 twice that of 2008/09.
Readmissions	3	1 year readmission rates appear to be holding for ACS, however are rising for heart failure. Further, we have to plan for an inevitable rise in the crude admission rate because of the rising number of aged people in the community.
Palliative services		
End stage heart failure	2	Several initiatives in this area. Will become more important with growing numbers of older people and proportions of those with heart failure.
Over all health status		
Ischaemic heart disease mortality	4	MDHB mortality is worse than the NZ average. Identified groups and areas have substantially higher risk than the MDHB average. Cardiology services across the district are emerging from an era of poor performance, but considerable improvement is possible.

6. Facilities

The landscape project and reviews beforehand have identified that facility changes are required in secondary services. MidCentral Health needs to invest in this area in order to provide an adequate service. The most important reasons are: staff are not located together and there is insufficient capacity across many components of the service (e.g. outpatient clinics, non-invasive and invasive procedures). The lack of a dedicated cath lab is a major barrier to local service delivery and many patients have to travel to Wellington for services unnecessarily. The lack of appropriate facilities also impacts on the ability to recruit medical staff. Possibilities were explored during the project for co-locating the department and building a dedicated cath lab. Hutt Valley, Hawke's Bay, Nelson Marlborough and Capital & Coast DHBs were contacted for comment about their facilities. The themes were:

- Co-location promotes cohesiveness and a sense of common purpose. It helps enormously with team work and support for the multi disciplinary team – needed in an environment of expansion of outpatient work e.g. nurse led clinics and support for community management of heart failure, cardiac rehab, atrial fibrillation.
- Creates efficiencies - doing 2-3 things at once such as echo reporting while supervising nurse and registrar clinics.
- Supports staff training / development and the provision of advice.
- Helps to solve small problems easily – scheduling, tests and adhoc bookings.
- More important to co-locate staff rather than services – commonly a choice has to be made between locating the team with inpatients or outpatients.
- Important to have a management structure that goes across the whole cardiology service.

Options for relocating the department are shown in Table 17 below. These options should be explored further to determine feasibility and assist in deciding which option to progress.

Table 17: Options for service co-location

Criteria / detail	Services located to promote maximum cohesion and efficiency	Capacity for 5 years including regional growth	Feasibility / comment
Options			
Option 1 – Staff, inpatient and technical services co-located in Ward 28 Status quo plus CNSs (2) and echo move to Wd 28. Outpatient clinics remain in ambulatory area.	√√ Co-location achieved. Staff and most services (except OP medical / nursing clinics) located with inpatient area.	X Unlikely to be sufficient room either in Wd 28 for echo, CNSs, growth of technical services, additional staff (4th cardiologist) or in the ambulatory area (clinics).	? Possibility would need to be explored via space planning to see if more space could be created out of existing area including option of using IP bed.
Option 2 – Technical services move to new area Staff offices remain in Wd 28, CNSs move to Wd 28, outpatient clinics remain in ambulatory area. Cathlab could be co-located with technical services.	X No except echo with rest of technical services. Technical staff separate from medical / nursing.	X Unlikely to be sufficient room in ambulatory area for medical / nursing OP.	√ Least number of rooms to find. New area would need receptionist unless shared with another area.
Option 3 – All outpatient services co-located in new area Medical / nursing outpatient clinics, technical services in new area. Staff offices remain in Wd 28, CNSs move to Wd 28. Admin stay in Wd 28.	√ Improvement on current with OP services being co-located. Staff located with inpatient services except technical.	√ Yes, space used for technical services in Wd 28 will be freed up.	? New area would need receptionist unless shared with another area. Admin staff could stay in Wd 28 or move.
Option 4 – Staff and outpatient services co-located in a new area Staff offices, medical / nursing outpatient clinics, technical services in new area.	√√ Co-location achieved. Staff located with outpatient services.	√ Yes.	X Large number of rooms to find, likely most costly. New area would need receptionist unless shared with another area. Would create considerable vacant space in Wd 28.

None of the options are ideal except option 4 which locates staff and outpatient / technical services in a new area. This would incur significant cost due to the substantial space required. This option however needs to be given serious consideration to permit MidCentral based cardiology services to take a more prominent role in service provision in this region, and to accommodate the progressively increasing volumes of work anticipated due to the aging Baby Boomer cohort.

A dedicated cath lab

Achieving adequate capacity for invasive services is consistent with the recommendations of all prior reviews from 2004 and is needed to:

- Retain and attract workforce.
- Improve capacity which is currently insufficient with no flexibility for additional or altered session times or acute procedures. Morning sessions would allow increased throughput.
- Cope with increasing demand.
- Support Whanganui. This is consistent with regional strategy and would help alleviate demand on Capital and Coast DHB thereby enabling it to concentrate more on its tertiary capacity.

Benchmarking was undertaken with four other medium sized DHBs providing angiography (Table 18 below and also p.67). Most have shared facilities with radiology (Nelson Marlborough have a dedicated cath lab within the radiology department). Hawke's Bay has a dedicated angio recovery suite while others used general facilities including day stay units/ ICU and ward areas. Except Taranaki who only have one session per week, all appeared to have a higher focus on acute procedures (electives fit around acutes – Nelson Marlborough use a 'hot list' for short notice electives) and have a higher number of sessions which are of longer duration. All DHBs delivered higher volumes of angiograms locally, most substantially more as follows with the percentage of total domicile volume shown in brackets.

Table 18: Benchmarking - Angiography volumes and cardiologist resource

DHB	Population	2009/10 Angio #			Current cardiologist resource		
		DoD	DoS	Local vol as % of total	FTE Budget	Heads	# perform angio
Bay of Plenty	210,125	689	465	67%	5.2	6	6
MidCentral	167,595	478	192	40%	3.0**	3	2
Hawke's Bay	154,405	634	423	67%	2.0	3	3
Nelson Marlborough	137,605	665	616	93%	2.4*	3*	3
Taranaki	108,110	359	206	57%	2.0	2	2

* This does not include a new 0.8 FTE position recently advertised (so FTE will be 3.2 and 4 heads)

**This includes 1.0 FTE in the 'community cardiologist' contract held by Central PHO

There is significant variation in team roles and size and processes such as preadmission and recovery. All DHBs had three or more cardiologists performing angiography except MidCentral and Taranaki.

High level requirements and ball park costs for a cath lab at MidCentral Health were explored as part of this project. Detailed costings would form part of the business case.

A cath lab would not have to be located with other services. Two potential layouts were reviewed which ranged from just over 60 sqm to 85 sqm for the main lab area. This did not include any supporting areas required for a 'stand alone' unit such as scrub bay, admission / recovery areas, storage, utility and staff working areas. Possible locations for a cath lab have not been explored.

The major cost items are the machine for coronary imaging (likely range \$1.6-\$1.9m), laminar flow ventilation system for operating theatre air quality (required for pacemakers implants), theatre lights, cardiac protected wiring and facility alteration or building costs. Allowing \$1.7m for the machine and \$800k for the facility and other costs would mean a total outlay of \$2.5m.

The 'cost of capital' percentage calculated was 18.2% and includes the service contract, depreciation and financing. There are two potential sources of financing, Ministry equity (8%) or loan from the Crown Health Financing Agency (5%). Internally, if cash reserves were used the current cost on loss of interest is 4-5%. The breakdown of the 'cost of capital' calculated is 8.7% for depreciation overall, 5% for service contract and 4.5% for financing. Table 19 provides a sensitivity analysis showing the annual cost of capital across a possible range of capital costs.

Table 19: Sensitivity analysis of capital costs

Range of total capital costs	Annual cost of capital (%)	Annual cost of capital (\$)
\$2,500,000	18.2%	\$455,000
\$2,750,000	18.2%	\$500,500
\$3,000,000	18.2%	\$546,000
\$3,250,000	18.2%	\$591,500

Using the assumption that national price covers cost, if the cath lab was fully utilised then it could be assumed that revenue would cover cost. Therefore, the risk sits in under utilising the facility. Table 20 estimates the carrying costs that the organisation would have to accept, based on the number of days that the cath lab is fully utilised e.g. if the capital cost was \$2.5m and the lab was only used one day a week then the shortfall would be in the region of \$341k. Four days utilisation is assumed to be 100% utilisation²¹ and the minimum target to achieve cost efficiency.

Table 20: Costs based on utilisation

Annual cost of capital (\$)	Carrying costs based on the number of days the Cath lab is used			
	1 day	2 days	3 days	4 days
\$455,000	\$341,250	\$227,500	\$113,750	-
\$500,500	\$375,375	\$250,250	\$125,125	-
\$546,000	\$409,500	\$273,000	\$136,500	-
\$591,500	\$443,625	\$295,750	\$147,875	-

Cath lab utilisation

Current services that would be provided in a dedicated cath lab are angiography (currently two half day sessions a week) and pacemaker implants (currently part of a half day session in theatre plus acutes). Forecast volumes based on the 2009/10 national standardised discharge ratio of 32 per 10,000 population provide an expected total volume of just over 600 angiograms²² for 2010/11. It is estimated that approximately 70% or 420 angiograms could be provided at MidCentral if there was capacity.²³ Based on operating for 44 weeks of the year this would be approximately 10 patients per week or 3 to 4 half day sessions depending on throughput. After adding pacemakers, utilisation could be 2 - 2 ½ days.

Current annual utilisation is estimated at 2 and 2 ½ days if the 'expected' intervention rate was achieved (420 angiograms locally).

Revenue modelling

Table 21 models revenue flows for angiography and PCI using four scenarios.

- Scenario 1 – current 2009/10 volumes with same volume of angiography provided locally
- Scenario 2 – volumes based on expected intervention rates but no change in local capacity
- Scenario 3 – volumes based on expected intervention rates with new cath lab

²¹ National price is calculated from DHB costs and using the assumption that utilisation nationally is less than 100%.

²² Expected volumes are standardised to take account of differences in DHB population profiles. A ratio of 1.12 has been used to estimate future volumes (2009/10 MoH expected volume (580) divided by raw rate of 527 (2009/10 population divided by 2009/10 SDR of 31.79)).

²³ Assumption – 50/50 acute elective split. 90% of electives and 50% of acutes provided at MidCentral.

- Scenario 4 – volumes based on expected intervention rates with new cath lab and introduction of PCI

The cost to reach expected intervention rates is \$875k over the 2009/10 rates (600 angiograms and 215 PCI). This shortfall would need to be paid to other DHBs if MidCentral does not achieve capacity (should capacity be available at Capital & Coast).

If PCI were introduced, outflows to other DHBs would decrease significantly and would enable most angiography to be done locally as well as PCI. Providing a service for Whanganui would provide additional revenue inflows. Providing even half of Whanganui's expected volume of 250 angiograms would result in additional revenue of \$500k.

Table 21: Revenue flows for angiography and PCI

Angiography & PCI	# Angio	# PCI	Total	MidCentral	Other DHBs
1. Current vols (2009/10)	484	166	\$3,336,060	\$744,810	\$2,591,250
<i>(183 angio at MCH, all PCI elsewhere)</i>					
2. Expected rate - no change in capacity	600	215	\$4,211,450	\$814,000	\$3,397,450
<i>(200 angio at MCH, all PCI elsewhere)</i>					
3. Expected rate - new cath lab	600	215	\$4,211,450	\$1,709,400	\$2,502,050
<i>(70% angio at MCH, all PCI elsewhere)</i>					
4. Expected rate - introduce PCI	600	215	\$4,211,450	\$3,082,525	\$1,128,925
<i>(90% angio at MCH & 50% PCI)</i>					
<i>Price - \$4,070 (Angio), \$8230 (PCI). Price based on costing information provided by Chris Lewis, MoH</i>					

Note: This analysis does not include any procedures provided for the Whanganui population (9 angiograms in 2009/10)

Growth of angiography volumes

Demand for angiography will grow. Table 22 below is constructed with a starting point of the 183 angiographies (MDHB population) performed locally in 2009/10. It shows the number that would be delivered locally if there was capacity using an 'expected' rate of 600 per year. The assumption is that 70% could be performed locally. Volumes are likely to be underestimated. The projected increase in risk factors for CVD and improved detection will likely lift referrals. Age predictions are based on future population projections for the MidCentral district and the current age split of ACS hospitalisations.

Table 22: Estimated growth in volumes

	Angiography at MidCentral – annual #	% increase over 2009/10 # (cumulative)
Starting volume of angiograms (2009/10)	183	0%
Higher proportion done locally at expected rates (70% of total)	237	130%
Age – 26% growth in # by 2021	109	189%
	529	
Opportunity - Increase in catchment area (50% of Whanganui's expected #)	127	242%
Opportunity - Development of PCI service (90% of MDHB angio done locally)	150	320%
Total angiograms delivered locally	806	

If MidCentral Health were to develop a PCI service for the regional population (MidCentral and Whanganui) then the first step would be to set up the service based on scheduled sessions. This could be mixture of acute and elective patients. Advice from Nelson is that 70-75% of their PCI workload is acute and a visiting consultant should be on site for first 100 cases. Down the track there would be potential for primary PCI for STEMI patients.

Other DHBs – Cath lab benchmarking

The RN coordinating MidCentral Health angiography contacted other secondary DHBs delivering angiography in January 2011 to provide a comparison with MidCentral services. Nelson Marlborough and Bay of Plenty also perform permanent pacemakers implant procedures and Nelson Marlborough provides PCI. Angiography volumes are for 2009/10, by DHB of Domicile (DoD) and DHB of Service (DoS) extracted by the MoH on 28 Jan 2011.

- Bay of Plenty, Hawke's Bay and Nelson Marlborough services focus more on acute procedures.
- All DHBs have shared facilities with radiology except Nelson Marlborough have a dedicated cath lab within the radiology department.
- Significant variation in team roles, team size and processes (preadmission, sheath removal/ recovery)

Table 23: Cath lab benchmarking

Area	MidCentral	Bay of Plenty	Hawke's Bay	Nelson Marlborough	Taranaki
Population	167,595	210,125	154,405	137,605	108,110
# DoD	478	689	634	665	359
# DoS	192 (40%)	465 (67%)	423 (67%)	616 (93%)	206 (57%)
Sessions	Twice weekly diagnostic coronary angiography sessions; Tues pm – max 2 outpts, 1 acute inpatient if required Thursday am – max 3 outpatients, 1 acute inpatient if required No flexibility about doing sessions on other days	Twice weekly morning angio sessions for outpatients – usually 3 at each session, could do four. Every afternoon there are sessions for acute cases – one or more. One pacemaker session per week (either 3 PPMs or biventricular pacing).	Two elective sessions held each week – one elective case on a Tuesday and two on Thursday (0730-1400) plus one solely acute session on a Friday. 5-6 procedures per session and elective cases are worked around the acute cases. There is no flexibility about doing sessions on any other days.	Angios Mon, Wed, Fri, (i.e. 6 half day sessions) 4-5 cases per session (less if PCIs). Out of the six sessions, two are dedicated acute sessions. If there are no acute patients, outpatients are brought in at short notice on the day to have their procedures. Outpatients cancelled to accommodate acutes.	1 session per week from 0830-1300hrs and we do 4 patients, most are elective patients, occasional acute inpatient. No space usually for an acute. In March will increase to two sessions/week of 4 patients to improve waiting times. There will be a slot available for any acutes.
Cardiologists	3.0 FTE (3 heads) 2 cardiologists do angiography	5.2 FTE (6 heads) 6 cardiologists do angiography.	2.0 FTE (3 heads) 3 cardiologists do angiography	2.4 FTE (3 heads) + 0.8 advertised 1 does interventional angio, others diagnostic	2.0 FTE (2 heads) 2 cardiologists do angiography
Team	Cardiologist MRT Cardiac technologist 3 RNs – (2 cardiac RNs, 1 RN from Radiology, no cardiac background). Radiology RN not available after 1630 on a Tuesday afternoon, nor usually after 1230 on a Thursday One RN possibly available for casual hours to cover annual	Cardiologist MRT Cardiac technician 3 RNs (all work throughout Radiology) – one scrubs, one circulates, one pulls sheath.	Cardiologist No cardiac technicians at HB MRT 5 R/N's - Scrub, remove sheath, haemodynamic monitoring, circulate, patient recovery in the post -angio suite. One Radiology Nurse going for NP status an experienced CCU nurse, other RNs from the cardiology service (1 works in	Cardiologist 2 MRTs per session – one at controls, one in room Cardiac technologist 3 or 4 R/Ns – 1 scrub, 1 circulating and one "floating". None of these RNs pull the sheath, but transfer the patient to Daystay or ICU for sheath removal. RNs are Radiology Nurses with a high degree of training and experience. There are	Cardiologist Radiographer Cardiac technician 4 nurses - cover both the cath lab and the ward (pre and post cares). Scrub nurse takes the patient back to the ward and pulls the sheath. Nurse coordinator position - coordinates angio service.

6. Facilities

Area	MidCentral	Bay of Plenty	Hawke's Bay	Nelson Marlborough	Taranaki
	leave, no other backup for leave. One cardiac RN has historically been responsible for training RNs, organising equipment imprest, developing angio guideline etc.		CCU). Radiology staff help if required, leave covered by cardiology nurses within service or cardiology registrar can scrub. A senior experienced R/N has cath lab charge/coord role.	no casual RNs to be brought in for sick leave etc, however, there is usually enough cover to proceed as they have an extra RN or two to begin with.	Resps include staffing, corresponding with reps. organising any extra sessions.
Process	<p>Outpatients are admitted to the TCU (general medical daystay). 3 RNs rotate throughout session - one cath lab RN scrubs, one RN circulates, one RN removes femoral sheath and escorts patient back to TCU.</p> <p>The two cardiac RNs see all outpatients in the preadmission clinic usually one week prior to angio (Tues morning or Thurs afternoon). They also see preadmission patients for pacemakers and reveal devices and liaise with the ward to see acute inpatient cases prior to procedure.</p> <p>Cardiac RN has usually seen post-angio outpts who are for further intervention, in TCU for education at the end of session.</p>	<p>Started using the radial approach for angios last year. Femoral approach just used for right heart studies. Use digital pressure when sheaths removed</p> <p>Outpatients do not attend a cardiac preadmission clinic – seen by cardiologists in clinic when wait listed.</p> <p>Outpatients admitted though the gen med daystay unit (next door). One RN starts early at 7am, prepares patient (IV & ECG) and cath lab. Sessions start at 8am – needle to skin.</p> <p>Patients require more sedation for radial approach. Usually still need 4 hours in hospital, but patients more mobile and can be moved out of the cath lab quicker (use device on arm).</p>	<p>Femoral approach is used and digital pressure after removing sheaths. Dedicated Angio Suite for cardiac patients post angio on the 2nd floor, staffed by a cardiology RN. The femoral sheath is removed in Radiology – for both inpatients and outpatients before transfer</p> <p>Cath lab RNs rotate in turns up to the post-angio suite. If there are two patients there will be one RN, 3 pts there will be 2 RNs.</p>	<p>One cardiologist uses the radial approach as well as femoral, the others use femoral</p> <p>Patients are seen in angio preadmission clinics by a R/N about six weeks prior to their procedure. Some agree to go onto a "hotlist" by which they will be called up at very short notice to come in if there are no acute patients.</p> <p>Patients who have had intervention are transferred to the ICU with the sheath in and this is removed by the RNs in ICU.</p> <p>Outpatients are transferred to the DayStay Unit (general, not dedicated) which is on the same floor and the RNs there remove the sheath.</p>	<p>Patients are in a general ward, any ward that has four beds together, although due to previous sessions being lost a proposal has gone forward for dedicated 4 bedded area.</p> <p>The nurse on the ward stays until the patients are discharged (time in lieu). With sheath being removed in the ward by the scrub nurse we can turn patients over a bit quicker. On the ward we have a dedicated angio nurse available to assist if any problems.</p> <p>IP managed the same way as OP except they go back to ward they were in for discharge (if for d/c), usually after about 3 hrs, once they have been ambulated with no problems/bleeding etc.</p>
Facilities	Coronary angiography is done in the DSA room, Radiology which is used for other radiological procedures at other times. Not used for any other cardiac procedures. Angio sessions may be delayed because of Tues am radiology cases being late. Can be issue if Thurs session goes overtime. All facilities shared with the rest of radiology, no cardiac equipment stored in DSA room.	<p>The cath lab is shared with Radiology and is currently used for one booked session per week which is not cardiac. There is a recovery area dedicated to the cath lab.</p> <p>The cath lab is used for the insertion of PICC lines and temporary pacing wires.</p> <p>Catheters not kept in the lab itself, use mobile carts.</p>	<p>Cath lab is situated within Radiology and is shared for other procedures</p> <p>The cath lab is used for insertion of temporary pacing wires.</p> <p>The cath lab shares facilities e.g. recovery area, dirty or clean utility areas, storage areas, offices with other services which are using these at the same time.</p>	<p>The cath lab is situated within the Radiology Department and they are able to insert permanent pacemakers in the cath lab.</p> <p>Facilities are shared by other procedure rooms within radiology at the same time.</p>	<p>Cath lab is situated within the radiology department (outsourced contract). Hire lab and room only for the 6 hrs we need it, usually procedures booked. Going over time is an issue (so only doing 4 procedures those mornings). PPMI is done in Waikato, temporary wires in ICU (rarely needed).</p>
Other		Midland project to increase surgery being undertaken.			Directive from the Minister to blitz the waitlist, temporarily inc Tues session to 8/day and 4 Saturdays with 8/day.

7. Future environment

In order to plan sensibly the future environment needs to be considered.

Changing demand

The environment is changing. One of main changes that will need to be planned for is the aging population – the biggest CVD Risk Factor is age. MidCentral's CVD workload **WILL** increase at a disproportionately rapid rate from now on. The upward trend has just begun. Table 24 below shows MidCentral's population broken down by under and over 65s. The number of under 65s is expected to be static over the next 15 years. Population growth is occurring in the over 65 year group at a rate of 2% every 5 years.

Table 24: MDHB population - under and over 65s

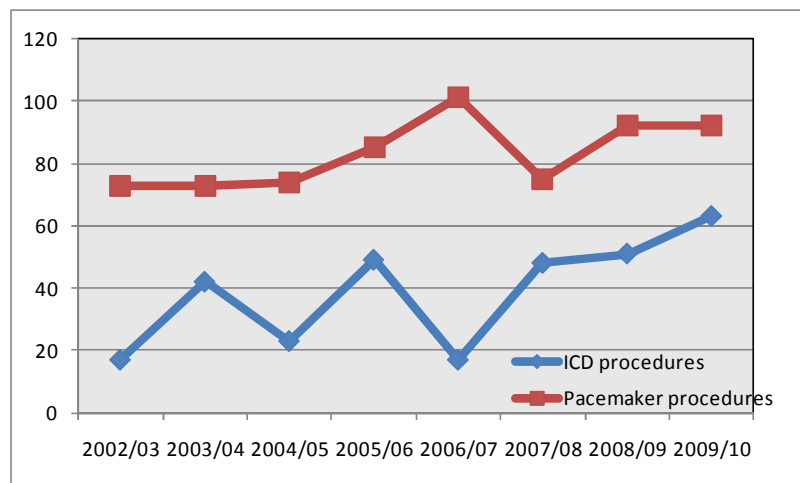
Year	< 65years	> 65 years	Total	% > 65 years
2006	140,900	22,740	163,640	13.9%
2011	142,945	25,665	168,610	15.2%
2016	143,240	29,868	173,108	17.3%
2021	142,828	34,131	176,959	19.3%
2026	142,348	38,421	180,769	21.3%

Source: Statistics NZ based on 2006 census data. Population Projections prepared for MoH. Ref No. RIS1864

By 2026 Māori will make up 22% of the total MidCentral population (up from 17% in 2006). Over 65s are currently a very small proportion of the Māori population (1075, 4%). This proportion is expected to double by 2026 (3,255).

The number of cardiology procedures is rising due to changes in practice, technology and an increase in risk factors including age as described above. Figure 36 shows the rising number of pacemaker procedures and implantable defibrillators for the MidCentral population. Patients with these devices need ongoing care. The increase in other cardiology interventions has been mentioned earlier in the document.

Figure 36: Trend in Implantable defibrillators (ICDs) and pacemaker procedures



Paediatric cardiology

The demand for paediatric cardiology is also increasing. In 2009/10 there were 122 visits coded as paediatric cardiology. Just under half (40%) were provided by the visiting paediatric cardiologist from Starship. The remainder were provided by the local paediatrician with an interest in cardiology. Half way through 2010/11 this volume had already been achieved.

Like all aspects of cardiology this service needs to be linked into the overall cardiology system of care and requires the support of the cardiology team.

Summary of factors influencing demand

Table 25: Factors may influence future demand for cardiology service

May cause a decrease in demand	May cause an increase in demand
IHD mortality continues to improve	The population over 65 is increasing
Success with prevention – age adjusted workload decrease. Likely to postpone onset of disease – age of MI and need for intervention	The ageing population, plus an anticipated increased rate of survival from ACS events, are likely to increase the number of people with chronic HF
	Increase in risk factors such as obesity and diabetes
	Public expectations of what can be done and will be provided are increasing, so consumer demand for services is likely to increase.

On balance, the ageing population plus increasing expectations is likely to result in a substantial increase in demand for diagnostic and therapeutic procedures. This will need funding and expert staff.

Priorities

This changing demand is likely to impact on cardiology services across the whole of the pathway. There are limited resources and MDHB needs to decide what will make the most difference to outcomes and where investment needs to be targeted.

Studies have analysed the reductions in coronary heart disease mortality and have found that this was attributed to multiple factors. Capewell et al. (2000) analysed the 23.6% reduction in coronary heart disease mortality in Auckland between 1982 and 1993 and found that 46% was due to medical therapies (acute MI 12%, secondary prevention 12%, hypertension 7%, heart failure 6%, and angina 9%) and 54% to reductions in major risk factors (smoking 30%, cholesterol 12%, population blood pressure 8% and other 4%). Several other studies internationally have produced similar results and the most recent study (Aspelund, 2010) analysed the 80% reduction of mortality in Iceland between 1981 and 2006, amongst 25 to 74 year olds. They found that 25% was due to medical therapies and 73% to reductions in major risk factors. The breakdown is shown in Table 26 below.

Table 26: Factors responsible for reduction coronary heart disease mortality 1981 – 2006 in Iceland

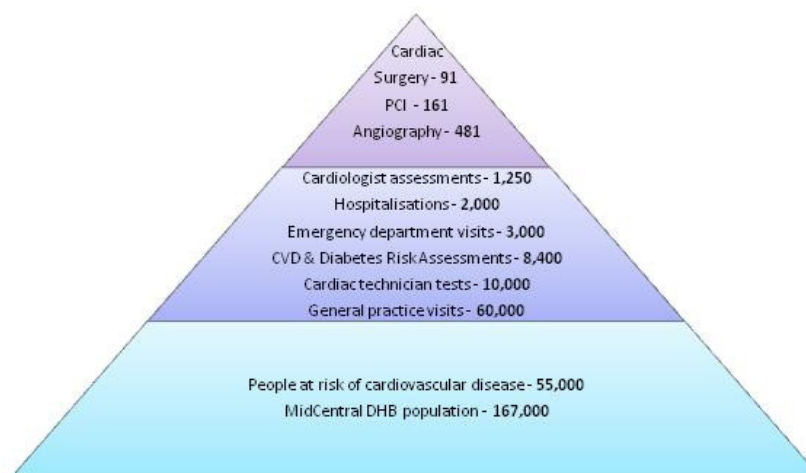
Medical therapies		Risk factor reductions	
Secondary prevention	8%	Cholesterol	32%
Heart failure	6%	Smoking	22%
Acute coronary	5%	Systolic blood pressure	22%
Revascularisation	3%	Physical inactivity	5%
Hypertension	2%	Diabetes (adverse effect)	-5%
Statins	0.5%	Obesity (adverse effect)	-4%

Source: *Aspelund T et al. PLoS ONE November 2010; 5; 11: e13957*

The question is whether these patterns are likely to continue as knowledge and technologies evolve. There have been significant changes since 1980 and different therapies and interventions are available now e.g. the first ever coronary angioplasty was performed in the late 1970s and the first description of the primary use of angioplasty for treatment of MI in a large group of patients was by Hartzler in 1983. Equally the escalation of some major risk factors in the population such as obesity, diabetes and age will mean that reduction of risk factors has to remain a primary focus.

Figure 37 provides a representation of 2009/10 activity for components of cardiology services. This illustrates the decreasing scale of requirement for services as one progresses up the triangle. Providing better services at the base and middle of the triangle should reduce the need for intervention (noting that absolute numbers will likely rise due to aging).

Figure 37: Cardiology statistics for 2009/10



Note: CVD risk assessments are for the 2010 calendar year. GP visits are 10% of total GP visits.

It is important that community resources are deployed in the best possible way and targeted to the population that needs services the most. This may need a different approach e.g. helping Māori men to manage diabetes and obesity might involve working with the family to achieve better nutrition and being smoke-free free for the family - i.e. a whānau ora approach.

Developing the service – intervention and PCI

Provision of PCI at MidCentral is strongly supported by some stakeholders for the combined benefit of better patient outcomes and ability to attract the cardiologist of today, many of whom are interventionists. Others are concerned that MidCentral's size would mean that the service would be vulnerable and difficult to support. Another view was that investment into other areas across the continuum may be more effective at improving outcomes in the long term. PCI may only bring marginal benefit if a major deficit is that many at-risk people or people with known pathology are not connected with cardiology services. The theme was that high-tech investment needs to be underpinned by services that make sure all the basics are covered well. Following is a discussion about the merits of PCI.

Much of the improvement in prognosis following MI is attributed to post infarction therapeutic interventions including early statin therapy and revascularisation. The ACSA Swedish study in 2000 found that starting statins in hospital after MI reduced one year mortality by 34% and early coronary revascularisation reduced mortality by 36% and the combination of the two reduced mortality by 64% (Wallentin, 2000, cited in Beller 2001).

Over the last decade PCI has come to be acknowledged as the gold standard for reperfusion. The European Society of Cardiology (ESC) guidelines state that a sharp decrease in mortality after STEMI has been seen in cities and countries switching from fibrinolysis to primary PCI. However there are caveats. The procedure is highly technical and guidelines further emphasize that PCI is the preferred therapeutic option, “when it can be performed expeditiously by an experienced team...lower mortality rates among patients undergoing primary PCI are observed in centres with a high volume of PCI procedure” (ESC, 2007, p. 2917).

Compared to primary PCI the benefit of thrombolysis is more time dependant and is associated with a lesser degree of myocardial salvage. While evidence is lacking about the precise acceptable delay for PCI over thrombolysis (and is controversial) the 2007 Scotland SIGN guidelines for ACS state that where primary PCI cannot be performed within 90 minutes of diagnosis, thrombolytic therapy should be used. The recommendations for rescue PCI following failed thrombolysis vary between within six hours of symptom onset (SIGN, 2007) and 12 hours (ESC).

The SIGN guidelines also cite research claiming there is consistent evidence of lower total costs with primary PCI compared to in-hospital thrombolysis due to reduced length of stay and the need for fewer subsequent procedures.

Other findings from selected guidelines and literature were:

- Australia – the results from large multicentre randomised controlled trials were reproduced with reduced 30 day and 1 year mortality in low and high risk STEMI patients (Gaal et al., 2007).
- Denmark – the term system delay (first contact with health care system) is independently associated with mortality and is more useful than door to balloon times as a performance measure for reperfusion therapy [PCI] (Terkelsen et al., 2010).
- United States – demonstrated that door to balloon times under 90 minutes can be routinely achieved for STEMI patients from non-PCI centres by program of rapid triage and transfer to hospitals providing PCI (Blankenship et al., 2010).
- Diabetics do significantly worse with primary PCI and have about double the mortality than non-diabetics (Hannan et al., 2000 quoted in Beller, 2001).

There are a number of Australian studies that claim that the time delay to reperfusion, not the modality, makes the most difference to outcomes.

- Huynh, et al., (2010) using the observational data of 755 suspected STEMI patients enrolled for the Australian ACS Prospective Audit between late 2005 to mid 2007, found that receiving reperfusion treatment of any kind was associated with 12 month mortality results. Timely reperfusion was associated with a reduction in mortality of 78%. The percentage receiving reperfusion within 30 minutes was 34.7% for thrombolysis and 36.5% for PCI with the median times 43 minutes (door to needle) and 102 minutes (door to balloon). There were no significant differences between early and late mortality in rural and metropolitan patients.
- Gerard Carroll, Cardiologist and Associate Professor of Medicine from New South Wales states that research has shown that the benefit of primary PCI is greater than thrombolysis provided the additional time is less than one hour, but that thrombolysis is more beneficial than PCI if door to needle time is less than 30 minutes and door to balloon time greater than 90 minutes (2005).

The Cardiac Society of Australia and New Zealand (CSANZ) have produced guidelines on support facilities for coronary angiography and PCI including the performance of procedures in rural sites (2008). Although stating that on-site surgical support is preferable, the guidelines acknowledge that providing PCI close to where people live facilitates equity of access and should result in improved quality of care. A set of conditions to guide safety is provided for hospitals performing PCI without on-

site surgical backup. They recommend that an elective PCI programme should be established before primary PCI is performed. Low volume operators (<100 PCIs per year) operating in low volume centres (< 400 PCIs per year) is not seen as ideal.

An evaluation of the new PCI service at Nelson showed that waiting times were significantly reduced for acute revascularisation and outcomes were comparable with other international peripheral PCI centres. Further, that significant cost reductions were achieved for the DHB. The authors suggested these outcomes support consideration of expanding this service to other New Zealand provincial hospitals (Adamson et al. 2009).

Conclusion – developing the service (PCI)

The quality of outcome for each patient is linked to the speed at which resumption of the blood flow to the heart muscle can be achieved. The most achievable objective in the short term is to reduce the time between the patient's first contact with health services, and the commencement of thrombolysis in circumstances where appropriate quality and safety requirements are met.

Available literature and guidelines indicate that a further improvement in outcomes is likely to occur through provision of PCI in the acute phase. Again, appropriate quality and safety requirements would need to be met. For such a service to be feasible, several prerequisites would be required. These appear to include:

- adequate numbers of appropriately trained cardiologists and other staff;
- a well equipped facility, likely to be a dedicated cath lab; and
- acceptable numbers of procedures (angiography, elective PCI, acute PCI).

The latter factor is likely to depend on the size of the catchment, which will have direct implications for regional planning.

Service models of the future

Service models are changing. They are having to in order to cope with shortages of specialist staff and the increase in chronic conditions. The 2007 MidCentral Clinical Services Plan and the 2008 Regional Clinical Services Plan provide a comprehensive overview of contemporary services models and recommended future approaches.

Nelson Marlborough cardiology services have made significant changes to their service model. Their 30 June 2010 annual report states, “We have therefore challenged the traditional models of consultant led care. Across the service we have seen staff at all levels encouraged to extend their roles.” A nursing led chest pain assessment clinic and technician echo value follow-up service have been introduced. A clinical governance approach is used supported by a philosophy of “if you can’t measure it you can’t manage it.”

Integrated family health centres are being established in the MidCentral area and other initiatives such as the acute demand project will have impact on the model of care for services across the district. There is a tendency to look outwards for new approaches but there are also local examples that cardiology services can consider when looking at the future shape of the service. A vignette follows of the MidCentral Respiratory Department.

Respiratory Department

The Respiratory Department philosophy is to focus on assisting those in primary care to manage their patients and manage the select group of patients best cared for in secondary care e.g. technical, investigations, procedures or where in-depth clinical knowledge is needed. Care should be delivered in the community when possible and they seek out patients who need them and see in the community where possible.

A stable clinical leadership (medical and nursing) has aided the development of the service which has been a 20 year journey. There is a substantial nursing team comprising 2 NPs and 3 CNSs. The CNS’s cover the wards and visit patients with potential respiratory problems identified from daily admission lists. Nurses see a sizeable portion of the outpatient workload and NP outreach clinics are provided in Horowhenua and Tararua and more recently have been set up in several ‘high needs’ communities - Te Runanaga O Raukawa and Foxton Beach.

Relationships with the community respiratory nurses are especially strong as the department took responsibility for training nurses to proficient level. Contact with community nurses is ongoing with department nurses providing clinical advice and mentoring (and some joint home visits) however patients must be referred via general practice. The nursing service also interacts with the generalist NPs in the community including providing clinical supervision for one NP. There are formal linkages between primary and secondary medical personnel.

4 or 5 Spirometers are in the community in PHOs and other providers. They are owned by MidCentral but the community takes responsibility for quality control.

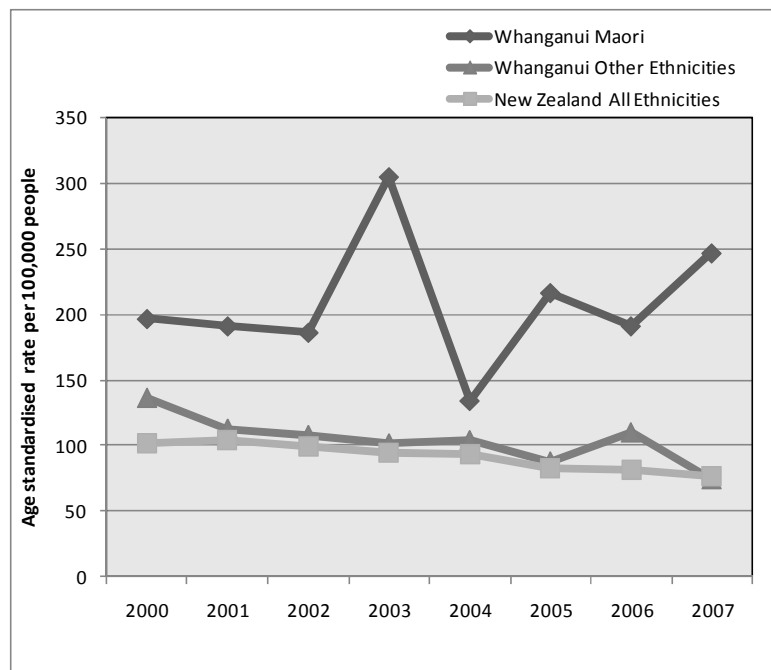
The department works together on many levels to review service provision and make improvements including weekly case review, sleep meeting and quality meetings. NP and physician letters are audited and a CQI project is underway to dictate letters to a framework. Average LOS has reduced from 4-5 days to 3-4 days for COPD patients partly through the REDS initiative (Respiratory Early Discharge Services). There is also a strong interface with management. The team has a good understanding of the service and “keeps tabs on everything” such as the volume of tests and review of the OP waiting list by clinician to ensure service is delivered as equitably as possible. Work with ED is next on the agenda as it has been identified that most self-referrals for asthma are from PN.

8. Regional service provision

Within the Central Region two distinct sub-regions have emerged which have made formal commitment at Board level to undertake joint initiatives, one group being Capital & Coast, Hutt Valley and Wairarapa DHBs and the second MidCentral and Whanganui DHBs. MidCentral and Whanganui DHBs entered into the 'centralAlliance' in 2009 and collaboration now exists across an increasing amount of corporate positions / activities and shared services. A regional implementation plan forms part of the 2011/2012 Regional Services Plan.

Like the MidCentral district, Whanganui also has issues in respect of some areas of cardiology services; high IHD mortality and low intervention rates for cardiology procedures. Whanganui's IHD mortality rates although improving (as shown in Figure 38 below) are higher than New Zealand overall. Whanganui's non-direct age adjusted rate (2003-2007 combined) was 25% higher than for New Zealand overall (compared to 10% for the MidCentral district).

Figure 38: Whanganui DHB trend in IHD mortality



Development of capacity at MidCentral would enable services to be provided for the Whanganui population as well, in particular elective services such as angiography, pacemaker implants and associated assessment. Being able to access cardiology services at MidCentral would be an opportunity for the Whanganui population to receive services closer to home.

Growing cardiology services regionally makes sense all round. This should help lift service levels for the Whanganui population and a higher level of support could be provided for Whanganui physicians. Moreover, providing services regionally would improve cath lab utilisation and cost effectiveness and help provide the critical mass vitally necessary to attract staff and offer a full range of services continuously.

The regional Cardiac Network advocates for MidCentral Health developing a stronger role in the region stating that, "there should be a close liaison between MidCentral and Whanganui, with MidCentral performing most of the assessment and diagnostic work for the Whanganui population and then referring for tertiary services in Wellington."²⁴

²⁴ 17 May 2010 letter from Dr Mark Simmonds, Clinical Leader CR Cardiology Network, to Lyn Horgan, Hospital Operations Director, MidCentral Health.

9. Conclusion

The landscape project identified that the issues for cardiology services are significant and lie right across the service. The assessment used a continuum approach utilising recognised indicators, supplemented by the views of service providers and stakeholders.

Assessment overview

A tool for cardiovascular risk assessment is being used across the district. Although the numbers of risk assessments are rising (particularly in Horowhenua) the proportion of risk assessments undertaken for the 'high needs' population is the same as the proportion undertaken for the total population. This is considerably behind the New Zealand 'high needs' rate. Many people are still not having a diabetes annual review, particularly the 'high needs' population. Rates have not shown improvement over the past two years. Stakeholder interviews identified that being able to access the target population for cardiovascular risk is one of the biggest barriers to improving cardiovascular outcomes.

Identification of cardiovascular risk does not equate to management. The tools to evaluate management of risk are negligible and the HBA1c test is used to assess satisfactory diabetes control. However, this is only for people having a diabetes annual review and equates to about half the number of those expected to have diabetes. Of those having the test, the rates of those with satisfactory control are below target and relatively static. The review looked at expenditure on cardiology related medications. Although expenditure is relatively more than national, there is no information available to evaluate appropriateness of prescribing.

When disease arises, diagnosis is needed in order to decide on a management plan. General practice has difficulty accessing tests to assist with diagnosis. There are long waiting times for some tests, particularly ETTs, holter monitors and echo (in respect of the latter, only those prioritised as urgent are being booked). The technical service is not resourced adequately for demand or even at a level which supports practicing to recognised standards. Last year technical services for paediatric patients 'fell over' which necessitated sending patients to Auckland for tests that should be available locally.

Stakeholders reported that the system works well for acute events and for high risk patients e.g. a positive exercise test. For those not classified as high risk, access problems for diagnostic tests and assessment have spanned years. A large group of patients have been stuck on a specially created 'awaiting test' waiting list with no likelihood of further assessment – in October 2010 there were 650 patients on the list going back as far as 2006. This group of patients appears to have been invisible to the service and elective services management. Similarly, the specialist follow-up waiting list has been building up and now numbers over 2,000 patients.

There is inadequate specialist advice available to general practice. Some GPs feel comfortable contacting cardiologists when the need arises however there is a tendency to minimise this contact in order not to disturb the busy specialists and "it's easier to send the patient to the hospital."

There is an inpatient cardiac rehabilitation service but nursing has a small role within the service overall comprising of support for angiography and a small heart failure service. The NP role is not available to the service for initiatives that are increasingly featuring as an important part of contemporary cardiology services. Nursing FTE is less than in the respiratory service which has much lower volumes.²⁵

The situation is different for the Horowhenua, Tararua and Otaki populations. Access to services has improved in these areas. The community cardiology clinics provide semi-urgent assessment, follow-up and tests and the one stop shop concept was largely supported. Community nursing services are provided across the district and service providers report that these services make a difference.

²⁵ In 2009/10 respiratory discharges (M65) were one third that of cardiology discharges (M10) and just over half the caseweight.

However, the landscape assessment was unable to demonstrate directly any change to outcomes by looking at information that can be extracted from current systems. There is a need to agree a set of data for collection to more easily evaluate the service. Currently it cannot be identified whether a patient is receiving cardiac rehab, heart failure or pre/post procedure support. Similarly, the source of referrers could not be identified from the data. A sample of referrals was manually reviewed and revealed that less than 10% of referrals were from general practice. This was confirmed by the cardiac nurses who reported low utilisation by GPs especially where services are based at the PHO.

Cardiology procedures (particularly angiography and PCI) and cardiac surgery intervention rates are low. It may be that MidCentral's angiography intervention rate should appropriately sit a little lower than other areas without a nuclear medicine service. Rates for PCI can also be expected to sit a little lower than centres where PCI is offered (thrombolysis is provided at MidCentral instead of primary PCI). However rates are still low even when taking these factors into account.

The access blockages mentioned earlier (tests and assessment) contribute to the low intervention rates. It is accepted that system blockages affect the demand for services. Referrals dry up, there are work arounds / alternative practices, going elsewhere, private options or services may not be offered at all. Interviews with stakeholders confirmed that this situation is occurring and that the service has not kept pace with modern day expectations of a secondary cardiology service.

Only 40% of the angiography volume is provided locally. This is much less than other medium sized DHBs providing angiography. While it appears there are some existing opportunities to improve throughput, local service provision is mainly hampered by capacity constraints such as the number and duration of sessions. Although some patients do need to go to Wellington, it is estimated that nearly three quarters of the total volume could be provided locally. This is over double the current amount being provided. MidCentral needs to decide whether or not it is going to offer an angiography service – the current volume per operator is barely sufficient to maintain skills or justify maintaining a trained support team. Over the next decade MidCentral can expect an increase in volume of approximately one quarter due to the aging population. This means that approximately 750 people will require this procedure annually with about three quarters able to receive services locally. The existing facility cannot manage these numbers and equally they cannot be absorbed by Capital and Coast.

Quality assurance is necessary to evaluate service provision and whether evidence based best practice is occurring. Presently MidCentral does not know if the population is receiving recommended health care. The following questions need to be resolved: Is management of cardiovascular risk occurring in primary practice? Are the appropriate combinations of drugs being prescribed as per guidelines? Do appropriate diagnostic tests get ordered? Do people receive appropriate interventions? There are many health providers that deliver cardiology services and they need to act in concert and keep up to date with contemporary practice which is frequently changing.

Previous health needs assessments identified that cardiovascular mortality in MidCentral had improved and that the gap with national cardiovascular mortality was closing. This project found that the picture is different for ischaemic heart disease which is commonly used as an indicator of community cardiac health status.²⁶

Key finding - Ischaemic heart disease mortality

Ischaemic heart disease mortality has improved but at a rate slower than New Zealand. A comparison of two periods a decade apart²⁷ showed a 23% decline in mortality for the MidCentral population compared to a 31% decline for New Zealand. At the beginning of the period, the rate for MidCentral was the same as New Zealand overall.

²⁶ Cardiovascular conditions include cerebrovascular conditions such as stroke.

²⁷ 1995-1997 with 2005-2007 using age adjusted rates.

The landscape project confirms that cardiology outcomes in the MidCentral district are poor. These unsatisfactory clinical outcomes arise in part from inadequate levels of service provision across the spectrum of care. Some positive developments have occurred recently, yet the rate of improvement in outcomes remains unsatisfactory. Under current circumstances, MidCentral DHB is unlikely to match the performance of cardiology services elsewhere in meeting the needs of its district's population.

The above analysis also showed that despite the decline in mortality, the number of raw deaths had increased. This suggests that mortality has been affected by MidCentral's aging population structure (in comparison, the number of deaths fell across New Zealand). As the 'future environment' chapter discussed, the rising proportion of over 65s will have significant implications on the need for cardiology service provision across the continuum. The MidCentral district has an older population than New Zealand overall and has just entered a phase in which the number and proportion of older people will relentlessly rise for the next three decades.

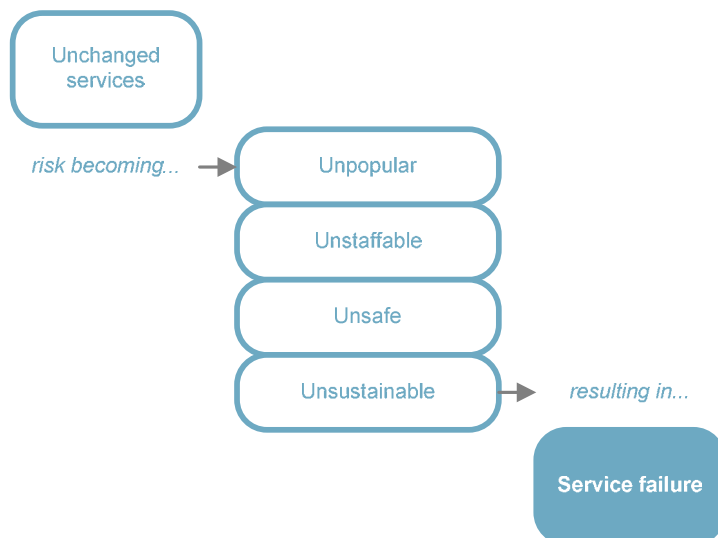
As the risk of CVD is very strongly age related, the absolute number of people presenting with CVD will steadily rise. Essentially this means that health system measures, if effective, may reduce premature mortality by 20 to 30% per decade, yet the increase in numbers of higher risk people will result in a rise in the absolute number of people presenting with CVD. MidCentral DHB needs to bear this unavoidable phenomenon in mind when planning for the short, medium, and long term.

The core problems

Hospital services have suffered from 'stasis' with a lack of planning and investment

Despite two external reviews, progress has not been made. This is in the areas of workforce, equipment, facilities and service organisation. It is acknowledged that it is difficult to commit to service development in an environment of limited resources; however, failing to develop the service has seen MidCentral slip further behind. The diagram below, in the writer's opinion, describes very well the risks of delay and continuing with no change.

Figure 39: Risks of the status quo



Source - Central Region Clinical Services Plan, 2008, pg 41

The service is fragmented across the continuum and requires clinical leadership

The 2005 MDHB cardiovascular service plan took a service wide approach. There have been some notable gains from investment and initiatives arising e.g. funding and roll-out of the cardiovascular assessment tool, chronic care teams and community cardiology. However, there has been minimal progress towards an integrated service and service provision is still largely siloed.

The highest level of cardiology expertise sits within specialist services. Attaining the best possible outcomes for the population requires the coordination of all providers in primary care, ED, generalist hospital roles, and specialist services to work seamlessly with cardiology specialists. These providers require guidance and timely access to advice and diagnostics. Services also need to be monitored against quality clinical standards.

District-wide delivery of a fine cardiology service can only be achieved through careful planning, and the planning process requires sound clinical leadership. This leadership is most appropriately provided by a cardiologist. A model of clinical governance is necessary which encompasses the whole care continuum from risk assessment to palliative care. This will provide the mechanism to ensure continuous quality improvement in services to prevent / address future problems in a constantly changing environment which needs ongoing examination and evaluation.

Required approach

There are many steps to be taken along the cardiology care continuum. The best possible outcomes will come from attention to multiple factors across the continuum from health to disease. The best possible outcomes cannot occur if a significant percentage of target people are not identified or are not provided with timely access to treatment. Currently available resources may need to be applied more productively (e.g. CVD Risk Assessment; annual diabetes review; then tying the most at-risk people into nursing and other supports, but only for as long as benefits are accruing in those cases; and ensuring the people at most need are reliably and efficiently transferred for specialist investigations and/or treatments). Further, this 'at risk' group is expected to grow with the ageing population and the epidemic of obesity and diabetes in the younger population.

The assessment identified that strategies are required across the whole service. The effort required to make improvements is considerable and will need to be coordinated and targeted along the whole of the patient pathway. This will require clinical leadership, resources, and initiatives to manage demand including the development of roles. The integrated model of care and enhanced clinical leadership is fully consistent with the Clinical Network concept which has already been supported by the Board as a model for future service planning and organisation.

In the first instance MidCentral DHB needs to address some urgent gaps in cardiology service provision to improve outcomes and reach an acceptable level of functioning. This includes:

- Developing a service plan with identified priorities, KPIs and allocation of responsibilities, sufficient to meet the existing requirements of the district's population
- An improved system for data collection, processing, and reporting, that enables evaluation of the effectiveness of services across the district's continuum of care
- Improved access to non-invasive tests referred to MidCentral Health (vs those preformed at Horowhenua, Tararua and Otaki venues)
- Improved access to tests resulting from presentation with an acute event, such as a presentation to ED with chest pain
- Improved access to angiography and pacemaker procedures and other interventions
- Improved access to specialist advice for general practice and hospital staff
- Urgent review of waiting list back-logs – 'cardiology awaiting tests' and 'repeat' waiting lists
- Establishment of strategies and algorithms for management of ongoing demand
- Clear definition of roles across the continuum of care
- Further development of roles and clinical skills of non-cardiologist providers
- Improved systems for communication across the service
- A clear plan for ongoing service development, to enable medium to long-term service requirements to be met.

The way this needs to occur is through progression to an integrated model where the parties work, interact and plan together more formally. Ideally, the service plan should be district wide.

The service needs appropriate facilities and staffing in order to achieve this. Staffing levels need to be increased across all professional groups and a minimum establishment of four cardiologists is required. The community cardiologist role needs to be integrated into the department to achieve the critical mass required to deliver 24 hour acute services.

Once MidCentral DHB has adequate human and physical capacity for its own population it can expand and offer services regionally. This will enable Whanganui patients to have services closer to home and should help to lift service levels for this population. Moreover, providing services regionally would improve cath lab utilisation and cost effectiveness and may provide the critical mass necessary for the introduction of PCI. This level of development would need to occur in parallel with regional-level planning and development.

We know that mortality in New Zealand is higher than mortality in several similar countries; and mortality in the MidCentral district is higher than the mortality for New Zealand overall. To catch up to performance internationally and nationally, MidCentral needs to perform at a rate that is above average. It is proposed that MidCentral district should adopt and sustain a minimum target of a 30% drop per decade in age-adjusted mortality from coronary heart disease. This equates to:²⁸

- 25 fewer deaths per year by year 5
- 50 fewer deaths per year by year 10

The ultimate objective is to lift the service to an advanced level of functioning. The following recommendations, if implemented should take cardiology services to a higher level of functioning and improve outcomes for the MidCentral population.

²⁸ 2005-2007 age adjusted rate is 270 per 100,000 for the 3 years. Divided by 3 and multiplied by 30% x population = reduction in 50 deaths.

Recommendations

Recommendations 1 to 3 are concerned with governance and resources and need to be implemented first in order to progress most other recommendations (save Recommendations 7 and 9). The remaining recommendations should be implemented by the end of 2012 at the latest – it will be the responsibility of the governance group to identify precise timing and responsibilities which should form part of the service plan.

Governance

1. That a clinical governance group be established to progress an integrated practice model across the continuum of care. Cardiologist leadership is fundamental to the success of this approach and dedicated time will need to be allowed. Membership will include GP, cardiologist, nursing and technical representation. The governance group will oversee the implementation of the recommendations in this report including the service plan.

Proposed targets should reflect improving inequalities and reductions in age-adjusted ischaemic heart disease morbidity and mortality, the latter target being:

- 25 fewer deaths per year by year 5; and
- 50 fewer deaths per year by year 10.

Timing: 1 July 2011
 Responsibility: Clinical Director Medical Services

Strategic

2. That the size of the cardiology department at MidCentral Health is increased to deliver on these recommendations and develop the service.

This is crucial in order to increase access, cope with demand and improve outcomes faster. Recommended staffing establishment is outlined in the following table.

		Current establishment	Additional positions	Additional FTE	New establishment
RC 320 - Cardiology	Medical	3.55 (3 heads)	Cardiologist	1.0	6.55
			GP	1.0	
			Advanced registrar trainee	1.0	
	Nursing	2.7 (CNS) 0.6 (RN)	Specialist nurse	1.0	5.3
			Diagnostic nurse (Cath lab)	1.0	
Allied	5.1	Cardiac Physiologist	1.0	6.1	
MRT	0.25	MRT	0.25	0.5	
Mngt/Admin	3.00	Service leader / admin	0.5-1.0	3.5 – 4.0	
RC 528 - Ward 28 / CCU	Nursing	31.2	Nursing	-	31.2
	Mngt/Admin	1.06	Mngt/Admin	-	1.06
		47.46		6.75 – 7.25	54.21 – 54.71

Timing: 1 July 2011 (Business case submitted)
 Responsibility: Operations Director Hospital Services

3. That investment occurs into invasive services at MidCentral Health. This is crucial for recruitment of cardiologists, optimal management of patients and the possibility of providing a regional service. This will include developing a cath lab which should be PCI capable. The possible introduction of another site within the Central Region for PCI is part of the regional work programme and should be explored within this context.

Timing: 1 July 2011 (Business case submitted)
Responsibility: Operations Director Hospital Services

4. The service will work towards providing a formal after hours cardiologist on-call roster to enable access to local cardiologist advice 24/7.
5. That an integrated service is furthered by the engagement of GP and specialist nursing resource that will work across the service assisting with service development and forming closer alignment between clinicians in primary and secondary services. This includes better linkages with community cardiac nurses and ensuring that the focus is targeted to the highest priority patients.
6. That service development include strategies to manage demand more effectively and speed the patient journey from first contact to contact with the specialised service, e.g. referral management, introduction of pathways / algorithms for common conditions (chest pain pathway, heart failure, atrial fibrillation and management of hypertension), and approaches that maximise all roles such as:
 - introduction of a GP special interest (GPSI) model of care;
 - technician reporting of tests;
 - secondary prevention clinics; and
 - reviewing waiting lists and triaging patients to the appropriate service.

The introduction of GPSIs could be linked to recommendation 5. As well as helping with demand this would have the benefit of enhancing cardiology knowledge across the district and identifying key individuals that can participate in service development initiatives.

Service delivery

7. That waiting list backlogs are urgently reviewed by 30 May 2011.
8. That priority is placed on improving access to diagnostic tests and hospital level cardiology services. This includes:
 - Exercise tests, echocardiograms, holter monitors (particularly for Manawatu and PN).
 - Cardiologist assessment (particularly for Manawatu and PN).
 - Angiograms and other cardiology procedures.
 - Cardiology procedures available in tertiary services including cardiac surgery.

Facilities

9. That MidCentral Health Cardiology Department services are co-located to improve team cohesiveness, efficiency and current and future capacity. Options presented in this document for co-location of the department should be explored and following this a preferred option agreed and progressed (refer p.63). This should occur forthwith given the urgent capacity issues for echocardiography.

Contractual arrangements

10. That the clinical leader of cardiology services (Rec 1) and the Funding Division Primary Care Portfolio Manager review the contractual arrangements for the service including:

- Price volume schedule with MidCentral Health and alternative funding possibilities which support a focus on outcomes rather than activity. Flexibility is required to move volumes to different professional groups and non-contact activities.
- Service specifications for the community cardiology service to ensure that service aims are realised such as providing regular advice and education to GPs and other professionals to improve diagnosis and management of cardiac conditions, working on shared treatment plans and acting as a source of expert advice. Roll out of community services to Manawatu is also required when cardiologist resource is in place.

Quality and audit

11. That a quality improvement approach be adopted and data quality improved in order to guide the service. A set of information necessary to manage the service and evaluate its performance should be agreed (linking to service KPIs) to facilitate audit and enable explanations for any deviations from national or international guidelines or recommendations.
12. That data processes for community cardiology are reviewed including the necessity for data to be entered into two systems by two organisations (MidCentral Health and Central PHO). Currently there are many inconsistencies with counting.²⁹ As a minimum the following needs to occur:
 - Agreement on data definitions to support a DHB wide view of activity.
 - Rework the data entry process with supporting procedures and training ensuring alignment between MidCentral Health and Central PHO processes.
 - Matching of data capture to contract requirements e.g. referrers. A more specific reporting template may be of advantage.
 - Introduce regular monitoring / audit to identify early any issues that occur.

Resources

13. That resources are committed to implement the recommendations. Early indications of the level of investment required are (refer Table 27 p.84 for breakdown):
 - Cath lab and equipment \$2.6m
 - Staff \$697 – 775k
 - Co-location of department – not costed, 4 options to explore.

The additional volumes required to reach ‘expected’³⁰ intervention rates will also need to be funded. This is approximately \$880k for angiography and PCI combined. The cost for the additional cardiac surgery required has not been assessed.

²⁹ Common Counting Standards 2011/12 publication, available from the Nationwide Service Framework Library www.nsf.health.govt.nz

³⁰ Expected intervention rate is the average national rate for angiography. There is a national target for PCI which is 10.8 per 100,000 population.

Table 27: Future resources required for cardiology services

Area	Description	CAPEX	OPEX
Facility	Cath lab facility to theatre spec (150sqm * \$4,000)	\$800,000	
	Co-location of department – 4 options to explore	Being assessed (GM Commercial Services)	
Equipment	Cath lab machine and information software	\$1,700,000	
	Pacemaker software	\$40,000	
	Echo machine	\$250,000	
	Treadmill	\$50,000	
Staff	Cardiologist – 1.0 FTE		\$200,000
	Advanced registrar trainee – 1.0 FTE		\$120,000 ¹
	GP – GPSI – 0.8 (0.2 ea TLA)		\$110,000
	Technician – 1.0 FTE		\$55,000
	Specialist nursing for assessment / follow-up – 1.0 FTE		\$90,000 ²
	Administration – dedicated service leader (1.0 FTE) or additional admin (0.5 FTE)		\$22,000 – \$100,000
	Existing sessions - Additional staff will be needed for change to dedicated Cath lab (MRT, possible additional reception resource and transfer of pacemakers from OT)		\$100,000
	Additional volumes - assumption is that national price will fund costs including staff for additional volumes. Additional volumes will be a combination of new service (increase in intervention rate) and transfer of IDFs from C&C. However these need to be budgeted for.		
	Total	\$2,595,000	\$697,000 – \$775,000

Note 1 – This could be reduced by \$40-50k in the event of CTA funding

Note 2 - There is an existing 1.0 FTE NP who has been transferred to the medical line

Appendix A – Steering Group and project team

Title / role	Name
Clinical Director, Medical Services	Dr Mark Beale
Cardiologist	Dr Laura Davidson
General Practitioner	Dr Delamy Keall
Service Manager, Medical Services	Amanda Driffill
Operations Director, Hospital Services	Lyn Horgan
Nurse Director, Medical Services	Jan Dewar
Senior Portfolio Manager, Funding Division	Craig Johnston
Clinical Director, Central Region Cardiology Network and HOD Cardiology, Capital & Coast DHB (received all information)	Dr Mark Simmonds
Project Sponsor	
General Manager Funding Division and acting GM Corporate	Mike Grant
Project Team	
Project Manager	Sharon Bevins
Project support	Warwick Davenport
Analytical input	
Performance and Planning Unit, Health Information	John Manderson, Paul Greatorex, Darren Signal, Greg Bolton, Quentin Bourke
Performance and Planning Unit, Management Accounting	Andrea McGregor
Elective Services Manager	Robyn Shaw
Funding Division	Dr Richard Fong, Chris Pennington, Andrew Orange
Compass Health	John Grant, Matthew Randall
MoH	Jane Potiki, Sylvia Watson, Chris Lewis, Mark Jackson

Appendix B – Stakeholders and interviewees

The following individuals were interviewed or provided input by e-mail.

Role / Area	Name
Primary	
Clinical Director, and DoN Primary Care, MDHB	Chiquita Hansen
General Manager, Central PHO	Joe Howells,
Chief Executive, Operations Manager, Compass Health	Cathy O'Malley, Jo Morris
Community Cardiac Nurses, Central PHO	Folole Fai, Jean Harris, Dan Carter, Teresa Fraser
General Practitioner, Pahiatua	Dr Delamy Keall
General Practitioner, Fielding	Dr Andy Williams
GP Liaison, MidCentral Health and GP Palmerston North	Dr Ashok Dahya
General Practitioner, Levin	Dr Allan Hull
MidCentral Health Cardiology Department	
Cardiologists	Dr Laura Davidson, Dr Dave Tang, Dr Richard Thompson
Charge Nurse Wd 28 & CCU / HDU	Richard Hansen
Cardiac Physiologists	Hazel Bell, Mark Wheddon, Jenny White
Nurse Practitioner, Adult Cardiac Care	Claire O'Sullivan
Clinical Nurse Specialists	Erin Horgan, Adrienne Kennedy
Clinical Nurse Specialist (formerly in the department)	Dean Kinloch
Booking Clerks	Jan Davis and Maggie Munro-Waaka
Typist	Meeghan Petronelli
Other MidCentral Health Departments	
Clinical Director, Clinical Support Services	Dr Kevin Smidt
Team Leader, Medical Imaging	Di Orange
Paediatric Head of Department and Paediatrician	Dr Jeff Brown, Dr Nicky Webster,
Paediatric Cardiologist (Starship)	Dr John Stirling
Head of Department, Intensive Care Unit	Dr Gerard McHugh
Emergency Department Manager and Clinical Director	Carrie Naylor-Williams, Dr Helen Cosgrove
Operating Theatre Manager	Chris Simpson
Anaesthetist	Dr Alberto Ramirez
Physician, Palliative Care	Joy Percy
Physicians, General Medicine	Merinda Beale, Andrew Herbert, Paul Dixon, Alistair Watson
MidCentral management / corporate	
Clinical Director, Medical Services	Dr Mark Beale
Service Manager, Medical Services	Amanda Driffill
Operations Director, Hospital Services	Lyn Horgan
Nurse Director, Medicine	Jan Dewar
Elective Services Manager	Robyn Shaw
Senior Portfolio Manager, Funding Division	Craig Johnston
Commercial Support Services	Jeff Small
Regional and other DHBs	
Regional Trainer, CentralTAS	Glenys Rossouw

Appendix B – Stakeholders and interviewees

Project Manager – Cardiology Network	Tricia Sloan
Clinical Director, Central Region Cardiology Network and HOD Cardiology, Capital & Coast DHB	Dr Mark Simmonds
Nelson Marlborough DHB, Cardiologist and Cath lab staff	Dr Nick Fisher, Margaret Benseman, Sarah Gerrard
General Manager Planning and Funding, Hawke's Bay DHB	Andrew Lesperance
Capital & Coast DHB, Operations Manager Medical Services	Diane Callinicos
Hutt Valley DHB, Cardiologist, Manager, General Practitioner	Dr Tim O'Meeghan, Lindsay Wilde, Dr Lise Kljakovic
Bay of Plenty DHB - Angiography	Helen Parker, Sandy Radford
Hawke's Bay DHB, Clinical Nurse Manager	Gay Brown
Taranaki DHB, Nurse Coordinator - Angiography	Jo-Ann Downie
Medical Director, National Heart Foundation	Dr Norman Sharpe

Appendix C – Abbreviations and definitions

Term	Description
Ablation	The irreversible damaging or destroying of the tissue in order to cure or control cardiac rhythm disturbances.
Acute Coronary Syndrome (ACS)	Acute Coronary Syndrome includes unstable angina (UA), non-ST segment elevation myocardial infarction (non-STEMI) and ST segment elevation myocardial infarction (STEMI).
Angiography	A procedure where a special dye is injected into the arteries around the heart under a local anaesthetic and X-rays are taken. The dye shows up on the X-rays revealing the arteries and the presence of any narrowing or blockages.
Angioplasty	See PCI and PTCA.
Cardiovascular disease (CVD)	Conditions or diseases of the heart and blood vessels in general, including coronary artery disease, angina, congestive heart failure, and high blood pressure, and stroke.
Cardioversion	A small electric shock is applied to the chest, which can restore an abnormal heart rhythm. It is a frequently recommended procedure for patients with atrial fibrillation and is carried out under a brief general anaesthetic.
Cath lab	A catheterisation laboratory or cath lab is an examination room in a hospital or clinic with diagnostic imaging equipment used to support the catheterisation procedure e.g. coronary angiogram.
CCU	Coronary Care Unit.
CFA	Crown Funding Agreement.
Clinical governance	Describes a systematic approach to maintaining and improving the quality of patient care within a health system. Attributes include recognisably high standards of care, transparent responsibility and accountability for those standards, and a constant dynamic of improvement.
Clinical Nurse Specialist (CNS)	A registered nurse practising at an advanced level in a specific area of practice who has completed advanced training in a specific scope of practice, and may have been prepared at masters level of education, but who has not been recognised and approved by the Nursing Council of New Zealand as a nurse practitioner.
Congestive Heart Failure (CHF)	A condition where the heart pumps inefficiently due to conditions that affect the heart or lungs, and may cause fluid back up in the lungs and/or legs adversely affecting the heart muscle.
Coronary artery bypass graft surgery (CABG)	Coronary artery bypass grafting. This is the operation that is carried out to bypass blocked coronary arteries in patients suffering from coronary heart disease. In certain circumstances this treatment is life saving. Cardiac surgeons in tertiary centres carry out this procedure.
CCU	Coronary care unit. A hospital ward specialising in the care of patients with heart attacks, unstable angina, arrhythmias and various other cardiac conditions that require continuous monitoring and treatment.
Coronary Heart Disease (CHD)	Also known as coronary artery disease. This is a disease that leads to angina and heart attacks and is caused by narrowing of the coronary blood vessels.
CWD	Case weighted discharge (also known as cost weighted discharge).
DAP	District Annual Plan.
DHB	District Health Board.
DHB of Domicile	The DHB area in which a patient lives. DHBs are responsible for the care of all people living within their catchment area.
DHB of Service	The DHB that provides the service.
DNA	Did not attend (either an appointment or for treatment).
DoN	Director of Nursing.
Echocardiography (echo)	This is a study of the heart using an ultrasound probe on the chest wall and obtaining a picture by directing the sound beams at the heart. The sound waves are reflected from the heart and produce a picture, which is interpreted by the cardiologist. Most of these procedures are carried out by echocardiography technicians.
ED	Emergency Department.
Electrocardiograph (ECG)	Electrocardiography is a commonly used, noninvasive procedure for recording electrical changes in the heart. The record, which is called an electrocardiogram (ECG), shows the series of waves that relate to the electrical impulses that occur during each beat of the heart. The results are printed on paper and/or displayed on a monitor to provide a visual

Appendix C – Abbreviations and definitions

Term	Description
	representation of heart function. The waves in a normal record are named P, Q, R, S, and T, and follow in alphabetical order.
Electrophysiology (EP)	Electrophysiology is the assessment of the mechanism underlying abnormalities of cardiac rhythm. This is done by introducing thin wires through the veins to the heart under X-ray control.
Event Recorder Monitoring	This is a process in which the patient wears a recording device over a number of days, which enables them to record any heart arrhythmias that they may feel.
Exercise Tolerance Test (ETT)	An Exercise Tolerance Test shows cardiovascular abnormalities not present at rest and determines adequacy of cardiac function with exercise.
FSA	First specialist assessment.
FTE	Full-time equivalent.
FU	Follow up or repeat outpatient visit or test.
GP	General Practitioner.
GPSI	General Practitioner with Special Interest.
HDU	High Dependency Unit. A unit in a hospital that offers specialist nursing care and monitoring to seriously ill patients. It provides greater care than is available on general wards but less than is given to patients in intensive care.
Holter Monitoring	This is a process in which a 24-hour record of patient's heartbeat is obtained, to determine if there are any cardiac arrhythmias present.
ICU	Intensive care unit.
IDF	Inter-district flow.
Implantable Cardioverter-Defibrillator (ICD)	An electrical device, which is the size of a large pacemaker. It can be inserted under the skin and connected to the heart. It delivers an electric shock to the heart if the heart goes into dangerous rhythm or if a cardiac arrest occurs.
Ischaemic Heart Disease (IHD)	A disease characterized by ischaemia (reduced blood supply) to the heart muscle, usually due to coronary artery disease.
LOS	Length of stay.
MCH	MidCentral Health.
M05	Health specialty code for emergency medicine discharges
MDHB	MidCentral District Health Board.
MoH	MoH.
Myocardial Infarction (MI)	This is when a coronary artery becomes blocked and part of the heart muscle dies as a result. This is treated by urgent unblocking of the artery either by a PCI (balloon angioplasty or insertion of a stent), or by thrombolysis. Other names for this condition are heart attack or coronary thrombosis. MI is further differentiated into STEMI (see STEMI) and non-STEMI (see non-STEMI) and the fastest way to diagnose whether a heart attack is a STEMI or non-STEMI is through the 12-lead electrocardiogram (ECG).
Myocardial Perfusion Scan	This is a scan to assess the supply of blood to the heart and to determine whether there is a difference between under rest and stress. These scans are based on physical stress either on a treadmill or, if the patient is unable to use the treadmill, chemicals are infused to stress the heart. The scanning is carried out in the Nuclear Medicine Department.
NHI	National Health Index number is the unique person identifier used within the New Zealand health system.
National Minimum Data Set (NMDS)	A database of information about publicly provided inpatient services.
Nurse Practitioner (NP)	A Nurse Practitioner is a registered nurse practising at an advanced level in a specific area of practice. Nurse Practitioners must have a Master's level of education and been approved and registered by the Nursing Council of New Zealand as a Nurse Practitioner.
Non-STEMI or NSTEMI	Non ST elevation myocardial infarction. When an artery is partially blocked and severely reducing blood flow, a non-STEMI heart attack may occur. The symptoms of chest pain can be identical to STEMI but is less life threatening. Diagnosed through lack of ST segment changes on ECG. The diagnosis is suspected on the history and symptoms and is confirmed by a blood test which shows a rise in the concentration of cardiac enzymes such as Troponin which are found in the cells of the heart muscle. When myocardial cells are damaged the cardiac enzymes leak out of the damaged cells into the blood stream. NSTEMI should be managed with medication, although PCI is often performed during hospital admission.

Appendix C – Abbreviations and definitions

Term	Description
	<p>In the case of a Non-ST elevation heart attack, to that of a STEMI, but the important difference is that the patient's ECG does not show the typical ST elevation changes traditionally associated with a heart attack. The patient often has a history of having experienced angina, but the ECG at the time of the suspected attack may show no abnormality at all.</p> <p>Patients whose heart attacks are of the Non-STEMI type do not need to be rushed into the cath lab in a time-critical manner. It is reasonable to make them stable, administer ASPIRIN® and other clot dissolving medications such as heparin or clopidogrel as well as heart protective drugs such as beta blockers and nitrates, and take them electively into the cath lab for angiography. Such patients are often found to have a critical but non occlusive narrowing of a coronary artery which can be treated with stenting.</p>
OPF	Operational Policy Framework.
Pacemaker	A small internal device that delivers low energy electrical pulses to the heart in order to make the heart beat faster.
Percutaneous Coronary Intervention (PCI)	Uses mechanical means to open to restore blood flow through an artery (formally known as "reperfusion") following a heart attack. This is the preferred treatment for STEMI heart attacks. This is where a tube is passed in through the skin into the artery, and then manipulated as far as the heart. The tube is then used to introduce balloons and other equipment that can clear the coronary arteries from inside. This technique encompasses all forms of percutaneous revascularisation including PTCA and stenting.
Percutaneous transluminal coronary angioplasty (PTCA)	Is where a balloon pump is used to widen the narrowed blood vessels.
PHO	Primary Health Organisation.
QA	Quality Assurance.
Revascularisation	Revascularisation is the restoration of blood flow through the arteries to the heart (the coronary arteries) using either CABG or PCI.
REVEAL	A small implantable device that continuously monitors heart rhythms and records them. The device is implanted just beneath the skin in the upper chest area during a simple procedure.
Society of Cardiopulmonary Technology (SCT)	The SCT is the professional society for cardiac technicians and technologists around New Zealand. The society has run education courses in the field of cardiac technology since 1974 and administrates correspondence education courses - a one year course designed for Technicians performing ECGs (CPM), and a two year practical competency course for Technologists (CCP).
Specialist Cardiology services	All discharges recorded with a speciality code of M10 (Cardiology), M11 (Allied health and community Cardiology (retired 1 Jul 2001)), M12 (Generalist Cardiology(retired 1 Jul 2001)), M13 (Specialist Cardiology (retired 1 Jul 2001)), M14 (Specialist Paediatric Cardiology).
Standardised Discharge or Intervention Ratio (SDR or SIR)	A comparison with the national average, taking certain board population demographics into account (e.g. age, sex, deprivation, and ethnicity).
STEMI	ST-elevation myocardial infarction. ST elevation myocardial infarction or a STEMI heart attack happens as a result of a complete blockage in a coronary artery. A STEMI attack carries a greater risk of death and disability compared to NSTEMI. Most STEMIs are treated with thrombolysis or PCI if the latter is available within 90 minutes. In people who have multiple blockages and who are relatively stable, or in a few emergency cases, bypass surgery may be an option.
Thrombolysis	Thrombolysis is the administration of drugs which dissolve clots, to patients who are having heart attacks. In some patients the blood clot is cleared with a PCI rather than by thrombolysis.
TLA	Territorial Local Authority.
Transient ischaemic attack (TIA)	A minor stroke which causes stroke-like symptoms but no lasting damage. It is an important predictor of stroke.
Transoesophageal Echocardiogram (TOE)	When an echocardiogram does not provide adequate images because the wall of the chest obstructs the sound beams a TOE may be performed. A probe is swallowed by the patient, who is lightly sedated and pointed at the heart from inside the gullet (oesophagus).
WIES8	Weighted Inlier Equivalent Separations, Version 8. A system of calculating relative casemix cost weights for different DRG groups.

Appendix D – Data and information

The project identified issues with data and information. Following are some observations.

Data capture and coding

Data has not been consistently captured in the Patient Management System ‘HOMER’ over time. Additional codes are created but used variably e.g. appointment types without any ability to lock the code usage to (for example) a clinic. New codes can be set up by front-line staff without discussion with PPU or IS. New controls are being introduced to restrict this ability and give PPU/Data Quality Forum the ability to retire codes – this ability is not inherent in HOMER in many areas.

An example of the above problem is found with the clinic code ECG where there are 22 appointment types. Subcategories have been created, such as ‘New Patient holter monitor’ but there are still two general categories (‘new patient’ and repeat’) which cannot be assigned to any subcategory. Eight of the 22 appointment types have less than 3 contacts in total against each but most have been used in the last 2 years. This impacts on reporting and increases the need for manual manipulation. In addition, to map this activity for counting, funding and costing, assumptions about how a code is used may prove incorrect as this can vary across clinic and staff member. The Team Coordinator Health Information and Health Analyst/Planner hopes that in the replacement of HOMER, appropriate data quality checks can be built into the new Patient Management System to improve this.

Reporting and analysis requires knowledge of how the data is entered and what should be included / excluded. Changes influence extraction requirements. However, this information is not well documented and relies on the knowledge of service and PPU staff which can be an issue when there is staff turnover / leave.

There are multiple sources of data such as referrals, waiting lists, outpatients, inpatients, radiology etc. which appears to create a complexity for monitoring and reporting.

Data quality

A Data Quality Steering Group (now called the Data Governance Group) and an operational forum oversees data quality. Many of the existing audits are focused on ensuring national collection accuracy and revenue assurance and run on the assumption that staff are appropriately educated and data entry is correct. Some obvious errors are picked up by PPU staff, for example codes appearing in clinics never used before, incorrectly populated contract fields, date time issues etc. To achieve good quality data requires that data entry clerks have a good understanding of how the data is used and regular monitoring / audit to ensure compliance. There appears to be no system of regular audit of data entry processes. Although communication with front-line staff occurs in forums such as Electives Group, several clerks still identify shortfalls in understanding and training.

There is a lack of clarity about where to go for information in the organisation. In some cases work can be done by PPU or the Funding Division. Five analysts in PPU and three staff members in the Funding Division contributed to this project.

Responsibility for service information appears unclear e.g. there has been variable oversight of the waiting lists. It is not clear what the processes and responsibilities are when there are waiting list issues.

Reporting parameters

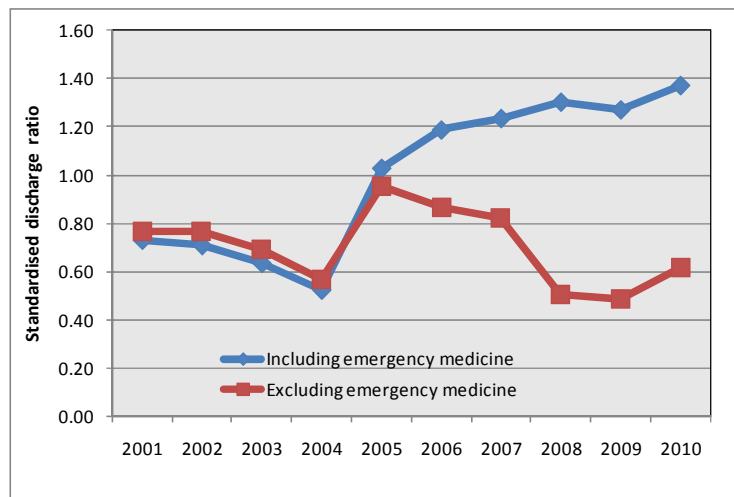
There are some major differences in reporting parameters used which impact on analysis outcomes. This was highlighted in the analysis of hospitalisation data. These differences decrease the usefulness of hospitalisations as an indicator of cardiology outcomes as explained further below.

Emergency medicine discharges (M05s)

MidCentral Health has a large proportion of M05s in comparison to other DHBs. In 2009 approximately 15-16% of all cardiology admissions were M05s. The national average for 2009 was 6%. The 2009 data shows a marked rise from 2% in 2004 when MidCentral was close to the national average of 1%.

MidCentral HNA work includes all health specialties whereas epidemiological work which has supported the DMGs excludes M05s. The national Ambulatory Sensitive Hospitalisation (ASH) indicator data also excludes M05s for admissions where LOS = 0. MidCentral has historically reported a low SDR for angina. Figure 40 below shows the difference in the SDR for angina and chest pain with M05s included and excluded. Each SDR is a single point in time and identifies the distance between MidCentral and the national average (so does not provide a trend of actual volume). The result with M05s excluded may not provide a fair representation of the relative proportion of chest pain and angina. This is because another DHB may have coded similar Day 0 admissions to another health specialty. In 2009, 83% of all MidCentral cardiology day 0 admissions were coded as M05; this was much more than the national average of 47%. However, even when M05s are included the number of MidCentral angina and chest pain discharges is very different to that of New Zealand. Discharges rose steeply in 2005 and nearly doubled over the decade compared to 21% nationally.

Figure 40: Angina and chest pain SDRs 15-74 yrs (new definition) – financial years 2001-2010



Source: MoH. Source Archived NMDs data passed through the WIESNZ09 Casemix Filter and the ASH filter. Count is set to 1 for each event. Data provided by MoH.

Change in Myocardial Infarction SDRs

MidCentral’s SDR results for MI also present an unusual pattern. Between 2001 and 2004 MidCentral’s SDR was not significantly different to the national SDR and a rise in actual discharges was seen (MidCentral and New Zealand overall) due to a change in the diagnostic criteria for ACS. A ‘step’ rise then occurred with the ratio rising to 1.18 in 2006 and remaining high since. Table 28 highlights the higher cumulative percentage for MidCentral over the 10 years. The number of events coded to MI has nearly doubled over the period compared to a much smaller rise nationally. The difference appears too great to attribute to increasing illness of the MidCentral population; a possible explanation is coding practices.

Table 28: Myocardial infarction discharges 15 – 74 years, for MidCentral and New Zealand, last 10 years

	MDHB		National	
	# Discharges	Cumulative % change	# Discharges	Cumulative % change
2000/01	220		5,071	
2001/02	254	15%	5,677	12%
2002/03	254	15%	6,461	24%
2003/04	310	41%	6,815	27%
2004/05	348	58%	7,206	31%
2005/06	396	80%	7,447	33%
2006/07	410	86%	7,365	31%
2007/08	396	80%	6,976	26%
2008/09	364	65%	6,693	23%
2009/10	418	90%	7,167	31%

Source: MoH. Source Archived NMDs data passed through the WTESNZ09 Casemix Filter and the ASH filter. Count is set to 1 for each event. M05 events where the event start date and event end date are the same are excluded.

Availability of data

This project required data for the MidCentral population which can be extracted from the national database using ‘business objects.’ Cardiology procedures could not be withdrawn by this method and had to be provided by the Ministry. This limited the scope of the analysis.

Community cardiology data – multiple issues

Central PHO and MidCentral Health both collect data for the community cardiology clinics. There were data quality problems with both sets of data.

The recent data request to Central PHO resulted in different volumes for cardiologist and technician clinics being provided than that previously provided in reports to MDHB. The volumes (particularly the breakdown of FSA to follow-up but also the totals to a lesser degree) ‘kept moving.’ Significant discrepancies were also identified in the MidCentral Health data. Cardiologist clinic volumes are also entered into HOMER. This enables notes to be pulled for clinic and visit details to be available on the system if the patient accesses other MidCentral Health specialist services.

Given the desirability of presenting a DHB wide picture of activity and to investigate the issues more fully, cardiologist FSA data was analysed in more detail. This included a match of Central PHO and MidCentral Health Cardiologist FSA data. Community cardiologist FSAs were matched with MidCentral Health data and found to be a poor match (refer Table 29 below). This brings into question the reliability of the data.

Table 29: Difference in community cardiologist volumes by source

Source of data	2008/09		2009/10	
	FSA	FU	FSA	FU
Central PHO (Cardiology project data request)	432	197	479	439
MidCentral Health	421	141	529	336

There were significant data entry errors in the MidCentral Health data, the most important being that community cardiology volumes had been entered and counted as MidCentral Health volumes (the FSAs volumes in question are 61 (2007/08) 51 (2008/09) and 9 (2009/10) and many duplicate FSA causing overestimating of volumes.

There were also problems with Central PHO data which inaccurately differentiated types of appointments (FSA, FU) and attendance (DNAs, cancelled) affecting ability to analyse FSAs and accuracy of volumes reported. Of the 1114 community cardiologist FSAs reported by Central PHO, the MidCentral Health system recorded 131 as DNA or cancellation and 58 NHIs were not on the system at all. Compass Health staff did a manual check of these NHIs to check for a record of attendance. The results of this check were:

- Attended – 62
- DNA or rescheduled but seen at a later date – 63
- DNA – 64

So one third of the 189 FSAs or 5.7% of total FSAs reported did not attend an appointment.

The MedTech system does not have an ‘attended’ check box on the screen used to enter the provider name and the time a patient is seen. Another screen does (called the screening template) and this was used for 70 to 80% of appointments in the second half of 2010.

Other observations

- Central PHO data definitions are not consistent with national data definitions with some FSA patients appearing to fit the definition of a follow up consultation. To a lesser extent this also applies to MidCentral Health.
- Cardiologist volumes are not submitted to national collections which prevents a DHB wide view of activity.
- An inherent inefficiency exists with two organisations entering data for Cardiologist clinics. The process must also negotiate two organisations which may have contributed to the data quality issues.
- Referrer information is not available except when made by e-referral which is a small proportion of total referrals (about 20% of referrals to the cardiologist). On the MidCentral Health dataset, referrer is entered as ‘GP unknown’ as the referral is not seen. Data on referral onwards for additional secondary and tertiary interventions is not being kept.
- Cardiac nursing services are not differentiated by type of service e.g. Cardiac Rehab and Heart Failure.
- When nurses assist the cardiologist in clinic at Horowhenua this is counted as a nurse contact as well as a cardiologist contact.
- The community cardiology booking clerk at MidCentral (0.5FTE) is funded by Central PHO as part of the Cardiologist / technician subcontract held by MidCentral Health although the financial breakdown is not specified in the contract. This position recently had sizeable MidCentral Health responsibilities (booking of other cardiology testing clinics) which caused workload issues and the position does not appear to be well linked into Compass processes. The position is currently being reviewed.

Appendix E – Stakeholder interviews

The following provides notes of the discussions with stakeholders that interact with cardiology services.

Internal Medicine

A good service is provided but it is restricted with only two cardiologists for MidCentral. As cardiology is a referral rather than admission service all patients after hours get admitted under general medicine. This allows general physicians to maintain a good level of competence in dealing with cardiology patients. Several were concerned that if the service should change to an admission service that physician skills would be lost and there may be vulnerability issues when there was turnover in cardiologists. Most physicians are comfortable with the current complexity of cardiology conditions that they manage saying that heart failure and IHD is a huge part of general medicine. One said general medical input into ACS (particularly STEMI) was minimal except for elderly and those not having intervention – but that this did depend on cardiologist availability. Likewise cardiologist availability does affect the management plan which may tend to become more conservative at times. One thought general medicine should be doing more which would help with demand while others thought that other professional groups such as nursing and technicians could be better utilised.

Outpatient streaming usually occurs at referral stage, small numbers diverted after arrival. Small numbers are referred to cardiology by physicians at outpatient assessment stage and in general physicians refer very selectively e.g. troublesome heart failure. However some said this was tempered by knowledge of lack of availability of cardiologist for outpatient services.

Issues

- Cardiologist availability out of hours – This was a frustration for most with insufficient support for acute cardiology and pacemakers. Cardiologist cover is needed for complex cases and those needing intervention. Cardiologists do come in if available but this not certain (one less cardiologist available to ring now) and undue time can be spent trying to track down a cardiologist – this delays management and adds to workload. One thought this could be solved with pacemaker training.
- Pacemakers were mentioned by most. Example - a patient required a temporary pacemaker wire. A cardiologist could not be raised so the on-call physician inserted the wire. The physician was not credentialed for this procedure and had not performed one for 10 years. It would not have been possible to send the patient to Wellington. General physicians can perform this procedure (and do in small places) but the issue is training combined with enough frequency to maintain skills. Some physicians want to be trained (was a plan in place to do this which at least one would like to see implemented) while others are not comfortable undertaking training due to the need to manage potential complications.
- Insufficient availability of diagnostics.
- Echo. Variable views. Could do a lot more, can affect management if unable to diagnose aortic stenosis or murmurs or heart failure (often have to go with BNP and Chest Xray for the latter). Routine echo is useful but can manage without it (other information available to assist diagnosis). One physician wanted training to use the machine in ED, OT, ICU.
- ETTs to meet chest pain pathway criteria (managed by cardiology).
- Rhythm monitoring – need more cardiologist availability.
- Angiography – waiting time too long, can contribute to bed block, should be doing more here.
- Wait for nuclear perfusion scans too long – impacts on assessment and management.
- More cardiologists – all but one advocated growing the service (however preferred a referral service although handovers could also occur in the weekend).

- Junior need training in cardiology procedures e.g. some have special interest and should be selected. Could be doing exercising for nuclear scans.
- Increased utilisation of nursing – other areas have more nursing input into cardiology – this is needed to manage demand and is effective and cost efficient. Respiratory NPs see FSAs, non-urgent endocrinology workload is devolved to specialist nursing.
- Provisional echo reports needed e.g. Canterbury reports come back with patient.
- IT backward – MDHB issue. Letters and reports should be sent to primary electronically, should be able to look at patient information from outside hospital. Two Éclair sites – should be put together.
- Leadership for protocols is an important role for the cardiologists ensuring cardiology care is appropriate and supervision / training of juniors.
- Relationships with primary needs further development – advice should be more readily available e.g. e-mail.
- Audit required for service evaluation.
- Other technologies will be coming (e.g. MR and CT' angio) and will affect the need for diagnostic angiography

Paediatric cardiology

There are a number of groups of cardiac patients that are managed by the local paediatricians including patients with either a defect waiting for surgery or already operated on and requiring follow-up. One paediatrician co-ordinates the care of cardiac patients in most instances is the “go-to” person for the other paediatricians in the hospital, the interface with Starship and can read echos.

- Since the end of 2009 there has been no sonographer who could perform an adequate paediatric echo for diagnostic purposes. This should be available preferably with after-hours access but at a minimum during office hours. A technologist has trained at Starship recently.
- Since the retirement of the cardiologist with an interest in echo there now is no-one to read and report studies in Palmerston North for paediatric patients.
- Upskilling of a paediatrician or cardiologist in echo is advisable. Outsourcing echo to visiting sonographers from Starship would be expensive and not solve the problem of diagnosis in the acutely unwell infant or child and would mean patients would have to travel to Starship at times for routine diagnostic procedures.
- Access to diagnostics is suboptimal - ECG's, ETTs, holters and event monitors, interrogation / adjustment of pacemakers and tilt table tests or nil since the cardiologists retirement.
- The service has unravelled since mid year, echo requests being returned, messages “we don't do children,” parents being told to ring Paediatricians about when echos will be done and feeling cast adrift. Children and babies being sent away to get echo interpreted.

Palliative care

Cardiology respiratory and renal services have provided regular input for a several years and there are formalised meetings.

- Heart failure has been the main area of attention. Most heart failure patients admitted under general medical – management in a dedicated cardiology ward would improve care
- Other possibilities are improved discussions around prognosis and communication regarding future planning and decision making particularly in regard to Integrated Care Pathways.

Surgical pre-assessment

Anaesthetists see medically compromised patients prior to surgery. An estimated 5-7 patients a week are referred for an opinion about surgical risk from a cardiac point of view. Typical conditions that patients being referred have include aortic stenosis, valvular conditions, unstable IHD, uncontrolled arrhythmia and suspected cardiomyopathy.

The process has changed recently. Previously referral occurred primarily at anaesthetic assessment – this usually meant the patient had 2 anaesthetic appointments and increased time waiting for surgery. A system was introduced approximately 6 months ago whereby where possible patients are identified for cardiologist opinion at the time of referral for surgery. A new project “Elective Service Productivity and Workforce Programme” kicked off 30 November at MidCentral which aims to improve elective processes and throughput. Formalising processes such as obtaining cardiologist opinion prior to anaesthetic assessment falls under the scope of this project. This may increase referrals.

Cardiology assessment is also required an estimated 2 to 3 times weekly for patients undergoing emergency surgery. For instance surgery may be indicated for a patient who has a severe aortic stenosis or a suspected MI. Cardiopulmonary exercise testing is being introduced in conjunction with respiratory services. This test is a good predictor of how some patients will respond to surgical stress and may reduce referrals to cardiology. Issues / comments are:

- The waiting time for pre-surgical cardiology opinion is often too long and there can be delays of months in severely compromised patients.
- Delays in elective investigations such as ETTs and echos
- Delays in obtaining echo for emergency patients and lack of report. Expectation would be that echo was performed on the next available elective session with immediate provisional report.
- Support for pacemakers and ICDs out of hours - In hours no problem, follow joint protocol however out of hours an issue if settings need to be altered.
- Most pacemakers are done as emergencies due to limited scheduled cardiology OT time available (however few are actually emergencies). This means at times that acutes and emergencies have to fit around cardiology workload.
- Reporting is not timely – the patient may attend anaesthetic clinic without a clinic letter or echo report. Much time can be spent chasing these up.
- Providing feedback to anaesthetists on appropriateness of referrals may decrease referrals. Also providing guidelines to treat simple conditions.

Emergency Department

- Thrombolysis – ED perform audit (door to needle). The standard is unclear. This is used only by ED and there is no analysis.
- Management of patients with chest pain (potential ACS) unclear since movement to high sensitivity troponins. Will affect admission rate, working with cardiologist on this.
- ETTs – availability is an issue. Previously policy was ETT within 3 weeks if negative Trop T but have been asked not to refer. Cardiology monitors and reads reports.
- Availability of cardiologist for advice out of hours is an issue as there is no acute roster. Also cardiologist / physician for temporary pacing (external pacing is uncomfortable).
- Most patients get admitted to general medical Ideally, cardiology should be involved with more patients.

Nuclear Medicine

Nuclear scans a diagnostic tool for some groups of cardiology patients.

- Waiting time for scans is too long - has increased slightly recently and has been up to 4 months. Referrals decrease when waiting list rises.
- Volume reliant on nuclear medicine physician so no tests performed when on leave.
- This service is not offered at some DHBs – alternatives are stress echo (not offered at MidCentral) and angio so would be likely to increase angio intervention rate.

- Take team approach to increase volumes. Exercise component of test can be performed by cardiologist/ registrar or nuclear med physician. Reporting can be outsourced when necessary.

Operating Theatre and Gastroscopy

Permanent pacemaker implantations performed in theatre. There is one 3 ½ hour session per week shared by cardiology and respiratory. Sometimes a spare list is available on Monday afternoon which is given to cardiology. Trans-oesophageal echo (TOES) are performed in gastroenterology.

- Inadequate theatre time – can only fit 1 pacemaker and 1 battery change on list if 2 bronchoscopies, juggling act which sometimes happens on the day.
- CAPEX application being prepared to enable bronchoscopies to be performed in Gastro unit. (\$30k budgeted). Waiting for information on air changes, no problem with putting door in, expected to be done by winter.
- A dedicated Cath Lab would allow more flexible scheduling.

Radiology

- No opportunity to increase angiography sessions except for Friday afternoon.
- Nursing staff issues – sometimes difficult to supply nurses and also issues keeping upskilled. One nurse cannot stay later than 4.30.
- Insufficient space for echo in department. Often need room for women's procedures and it is inappropriate to share space. Clogging of working area and computers.
- DSA machine being replaced shortly – need to know whether cardiology componentry is required.
- Dedicated cath lab and dedicated cardiology nursing team would solve the problems. Could share MRT position.

Intensive Care Unit

Cardiologist assessment mostly required on a same day basis. Maybe needed to assist with determining diagnosis e.g. sepsis (suspected endocarditis) and acute valvular lesions and tapping into referral pathway for cardiology patients, sometimes arrhythmia and pacing. Volumes are not known but not high. Echo is an important diagnostic tool which can add to prognostic certainty and affects the degree and duration of support offered. Indications including organ donation, acute valvular lesion, cardiac dysfunction, suspicion of tamponade, post coronary syndrome, therapeutic hypothermia and pulmonary embolus. Issues / comments:

- Availability of cardiologists – obliging but can be hard to track down (no formal on call). 24/7 cover a reasonable expectation for a place the size of PN.
- Availability of echo – after-hours /weekend particularly an issue but even in hours can be difficult.
- Echo reporting -need a technical report, previously this was provided verbally by one of the technologists.
- TOEs are provide afterhours by negotiation but do not have technician support.

Primary providers

- Ambulance services have significantly contributed to improved cardiac outcomes.
- Private volumes may be significant – a prior review found that 55% of surgery was provided in private hospitals.
- Waiting lists for GP services affect access, 2,000 patients are on the waiting list for a GP in Horowhenua.
- Opportunities are:
 - Developing decision tools such as the TIA pathway.

- Reducing referrals by providing direct access to diagnostics, advice such as the e-mail service renal provides and more and regular education.
- Reminder systems to reduce DNAs.

Angioplasty - PCI

A range of views were held across the primary and secondary stakeholder groups about whether PCI should be provided in PN. Some said it was just a matter of time, that it is the gold-standard and is vital in order to attract cardiologists and that the service would not be able to develop without PCI. An advantage would be to provide elective PCI when the indication discovered during angiography. Others were concerned that MDHB may not be large enough or have sufficient demand to justify the size of the overall investment. The point was made that 4-5 cardiologists and more nursing and technical staff would be needed to provide an acute service including rescue PCI. Balloon pumps for cardiogenic shock require IABP (bridging support until revascularisation possible).

Appendix F – Data supplement

MidCentral DHB geography and demography

The MidCentral DHB covers four complete territorial authorities (TLAs) and part of a fifth. The TLAs covered and populations (2006 census ‘usual resident count’) are:

- Palmerston North City Council (main urban area is Palmerston North) – 75,543, 48%
- Horowhenua District Council (main towns are Levin and Foxton) – 29,865, 19%
- Manawatu District Council (main town is Feilding) – 28,254, 18%
- Tararua District Council (main towns are Dannevirke and Pahiatua) – 17,634, 11%
- Part of Otaki ward (Kapiti Coast District Council) – 7,551, 5%

The total 2006 census ‘usual resident count’ was 158,847. MidCentral DHB’s demographic characteristics are:

- The population of MidCentral district is increasing, although at a slower rate than New Zealand overall (2.5% compared to 7.8% respectively in the last census). Growth is not even across its TLAs, with growth occurring mostly in Palmerston North.
- Like New Zealand, MidCentral district’s population age balance is getting older and this is expected to continue. MidCentral has a slightly older population compared to New Zealand overall (14.1% compared to 12.3% of people aged 65 and older). The distribution of older people is uneven across the MidCentral district. Otaki and Horowhenua have higher proportions of older people; Palmerston North has a lower proportion of older people.
- MidCentral’s proportion of Māori residents is higher than New Zealand overall (17.3% compared to 14.6%). The proportion of Māori in the MidCentral district is increasing and this trend is expected to continue.
- MidCentral’s proportion of Pacific residents is lower than New Zealand overall (3% compared to 6.9%).
- The age balances of Māori and Pacific populations are younger – with greater proportions of younger people and lesser proportions of older people compared to non-Māori, non-Pacific populations.
- In general, MidCentral has slightly higher proportions of socio-economically disadvantaged populations than New Zealand overall (using NZDep study results).
- The Horowhenua, Otaki, and to a smaller extent, Tararua have higher proportions of residents who are socio-economically disadvantaged (using NZDep study results) than MidCentral overall.

GP Utilisation

Consultation rates in general practice are an indicator of access to primary care services. Data was provided by Central PHO. Figure 41 shows that Māori have similar consultation rate to ‘other’ when data is age standardised. Table 30 shows the distinct annual cycle.

Figure 41: Consultation rates by ethnicity for the 2010 calendar year

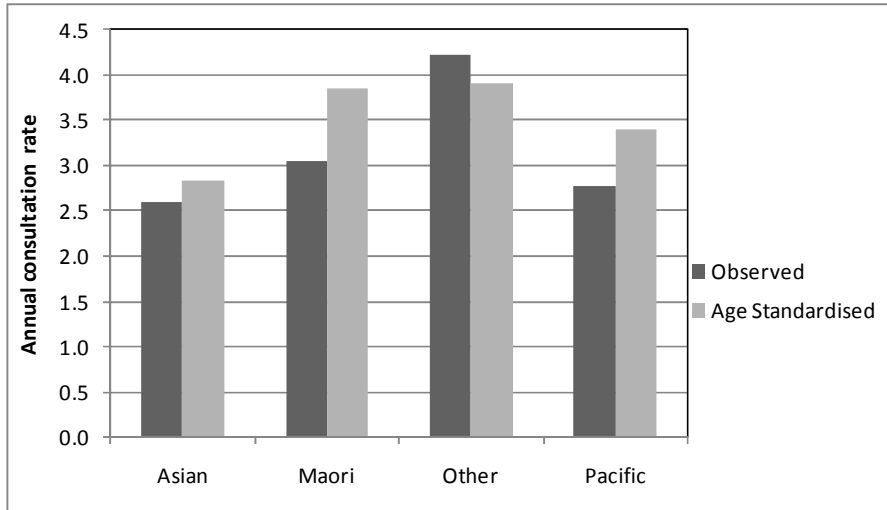
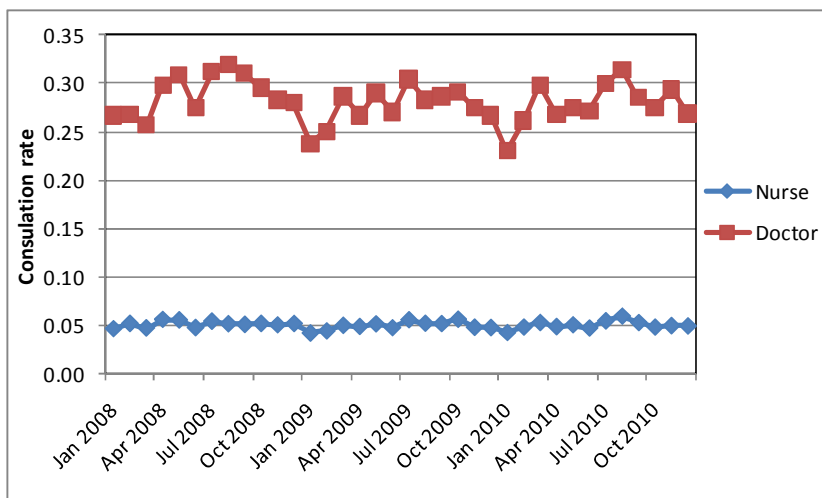


Table 30: Trend in consultation rates by ethnicity (observed and age standardised) – 2009-2010

Quarter	Asian		Maori		Other		Pacific	
	Observed	Age Standardised	Observed	Age Standardised	Observed	Age Standardised	Observed	Age Standardised
Q1 2009	0.58	0.65	0.72	0.94	0.95	0.91	0.62	0.79
Q2 2009	0.66	0.70	0.79	1.01	1.03	0.98	0.69	0.85
Q3 2009	0.73	0.79	0.83	1.04	1.08	1.03	0.80	0.95
Q4 2009	0.67	0.74	0.75	0.99	1.02	0.97	0.63	0.81
Q1 2010	0.61	0.67	0.70	0.93	0.98	0.93	0.71	0.87
Q2 2010	0.65	0.70	0.75	0.96	1.00	0.95	0.70	0.89
Q3 2010	0.73	0.78	0.85	1.07	1.11	1.06	0.77	0.92
Q4 2010	0.63	0.70	0.74	0.97	1.03	0.98	0.64	0.80

Nurses provide a low proportion of consultations which no change seen over the last 2 years.

Figure 42: Monthly consultation rates by doctor or nurse



Mortality

This section provides analysis of circulatory system and IHD mortality. There were two distinct pieces of mortality analysis completed during the project. The first piece of analysis looked at recent trends in circulatory system disease and IHD mortality replicating the methods used in the MidCentral DHB HNA and

Trend data is presented for the years 2000-2007 using age standardisation rates per 100,000. This is done to compensate for the differences in age balances that might be present in the different groups e.g. mortality rates are higher for older age groups. Therefore, populations with higher percentages of older people will have higher population mortality rates due to differences in age balances rather than differences in health status. The Māori population has a much younger age structure than New Zealander Europeans which largely make up the 'Other' ethnicity group.

The second method used is another form of age adjustment (called indirect age adjustment) which can be more appropriate where there are small numbers and several years data is analysed together. MidCentral health data, when sub-divided (for example, by ethnicity, or disease, or sub-district), often gives small numbers. In indirect age adjustment, one of the population groups is set as a reference population, and then all the other groups are compared to it. Confidence intervals at 95% are provided (95% chance the real life value of the age adjusted ratio lies between the confidence limits) to indicate statistical significance. The following analysis calculates indirect age adjusted ratios with 2003-2007 data combined.

Trends in circulatory system disease and IHD mortality by ethnicity

Table 31 below shows the number of deaths from circulatory system disease and IHD for MidCentral ethnic groups between 2000 and 2007.

Key point

- Absolute numbers of deaths for 'all ethnicities' and Māori are declining for circulatory disease and relatively static for IHD (numbers for Pacific are too small to interpret).

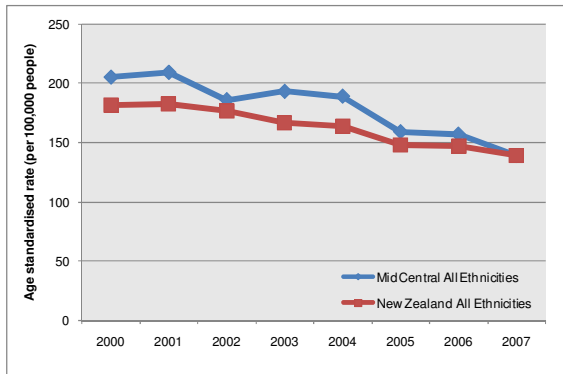
Table 31: Circulatory and IHD raw deaths 2000-2007

MidCentral DHB Mortality 2000 to 2007								
	2000	2001	2002	2003	2004	2005	2006	2007
Circulatory System Disease								
Māori	43	38	38	35	37	30	31	31
Pacific	7	5	3	1	5	3	2	5
Other	501	556	508	543	536	466	488	422
All Ethnicities	551	599	549	579	578	499	521	462
Ischaemic Heart Disease								
Māori	25	28	22	22	19	19	19	23
Pacific	3	1	1	1	4	2	1	2
Other	267	298	263	300	279	267	277	244
All Ethnicities	295	327	286	323	302	288	297	269

Age adjusted trends are shown in the following figures using the same axes for comparison. Improvements can be seen in the mortality rates for circulatory disease and IHD for MidCentral and New Zealand. The MidCentral 'all ethnicities' rates is higher than New Zealand but the gap appears to be closing with rates converging by the end of the period. The improvement appears more marked for circulatory disease (gap larger at the beginning of the period). This is particularly so for Māori which is below the New Zealand Māori rate by the end of the period. For IHD, MidCentral rates for Māori are

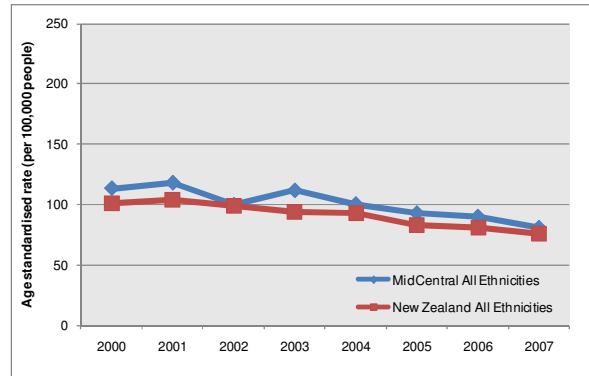
similar to national (about twice the ‘all ethnicities’ rate). Pacific rates are not shown due to the small numbers.

Figure 43: Circulatory Mortality 2000 to 2007, Age adjusted



Note: Age adjusted to WHO Standard Population

Figure 45: IHD Mortality 2000 to 2007, Age adjusted



Note: Age adjusted to WHO Standard Population

Figure 44: Circulatory Mortality 2000 to 2007, Age adjusted

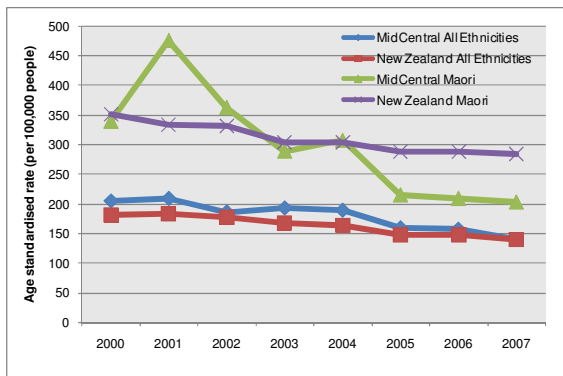
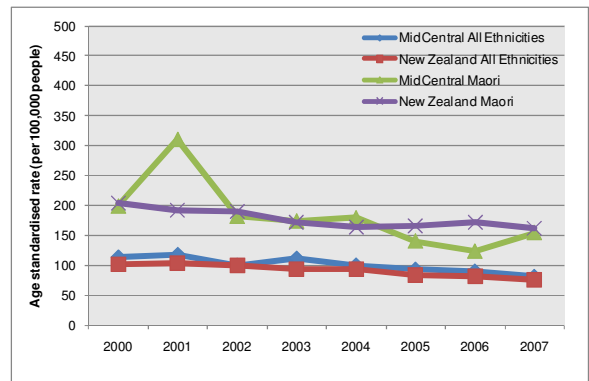


Figure 46: IHD Mortality 2000 to 2007, Age adjusted



Key points

- There were improvements in the mortality rates both for circulatory disease and IHD for MidCentral and New Zealand across the 7 years period. Rates had almost converged by the end of the period.
- Reductions in age adjusted mortality for IHD was less than reductions in circulatory disease mortality (gap was larger at the beginning of the period)
- Circulatory disease and IHD mortality rates are much higher for Māori than ‘other ethnicities.’ However, MidCentral Māori rates for circulatory disease improved more than for New Zealand Māori and were much lower than the New Zealand rate for Māori by the end of the period.

Five years data was combined to calculate indirect age adjusted ratios, which is presented in Table 32.

Table 32: MDHB and NZ Mortality by ethnicity 2003 - 2007 - Circulatory System and Ischaemic Heart Disease

MidCentral DHB, and New Zealand Mortality 2003 to 2007 Combined Indirect Age Adjustment								
Ethnic group	Circulatory System Disease				Ischaemic Heart Disease			
	MidCentral		New Zealand		MidCentral		New Zealand	
	Age adjusted ratio	95% conf limits	Age adjusted ratio	95% conf limits	Age adjusted ratio	95% conf limits	Age adjusted ratio	95% conf limits
Māori	1.98	1.68 - 2.29	2.28	2.21 - 2.35	2.05	1.65 - 2.44	2.24	2.16 - 2.33
Pacific	1.27	0.65 - 1.89	1.98	1.88 - 2.07	2.07	0.79 - 3.35	1.76	1.64 - 1.87
Other	1.04	1 - 1.08	0.94	0.93 - 0.94	1.06	1.01 - 1.12	0.94	0.93 - 0.95
All Ethnicities	1.08	1.04 - 1.12	1.00		1.10	1.05 - 1.16	1.00	

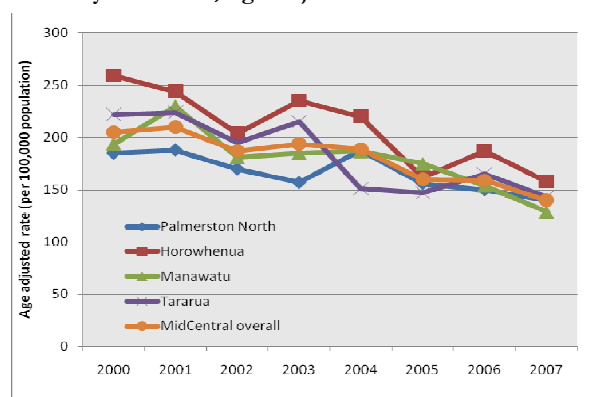
Key points

- In-direct age adjusted analysis supports the picture seen with age adjusted trends for circulatory disease. MidCentral's circulatory disease mortality rate has continued to improve with a result of 8% above the New Zealand 'all ethnicities' rate. The gap with New Zealand has continued to shrink when looking at the results presented in the 2005 and 2008 Health Needs Assessments (15% and 11% respectively for 'all ethnicities').
- IHD mortality results were worse than circulatory disease and were 10% above the New Zealand 'all ethnicities' rate. Mortality rates for IHD were not analysed in the 2008 Health Needs Assessment so no comparison with previous rates was available.
- Circulatory disease mortality for MidCentral Māori has improved as shown in Figure 44. This was also seen in the in-direct age adjusted analysis. Rates for MidCentral Māori rate was about double (98%) that of New Zealand 'all ethnicities' but had improved from 122% in the 2008 HNA. The MidCentral rate for Māori was slightly better than for New Zealand Māori which was 128% above New Zealand 'all ethnicities' rate.
- IHD mortality rates for MidCentral Māori are also about twice the New Zealand 'all ethnicities' rate (105%) but slightly better than for New Zealand Māori (124% above New Zealand 'all ethnicities').
- MidCentral Pacific rates were not able to be analysed due to small numbers. The New Zealand age adjusted trend for Pacific also shows declining rates for circulatory disease and IHD and sat at nearly double the 'all ethnicities' rate by the end of the period. The non-direct age adjusted rates were 98% above New Zealand overall for circulatory disease and 76% above for IHD.

Mortality by territorial area (TLA)

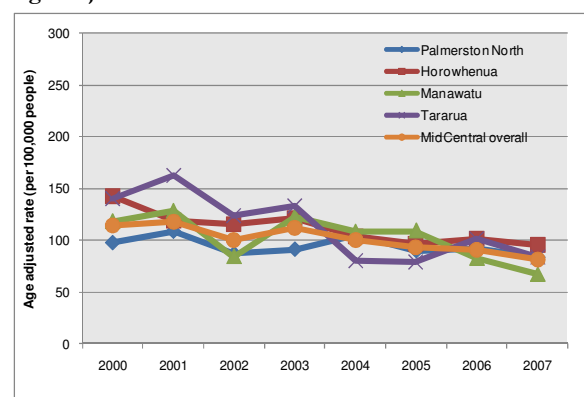
Age adjusted circulatory disease and IHD mortality by TLA is shown in Figure 47 and Figure 48 (Kapiti is not shown due to small numbers). In relation to circulatory disease mortality the 2008 HNA identified that Horowhenua rates were higher than MidCentral overall and conversely that Palmerston North rates were lower. The following graphs show that although Horowhenua rates are still higher at the end of the period there is a general converging of rates across all TLAs.

Figure 47: MidCentral TLA Circulatory Disease Mortality 2000- 2007, Age Adjusted



Note: Age adjusted to WHO Standard Population

Figure 48: MidCentral TLA IHD Mortality 2000-2007, Age Adjusted



Note: Age adjusted to WHO Standard Population

In-direct age adjusted ratios by TLA are presented in Table 33. These results are not in line with the trend graphs above. This is likely due to the need to include 5 years data to calculate the indirect ratios – the ratios will reflect the high rates seen particularly at the beginning of the period. In-direct age adjusted rates were not presented by TLA in the 2008 Health Needs Assessment so no comparison is possible with earlier periods.

Key points

- TLA trend analysis showed some convergence by the end of the period for circulatory disease and IHD mortality. However, Horowhenua yearly rates were still higher than the other TLAs for circulatory disease mortality across the whole period. This was less marked for IHD where the higher rates for Horowhenua and Tararua at the beginning of the period had somewhat converged with the other TLAs by the end of the period.
- Most TLAs did not achieve significance in the TLA non-direct age adjusted analysis due to small numbers. Horowhenua had high rates for both circulatory disease and IHD mortality (19% and 17% above New Zealand overall) and Manawatu had a high rate for IHD mortality (15% above New Zealand overall).

Table 33: MDHB Mortality by TLA 2003 - 2007 - Circulatory System and IHD

MidCentral DHB Mortality 2003 to 2007 Combined Indirect Age Adjustment (NZ overall is used as the comparison population)								
Territorial Authority (TLA)	Circulatory System Disease				Ischaemic Heart Disease			
	No. of events	Crude rate/ 100,000	Age adjusted ratio	95% conf limits	No. of events	Crude rate/ 100,000	Age adjusted ratio	95% conf limits
Horowhenua	735	2390	1.19	1.1 - 1.27	397	1290	1.17	1.05 - 1.28
Manawatu	423	1460	1.09	0.99 - 1.19	247	855	1.15	1.01 - 1.3
Tararua	286	1580	1.05	0.93 - 1.18	164	904	1.10	0.93 - 1.27
Palmerston North	1051	1350	1.04	0.98 - 1.1	602	776	1.09	1 - 1.18
Kapiti (MidCentral portion)	144	1870	1.05	0.88 - 1.22	69	898	0.90	0.69 - 1.11
MidCentral overall	2639	1620	1.09	1.05 - 1.13	1479	907	1.11	1.05 - 1.16

IHD mortality across a decade

The analysis above indicates an improving picture for cardiovascular outcomes. However, cardiovascular mortality includes cerebrovascular conditions (such as stroke). IHD mortality is commonly used as a more targeted indicator of cardiology service provision. As stated in body of the report, mortality from coronary heart disease has been falling internationally for several decades and frequently the decline has been of the order of 20% to 30% per decade. Because IHD mortality was not analysed in the 2008 HNA the level of longer term improvement was not clear for IHD. Therefore a second piece of analysis was completed looking at the change in IHD mortality over the last decade.

The data is a comparison of two periods: 1995 to 1997 and 2005 to 2007 for both MidCentral and New Zealand. Each period has 3 years of data included to avoid the problem of yearly fluctuations of MidCentral's rates due to smaller numbers. Direct age adjusted rates, crude rates, and raw numbers have been provided in the tables below. Ninety-five percent confidence intervals have been calculated for the age adjusted rates and crude rates.

Key points

- Improvement in age adjusted mortality for both MidCentral and New Zealand.
- The reduction in IHD mortality for the MidCentral district was less than for New Zealand (23% versus 31%).
- The MidCentral and New Zealand age adjusted rates were similar for the first period (1995 to 2007), but New Zealand rate was lower for the second period (2005 to 2007). This difference is statistically significant.
- MidCentral's crude rates remain very similar across the two periods, even though the age adjusted rates declined (by comparison, New Zealand's crude rates fell across the period).
- MidCentral's raw number of deaths actually increased across the period.

When compared to the improvement in MidCentral's age adjusted mortality rates, this suggests mortality has been affected by MidCentral's ageing population structure and there were more people in the older age groups in the second period – more people at risk of IHD mortality.

Table 34: MidCentral and New Zealand IHD Mortality for Two Periods: 1995-1997 and 2005-2007 (Age Adjusted to WHO Standard Pop.)

	1995 - 1997		2005-2007		% change
	Age adjusted rate (per 100,000)	95% confidence interval	Age adjusted rate (per 100,000)	95% confidence interval	
MidCentral	350	326 - 373	271	252 - 289	-22.7
New Zealand	350	345 - 355	240	236 - 244	-31.4

Table 35: MidCentral and New Zealand IHD Mortality for two Periods: 1995-1997 and 2005-2007 (Crude rates - non-age adjusted)

	1995 - 1997		2005-2007		% change
	Crude rate (per 100,000)	95% confidence interval	Crude rate (per 100,000)	95% confidence interval	
MidCentral	518	483 - 553	516	481 - 550	-0.5
New Zealand	489	482 - 496	419	413 - 426	-14.2

Table 36: MidCentral and New Zealand IHD Mortality by two Periods: 1995-1997 and 2005-2007

	1995-1997	2005-2007	% change
MidCentral	839	854	1.8
New Zealand	18244	17353	-4.9

Hospitalisations

The first part of this section provides a snapshot of cardiology hospitalisations at MidCentral Health. Emergency medicine discharges (M05s) are excluded.

Profile of hospitalisations - MidCentral Health

The following shows the breakdown of cardiology hospitalisations by ICD sub-block and reflect the ICDs used in the project. Primary diagnosis code is used. IHD makes up just over half of cardiology related admissions.

Table 37: Cardiology hospitalisations by ICD Block – 2009/10

ICD Block Title	Sub-Block Code	Sub-Block Title	Total	Proportion of total
Diseases of the circulatory system	I00-I02	Acute rheumatic fever (I01 only – chronic with heart involvement)	1	0.1%
	I05-I09	Chronic rheumatic heart diseases	8	0.5%
	I10-I15	Hypertensive diseases	27	1.6%
	I20-I25	Ischaemic heart diseases	936	54.1%
	I30-I52	Other forms of heart disease	699	40.4%
Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	R00-R09	Symptoms and signs involving the circulatory and respiratory systems	58	3.4%
Grand Total			1729	100.0%

When grouping by major condition the proportion of discharges is as follows.

Table 38: Cardiology hospitalisations by condition – 2009/10

Condition		Sub-condition and ICD code	
Acute Coronary Syndrome	51.9%	Angina (I20)	20%
		Myocardial Infarction - non-STEMI (I21.4-I22)	27%
		Myocardial Infarction – STEMI (I21-121.3)	5%
Heart Failure	19.0%	Heart Failure (I50)	19%
Arrhythmias	17.6%	Atrial fibrillation (I48)	12%
		Other arrhythmias (I44-I47, I49)	6%
Other	11.0%		11%
Rheumatic heart disease	0.5%	Rheumatic heart disease I01, I05-09	0.5%
Grand Total	100%		100%

Most discharges (90%) are acute.

Table 39: Cardiology hospitalisations by admission type

Condition	#	Acute	Arranged	Waiting List
Acute Coronary Syndrome	898	88.29%	2.79%	8.92%
Heart Failure	328	96.95%	2.44%	0.61%
Arrhythmias	304	82.24%	2.63%	15.13%
Other	190	60.53%	14.74%	24.74%
Rheumatic fever with heart involvement	9	0.00%	87.50%	12.50%
Grand Total	1729	85.36%	4.46%	10.19%

Just over two thirds of people admitted are over 65 yrs. People admitted for heart failure are notably older.

Table 40: Cardiology hospitalisations - age proportions by condition

Condition	#	00-14 Years	15-24 Years	25-44 Years	45-64 Years	65 Plus Years	Grand Total
Acute Coronary Syndrome	898	0.00%	0.11%	3.79%	27.76%	68.34%	100.00%
Heart Failure	328	0.00%	0.00%	1.22%	17.68%	81.10%	100.00%
Arrhythmias	304	1.64%	0.66%	4.28%	29.61%	63.82%	100.00%
Other	190	3.16%	3.16%	11.05%	25.26%	57.37%	100.00%
Chronic rheumatic heart diseases	9	0.00%	0.00%	0.00%	62.50%	37.50%	100.00%
Grand Total	1729	0.64%	0.52%	4.17%	26.06%	68.62%	100.00%

The proportion of Māori admitted for heart failure is much higher than rates for other cardiology conditions except for rheumatic heart disease which has very low volumes.

Table 41: Cardiology hospitalisations - ethnicity by condition

Condition	#	NZ Māori	Other	Pacific Islander	Grand Total
Acute Coronary Syndrome	898	6.58%	92.42%	1.00%	100.00%
Heart Failure	328	16.16%	81.71%	2.13%	100.00%
Arrhythmias	304	4.61%	94.74%	0.66%	100.00%
Other	190	9.47%	89.47%	1.05%	100.00%
Chronic rheumatic heart diseases	9	50.00%	37.50%	12.50%	100.00%
Grand Total	1729	8.57%	90.21%	1.22%	100.00%

Breakdown by TLA. People from other DHB areas that received services at MidCentral have been excluded.

Table 42: Cardiology hospitalisations - condition and TLA

Condition	Horowhenua District	Kapiti Coast District	Manawatu District	Palmerston North City	Tararua District
Acute Coronary Syndrome	28.45%	4.13%	14.76%	43.33%	9.33%
Heart Failure	24.20%	4.14%	14.01%	43.95%	13.69%
Arrhythmias	25.80%	4.24%	18.37%	40.64%	10.95%
Other	24.86%	2.26%	14.12%	46.33%	12.43%
Chronic rheumatic heart diseases	28.57%	14.29%	14.29%	14.29%	28.57%
Grand Total	26.78%	3.99%	15.17%	43.18%	10.87%

There has been a slight decrease in the number of discharges over the last decade and decrease in length of stay (after a marked increase between 02/03 and 03/04).

Figure 49: Trend in hospitalisations by condition

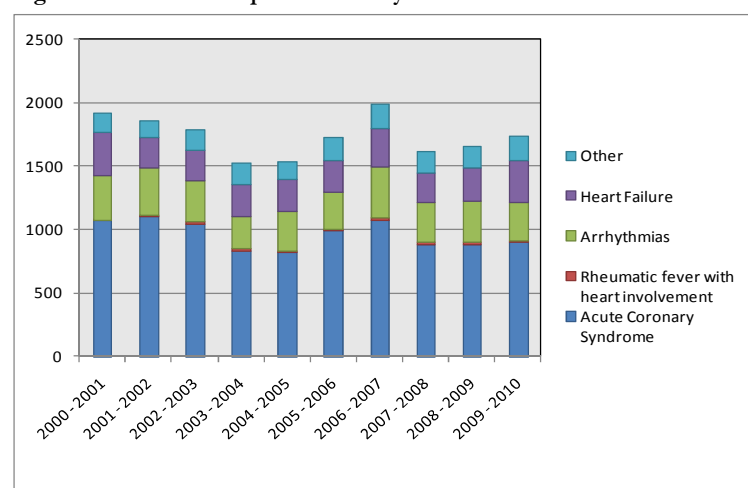
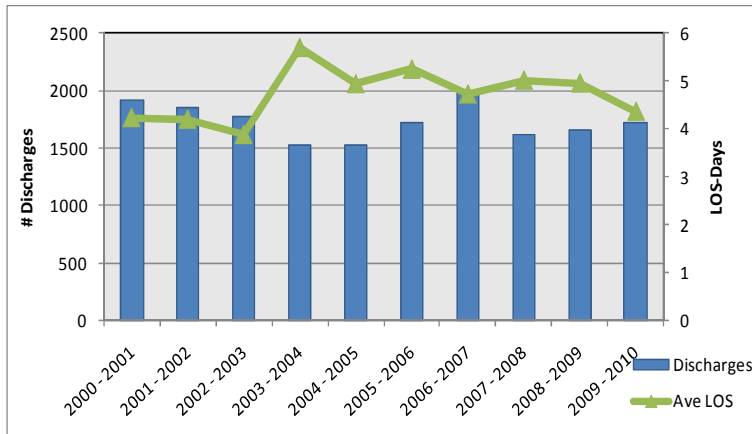


Figure 50: Trend in hospitalisations compared to LOS



Length of stay is much higher for heart failure than other cardiology conditions.

Table 43: LOS by condition - 2009/10

Condition	Discharges	Bed days	Ave LOS
Heart Failure	328	2292	7.0
Acute Coronary Syndrome	897	3771	4.2
Other	190	590	3.1
Arrhythmias	304	879	2.9
Chronic rheumatic heart diseases	9	0	0.0
Grand Total	1728	7532	4.4

Age adjusted analysis - MidCentral district population

Following is an analysis of hospitalisations for circulatory system diseases and the main cardiac conditions:

- Ischaemic heart disease
- Acute coronary syndrome
- Heart failure
- Arrhythmias

Age adjusted rates and indirect age adjustment methods are used. Emergency medicine discharges have been excluded. This is because MidCentral has one of the highest proportions of emergency medicine discharges nationally and this was found to distort the results.

Firstly the trends for circulatory disease and IHD are shown side by side.

Figure 51: Circulatory Hospitalisations 2002 to 2009 Age Adjusted (all ethnicities)

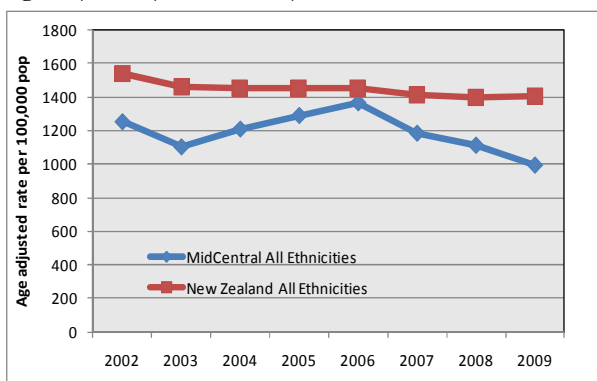


Figure 52: IHD Hospitalisations 2002 to 2009 Age Adjusted (all ethnicities)

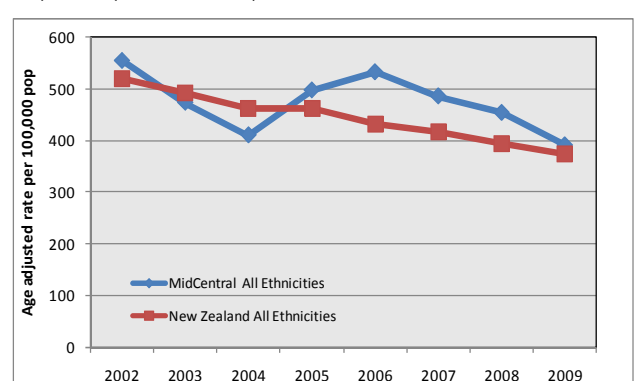


Figure 53: Circulatory Hospitalisations 2002 to 2009 Age Adjusted (All ethnicities and Māori)

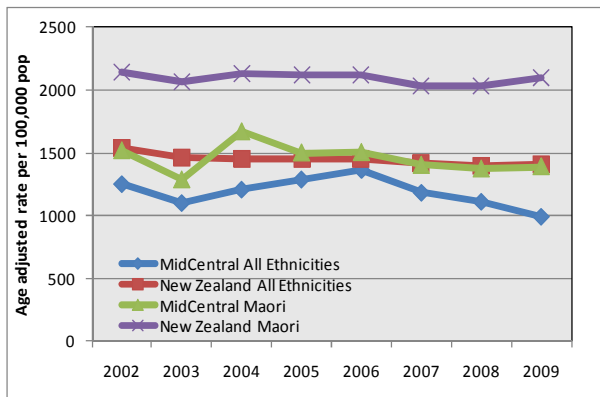
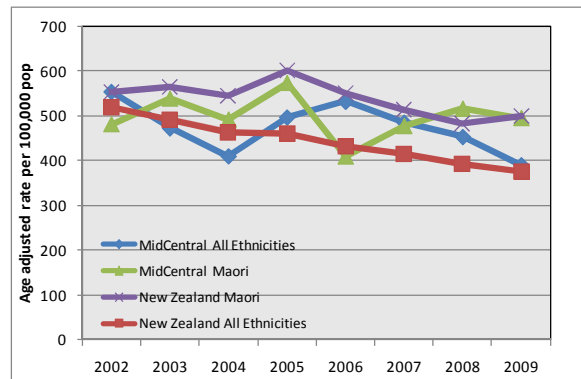


Figure 54: IHD Hospitalisations 2002 to 2009 Age Adjusted (MidCentral all ethnicities and Māori)



Circulatory system and IHD hospitalisations are trending down nationally. MidCentral is following the same trend for all ethnicities although a hump is seen for the years 2005-2007. Hospitalisations rates are considerably lower than national for circulatory disease, for IHD rates were above national for the second half of the period and converged with national in 2009.

The pattern for Māori is surprising for circulatory disease. The national rate for Māori is considerably higher than the New Zealand all ethnicities rate however the MidCentral rate for Māori is very close to the New Zealand all ethnicities rate and slightly above that for MidCentral all ethnicities. This is not the same pattern for IHD where the gaps are much smaller. Rates for MidCentral Māori are slightly above those for MidCentral overall and slightly less than for New Zealand Māori.

IHD hospitalisation age patterns for MidCentral Māori vary with New Zealand Māori as shown below. MidCentral Māori admitted for IHD appear to be slightly younger than New Zealand Māori.

Figure 55: MidCentral Māori IHD Hospital Discharges by Age Group 2005 to 2009

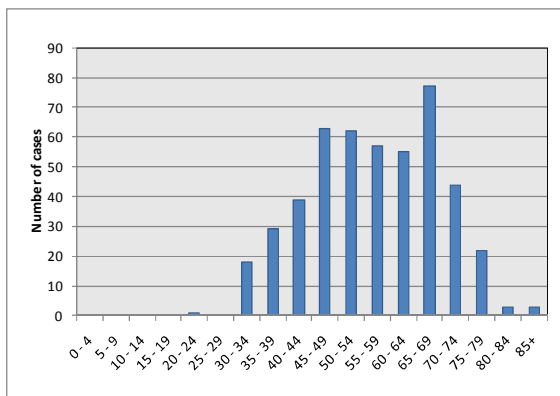
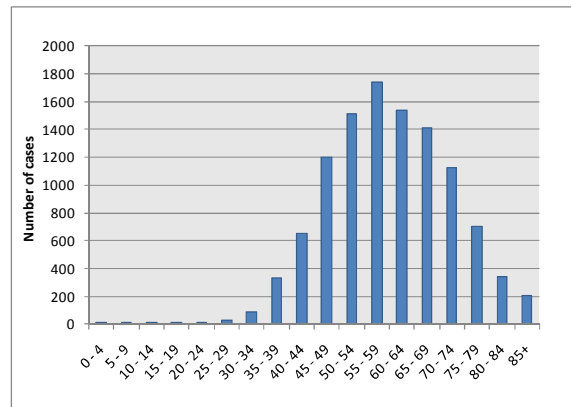


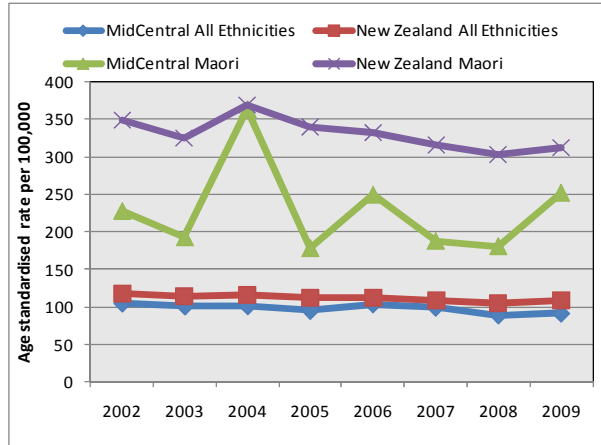
Figure 56: NZ Māori IHD Hospital Discharges by Age Group 2005 to 2009



Hospitalisation rates for ACS were analysed. Trends mirrored that of IHD.

For heart failure New Zealand and MidCentral rates are relatively static. The rate for New Zealand Māori is trending down but is about three times more than New Zealand ‘all ethnicities.’ Rates for MidCentral Māori are considerably less than national, but are still high and appear to be more level rather than trending down.

Figure 57: MDHB Heart Failure Hospital Discharges 2002 - 2009, Age Adjusted to WHO Standard Population



There is a significant difference between the age distribution in hospitalisations for heart failure between MidCentral ‘Other’ and Māori is shown below. MidCentral Māori tend to be younger. A very small proportion of MidCentral ‘other ethnicities’ are under 65 years – the majority are 75 years or older. The reverse is true for Māori.

Figure 58: MidCentral Other Heart Failure Hospital Discharges by Age Group 2005 to 2009

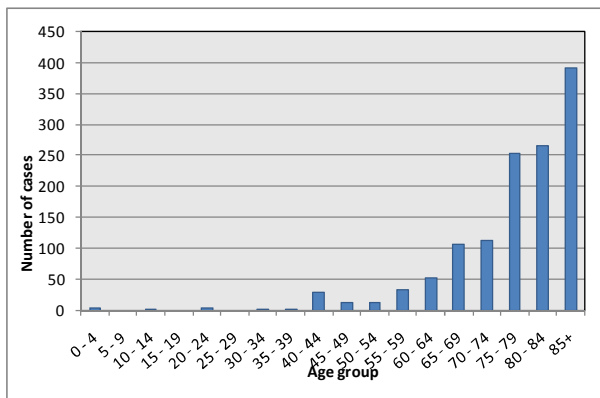
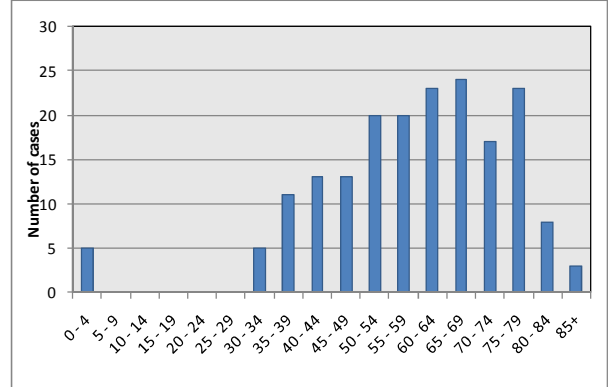
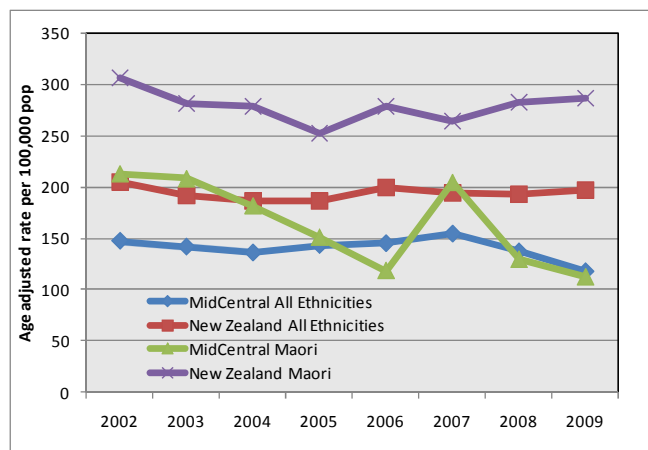


Figure 59: MidCentral Māori Heart Failure Hospital Discharges by Age Group 2005 to 2009



For arrhythmias, the next graph shows a relatively level picture for New Zealand all ethnicities with a slight trending up at the end of the period. MidCentral rates are significantly below New Zealand for the whole period. Rates for MidCentral Māori have fluctuated but have declined and have been close to MidCentral ‘all ethnicities’ since 2005. New Zealand Māori hospitalisations rates are about 50% more than the New Zealand all ethnicities rate. The MidCentral rate for Māori is much less than for New Zealand Māori. The gap increased over the period.

Figure 60: MidCentral Arrhythmias Hospital Discharges 2002 to 2009, Age Adjusted to WHO Standard Population



The table below shows the indirect age adjusted rates for all disease groups discussed above. The results confirm the trends shown above.

IHD and acute coronary syndrome

- Compared to New Zealand overall MidCentral has **higher** hospitalisation rates for IHD and ACS all ethnicities (15% and 18% respectively) and for Māori (34% and 38% respectively). The rate for Māori is the same as for New Zealand Māori (34% above New Zealand overall).

Circulatory disease, heart failure and arrhythmias

- MidCentral has **lower** hospitalisation rates for all ethnicities when compared to New Zealand all ethnicities (12%, 11% and 26% respectively). Māori also have lower hospitalisation rates when compared to New Zealand for circulatory disease and arrhythmias (11% and 26% less). This is contrary to the pattern nationally; the New Zealand Māori rates for these conditions are 26% and 34% respectively above the New Zealand all ethnicities rate. For heart failure MidCentral Māori have a higher rate than New Zealand all ethnicities (78%) however this considerably less than for New Zealand Māori which was 255% more than New Zealand overall.

The rates for Pacific are not statistically significant.

Table 44: Hospitalisation rates 2005-2009 using indirect age adjustment - breakdown by ethnicity

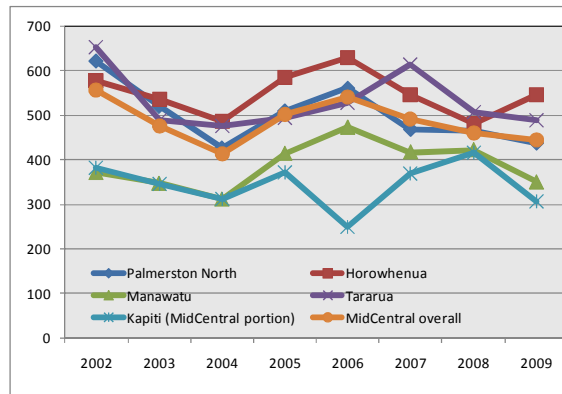
MidCentral DHB Hospital Discharges 2005 to 2009 Combined Indirect Age Adjustment (NZ all ethnicities used as comparison population)										
	Cardiovascular		Ischaemic heart disease		Acute Coronary Syndrome		Arrhythmias		Heart Failure	
	Age adjust ratio	95% conf limits	Age adjust ratio	95% conf limits	Age adjust ratio	95% conf limits	Age adjust ratio	95% conf limits	Age adjust ratio	95% conf limits
MidCentral Māori	0.89	0.84 - 0.93	1.34	1.22 - 1.46	1.38	1.25 - 1.51	0.74	0.62 - 0.87	1.78	1.53 - 2.04
MidCentral Pacific	0.82	0.69 - 0.95	1.23	0.89 - 1.57	1.26	0.9 - 1.62	0.84	0.45 - 1.23	1.42	0.74 - 2.09
MidCentral Other	0.88	0.86 - 0.89	1.14	1.11 - 1.17	1.16	1.13 - 1.2	0.74	0.71 - 0.78	0.83	0.78 - 0.87
MidCentral All	0.88	0.86 - 0.89	1.15	1.12 - 1.18	1.18	1.15 - 1.21	0.74	0.71 - 0.78	0.89	0.85 - 0.94
# events	15,076		6,214		5,797		1,796		1,477	

If emergency medicine discharges (M05s) are included the ratios for MidCentral overall rise and are as follows. The total number of discharges is in brackets.

- IHD – 1.24 (6,873)
- ACS – 1.28 (6,443)
- Arrhythmias – 0.90 (2,336)
- Heart failure – 0.98 (1,672)

Hospitalisation trends over the eight year period were analysed by TLA however the small numbers in some TLAs produce fluctuations which affect the ability to see patterns as per the following graph for IHD. However, it can be seen that Manawatu and Kapiti have rates significantly below the other TLAs and Horowhenua above throughout the whole of the period (Tararua is above at the end of the period). A similar pattern is seen in the trends for circulatory disease and the other cardiac conditions – Manawatu and Kapiti below MidCentral overall and Horowhenua and Tararua above. There does appear to be some convergence across the TLAs at the end of the period for all conditions.

Figure 61: MidCentral Territorial Authorities IHD Hospitalisations 2002 to 2009 Age Adjusted



The results of the analysis using the indirect age adjustment method are presented in the table below. This confirmed the patterns apparent on analysis of trends – the highest rates of hospitalisation for all conditions were in the Horowhenua and Tararua TLAs. This was irrespective of whether rates were above or below New Zealand overall.

Table 45: Hospitalisation rates 2005-2009 using indirect age adjustment - breakdown by territorial authority (TLA)

MidCentral DHB, Territorial Authorities Hospitalisations (excluding ED discharges) 2005 to 2009 Using Indirect Age Adjusted Ratios (NZ overall is the comparison population)										
	Cardiovascular		Ischaemic heart disease		Acute Coronary Syndrome		Arrhythmias		Heart Failure	
	Age adjust ratio	95% conf limits	Age adjust ratio	95% conf limits	Age adjust ratio	95% conf limits	Age adjust ratio	95% conf limits	Age adjust ratio	95% conf limits
Palmerston N	0.88	0.86- 0.91	1.18	1.13 - 1.22	1.20	1.15 - 1.25	0.80	0.74 - 0.85	0.87	0.8 - 0.94
Horowhenua	0.96	0.93 - 0.99	1.33	1.27 - 1.39	1.38	1.31 - 1.44	0.75	0.68 - 0.82	1.04	0.94 - 1.14
Manawatu	0.71	0.68 - 0.74	0.99	0.93 - 1.06	1.03	0.96 - 1.1	0.66	0.58 - 0.74	0.67	0.57 - 0.77
Tararua	1.00	0.95 - 1.04	1.21	1.12 - 1.3	1.23	1.13 - 1.32	0.82	0.71 - 0.93	1.07	0.92 - 1.22
Kapiti	0.65	0.6 - 0.7	0.80	0.71 - 0.9	0.83	0.72 - 0.93	0.59	0.47 - 0.72	0.75	0.58 - 0.93
MidCentral All	0.87	0.86 - 0.88	1.17	1.14 - 1.19	1.19	1.16 - 1.22	0.75	0.72 - 0.79	0.89	0.85 - 0.94
# events	15,076		6,214		5,797		1,796		1,477	

Cardiology Tests

Non-invasive / technician led tests

Figure 62: All non-invasive tests

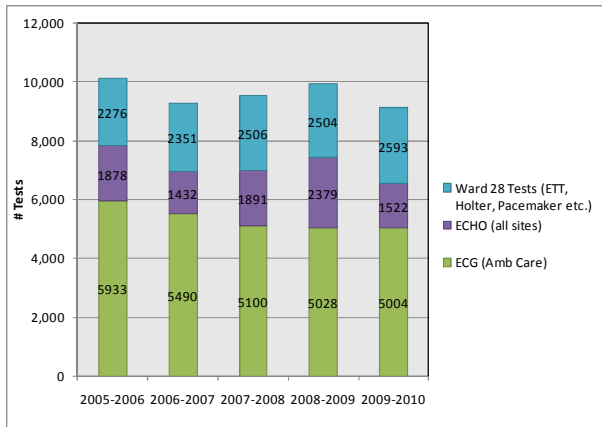
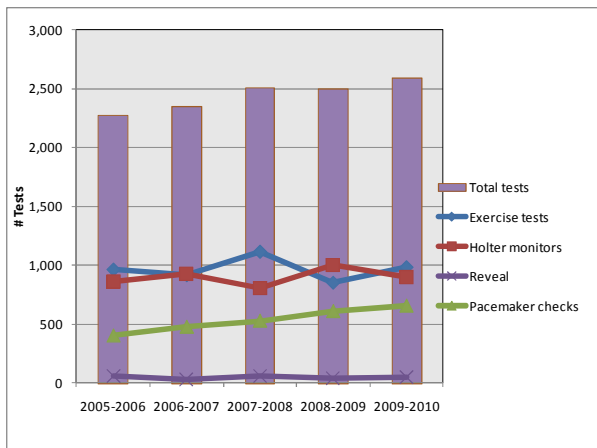


Figure 63: Tests based in Ward 28



Overall the number of non-invasive tests have reduced slightly over the last 5 years. The reductions have been primarily in the ECG service and echo (huge fluctuation in last 2 years volume). The main reductions in the ECG service have been for inpatients although there has been an increase in the number of pre-op ECGs. Tests based from Ward 28 have increased; the major rise appears to have been in pacemaker checks (ICD checks were included in this volumes). TOEs are not shown, the numbers on the system in 2009/10 were 58 for 2007/08, 64 in 2008/09 and 126.

Figure 64: ECG service (based in Ambulatory Care)

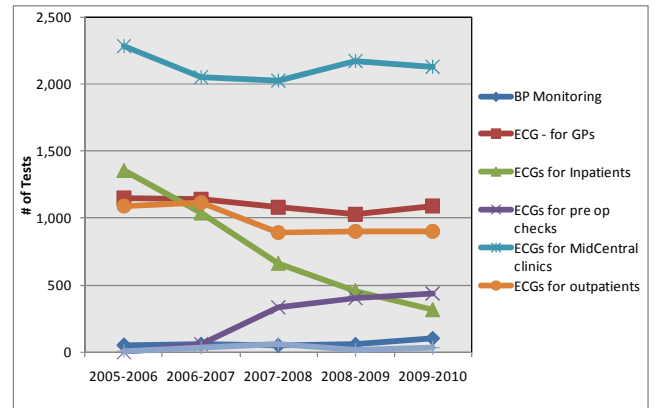


Figure 65: Exercise test breakdown

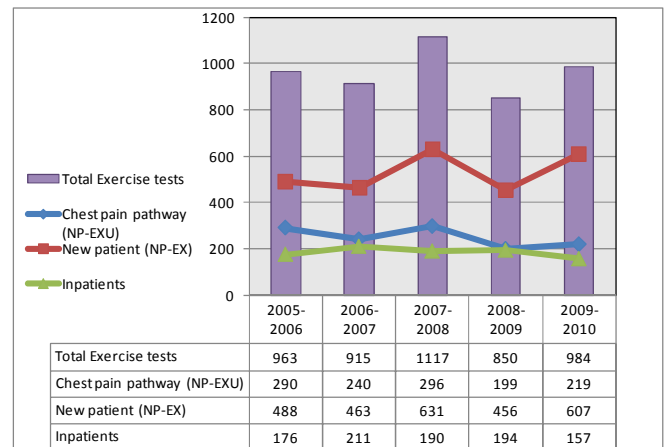
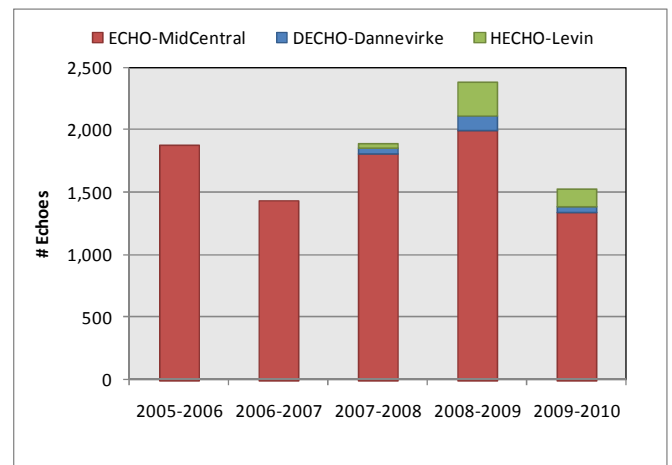


Figure 66: Echo volumes

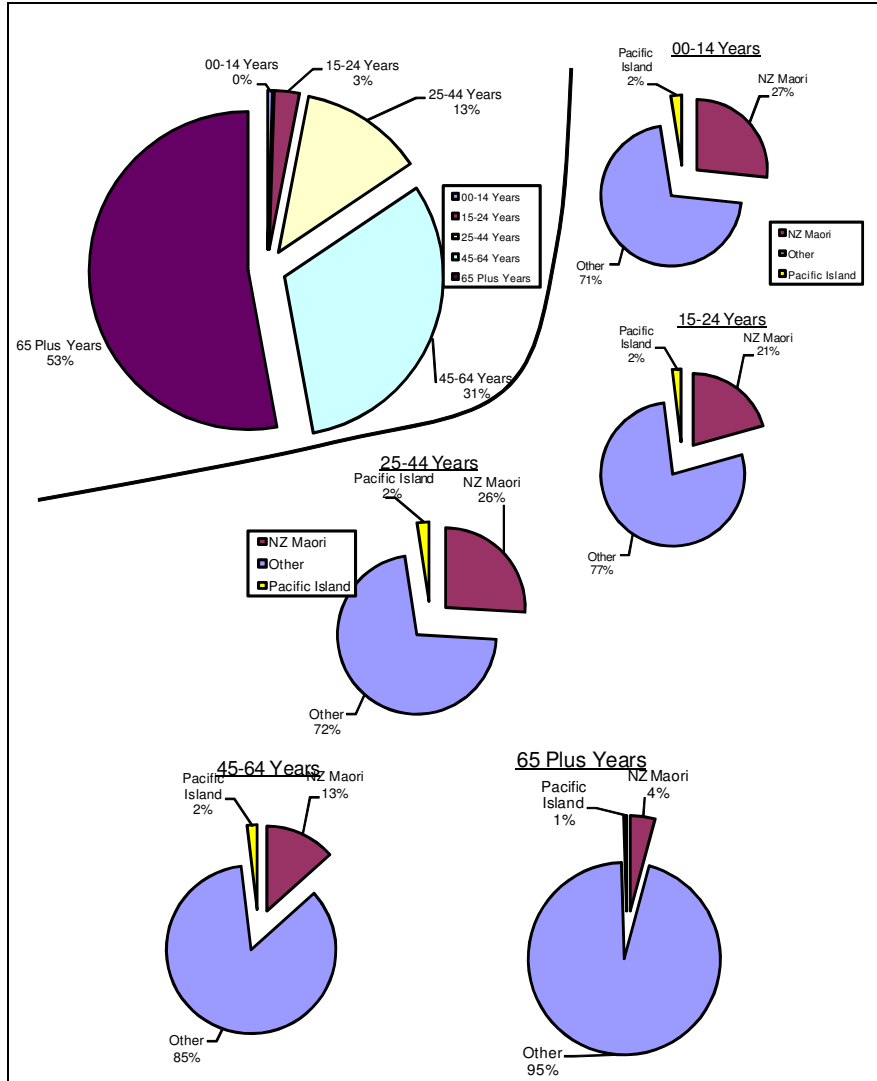


Emergency Department

Profile of cardiology service users.

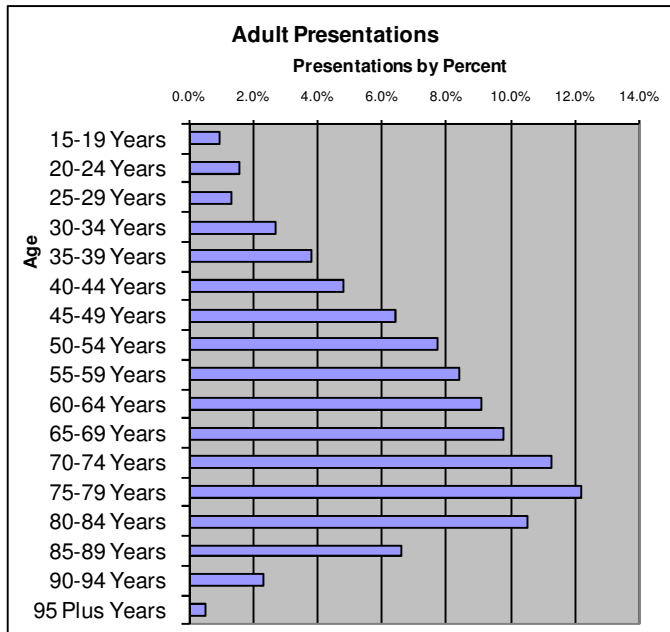
The data presented here covers the 9 financial years from - 2001-2002 through to 2009-2010 for adults (over 15 years) unless otherwise stated. The population group extracted for analysis are those presenting at the emergency department with a cardiology related ‘presenting problem.’ The list of presenting problems was compiled with cardiologist input.

Figure 67: ED presentations by age and ethnicity



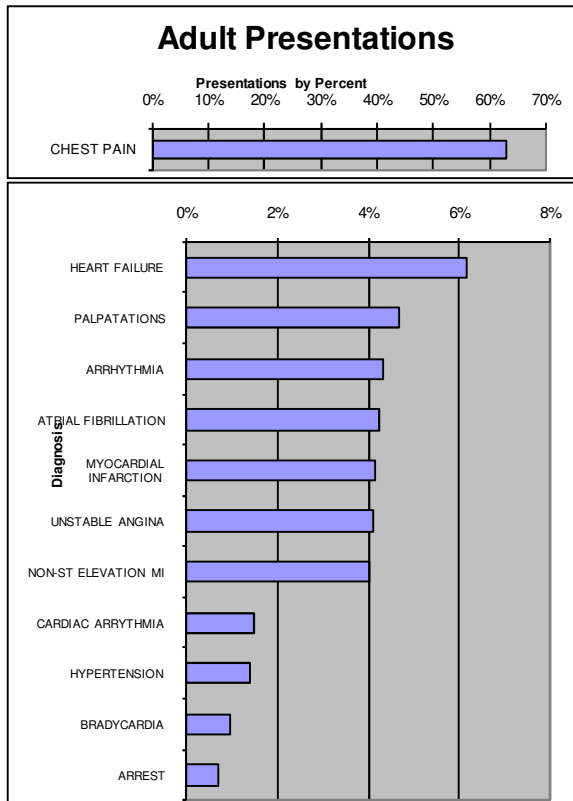
Age by 5 year bands. Of the 53% over 65 years, the highest proportion are in the 75-79 age group. This is mostly 'other ethnicity' as only 4% of those presenting in the over 65year age group are Māori.

Figure 68: ED presentations - 5 year age bands



The majority of presentations (by far) are for chest pain.

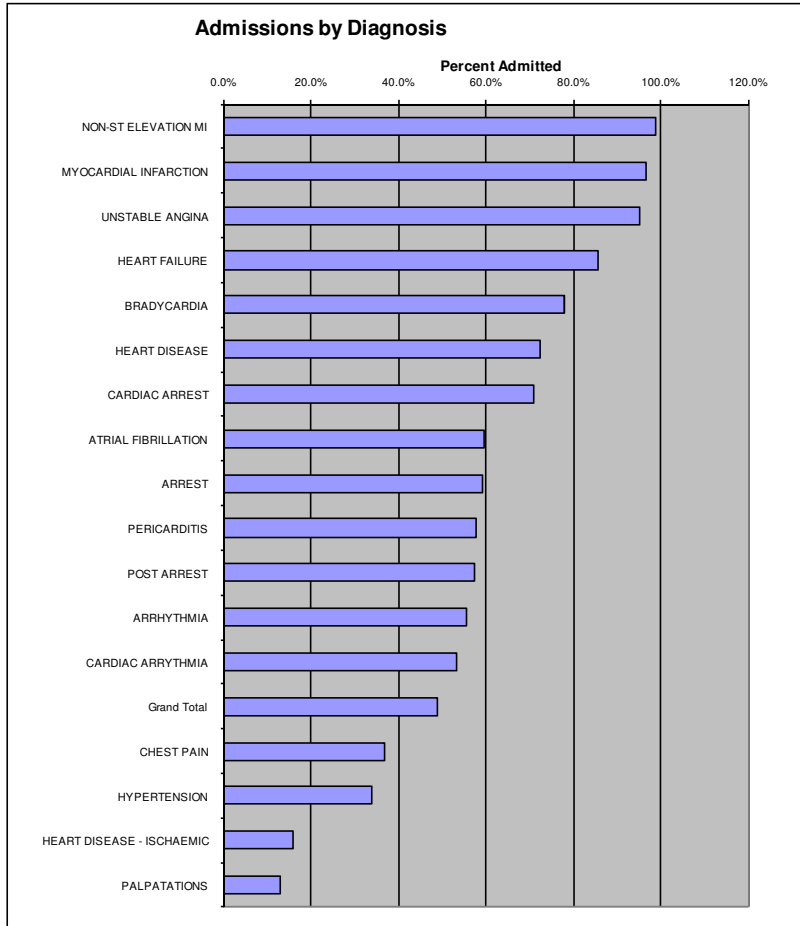
Figure 69: ED presentations by presenting complaint



Admissions from the ED

Overall, 48% of cardiology presentations are admitted, breakdown by diagnosis code as below.

Figure 70: Admissions from ED by diagnosis



More admissions are from the outlying areas.

Figure 71: ED admissions by TLA

	Horowhenua	Kapiti Coast	Manawatu	Palmerston North	Tararua
Total	53.6%	57.0%	47.2%	44.9%	57.1%
Admissions - breakdown by hour					
00-03	48.7%	50.5%	45.2%	37.5%	47.4%
04-07	52.9%	55.7%	46.4%	44.4%	54.5%
08-11	54.4%	53.1%	50.7%	46.5%	59.1%
12-15	55.0%	63.8%	49.7%	48.4%	62.7%
16-19	57.3%	61.9%	46.1%	47.2%	60.3%
20-23	47.8%	49.0%	39.5%	38.5%	45.6%

A higher proportion of those admitted are quintile 4 and 5

Figure 72: ED admissions by quintile

Quintile	Total presentations	% admitted
1	1473	44.7%
2	2073	46.2%
3	5071	46.8%
4	7749	51.1%
5	7521	49.3%
Grand Total	23887	48.8%

Admissions over 65 years (2004/05 – 2007/08)

There was a high % of admissions 2001/02 and 2002/03, then a marked dip and has been trending up since.

Figure 73: ED admissions 65 years and over

	2004-2005	2005-2006	2006-2007	2007-2008	Grand Total
Admitted as an Inpatient	725	776	895	809	7593
Presentations to ED: 65 Plus Years	1413	1396	1439	1445	12700
Percentage Admitted over Total Presentations to ED: 65 Plus Years	51.3%	55.6%	62.2%	56.0%	59.8%

Analysis of admissions by ethnicity (numbers and % below) shows a similar % to presentations

Figure 74: ED admissions by ethnicity (numbers)

	2004-2005	2005-2006	2006-2007	2007-2008	Grand Total
Asian	8	10	8	13	94
European	680	726	831	762	7086
NZ Māori	31	35	47	27	322
Other	2	1	4	0	47
Pacific Island	4	4	5	7	44

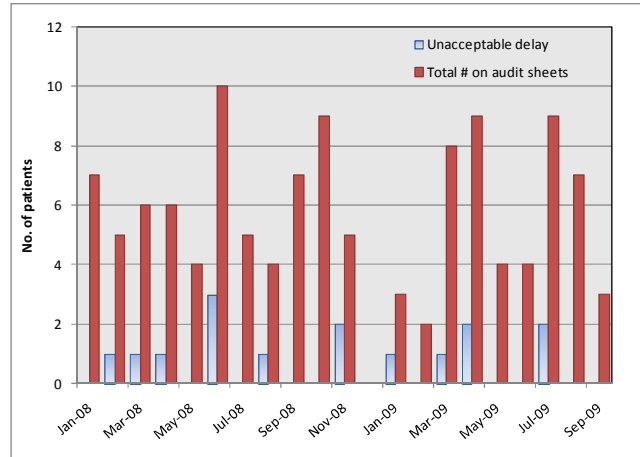
Figure 75: ED admissions by ethnicity (percentage)

	2004-2005	2005-2006	2006-2007	2007-2008	Grand Total
Asian	1.1%	1.3%	0.9%	1.6%	1.2%
European	93.8%	93.6%	92.8%	94.2%	93.3%
NZ Māori	4.3%	4.5%	5.3%	3.3%	4.2%
Other	0.3%	0.1%	0.4%	0.0%	0.6%
Pacific Island	0.6%	0.5%	0.6%	0.9%	0.6%

Thrombolysis

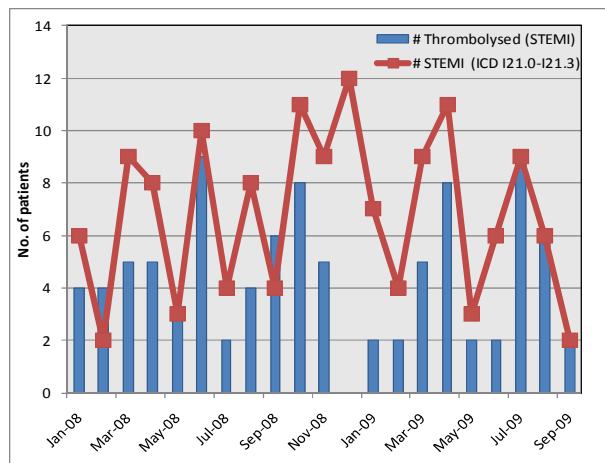
ED thrombolysis monthly audit sheets were reviewed between January 2008 and September 2009. There was no audit information for December 2008. Figure 76 shows by month the number of patient's thrombolysed (117 over the period) and the number of delays that were identified as unacceptable (15 in total).

Figure 76: Thrombolysis – proportion of unacceptable delays



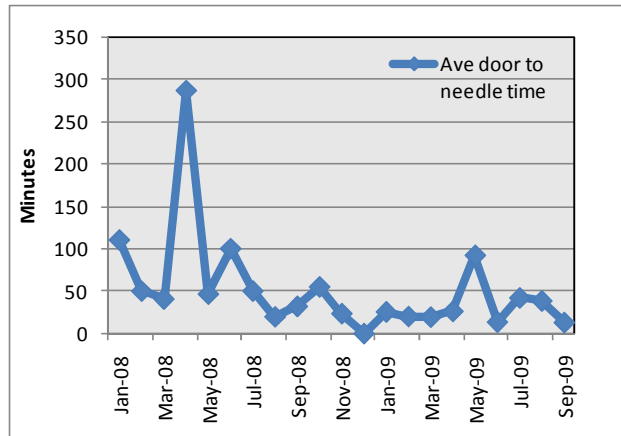
In order to examine thrombolysis times for STEMI patients the comments on the audit sheets were used to exclude other indications. Thirteen patients were excluded with indications such as stroke, pulmonary embolus, ischemic leg, AV block and right bundle branch block and 11 patients with no 'door to needle' times. The remaining 93 patients were compared to the number of patients identified as STEMI on the inpatient system. There were 143 hospitalisations identified with a primary diagnosis code of STEMI. This is higher than ED volumes however this would be expected given the missing month, exclusions, STEMI's developed after admission and that thrombolysis would not be clinically indicated for some patients. Figure 77 shows that the patterns of thrombolysis volumes and inpatient admissions with STEMI are aligned, particularly for the last three months of the period.

Figure 77: Thrombolysis – monthly volumes compared to STEMI discharges



Door to needle times appear to have reduced as shown in Figure 78. The peak in March 2008 was due to a time of 1080 mins for one patient (comment –was “Worsening T wave inversion in anterior leads and Trop T raised with ongoing pain”) and the peak in May 2009 was caused by a delay getting consent. Between January and September 2009 50% (n=19) were thrombolysed within 20 minutes of arriving, 63% (n=24) within 30 minutes and 95% (n=36) within 60 minutes.

Figure 78: Thrombolysis – trend in monthly average door to needle times



Cardiology interventions – Standardised Discharge Ratios (SDRs)

Figure 79: Angiography – MDHB SDR per 10,000 population

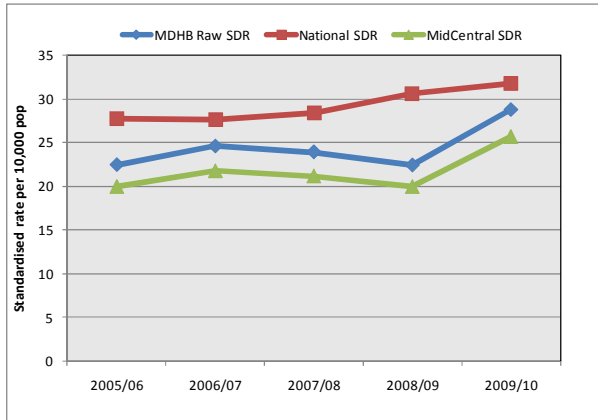


Figure 82: Cardiology interventions – MDHB SDR per 10,000 population

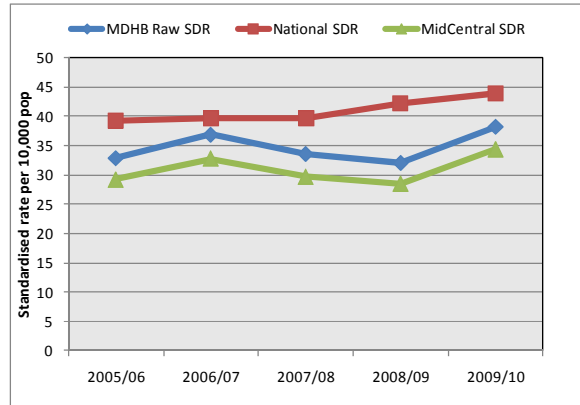


Figure 80: Angioplasty – MDHB SDR per 10,000 population

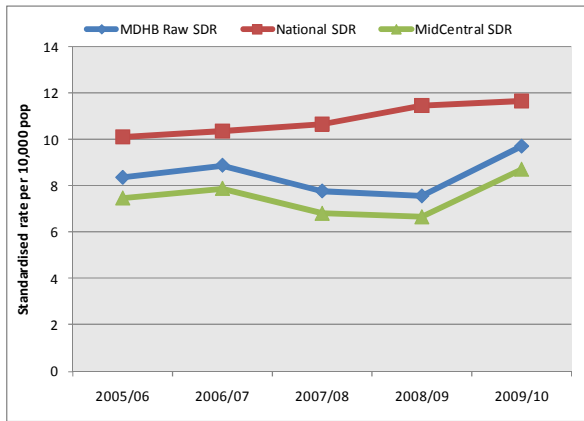


Figure 83: Cardiac surgery – MDHB SDR per 10,000 population

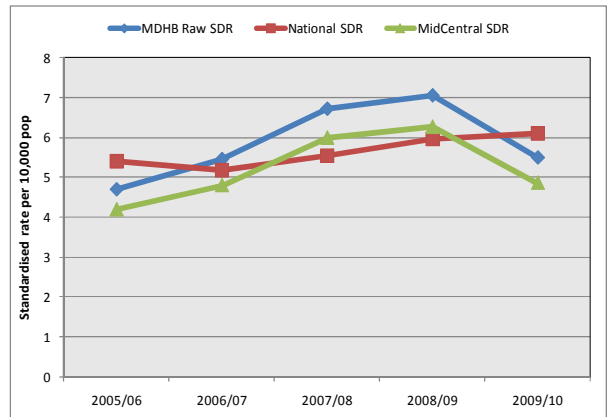


Figure 81: Revascularisation – MDHB SDR per 10,000 population

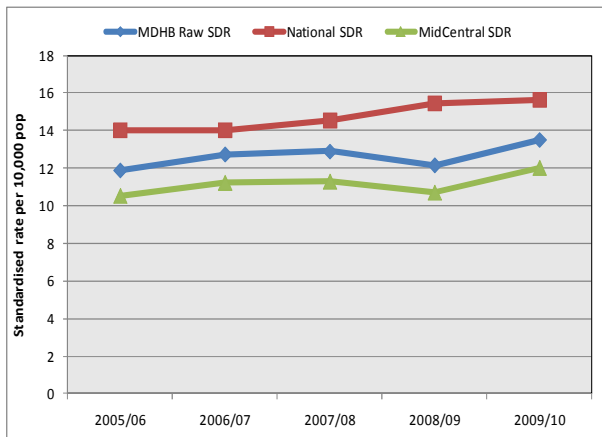
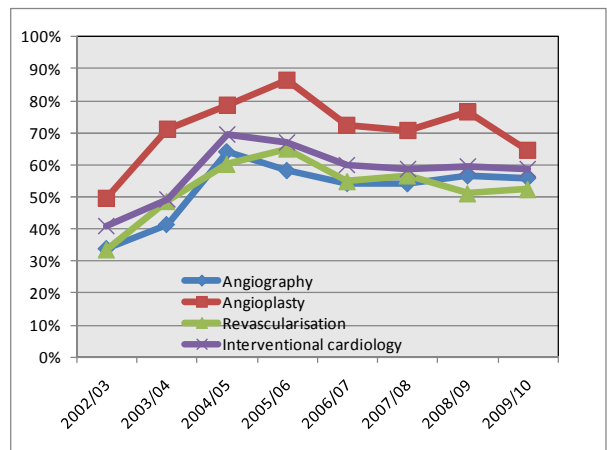


Figure 84: MDHB – Proportion of acute cardiology procedures



Relationship of MDHB 2009/10 SIRs to population

The below graphs show a relationship between population size and 2009/10 angiography and PCI intervention rates. This would be expected for PCI (reperfusion for STEMI patients in hospitals not providing PCI is usually thrombolysis). No relationship is seen between population size and cardiac surgery rates.

Figure 85: 2009/10 Angiography SIR and DHB population

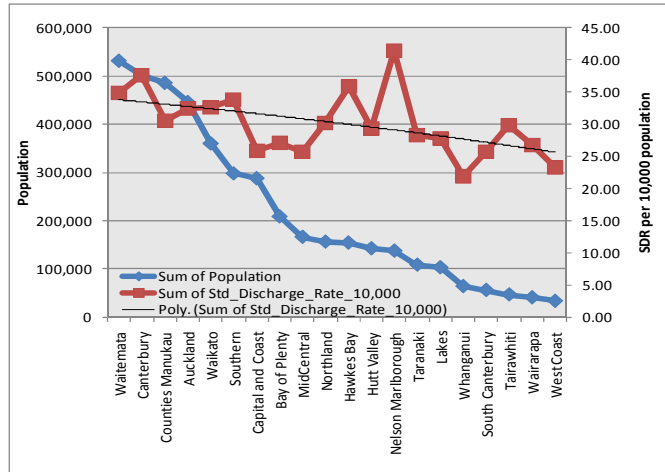


Figure 86: 2009/10 Angioplasty SIR and DHB population

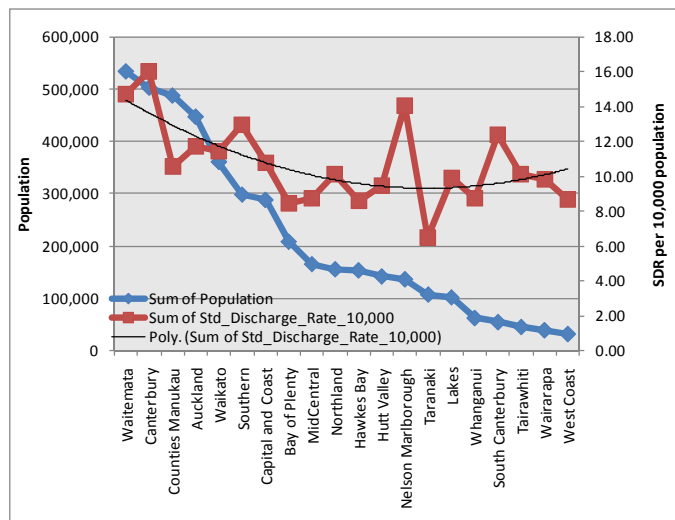


Figure 87: 2009/10 Cardiac surgery SIR and DHB population

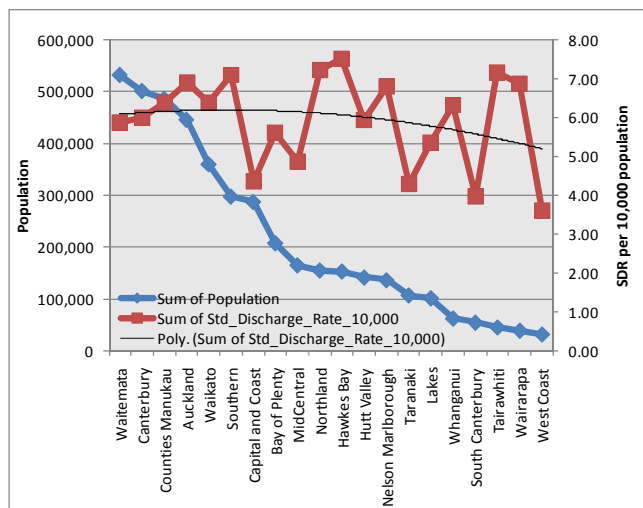


Table 46: Relationship of angioplasty (PCI) SDR to provision of service locally

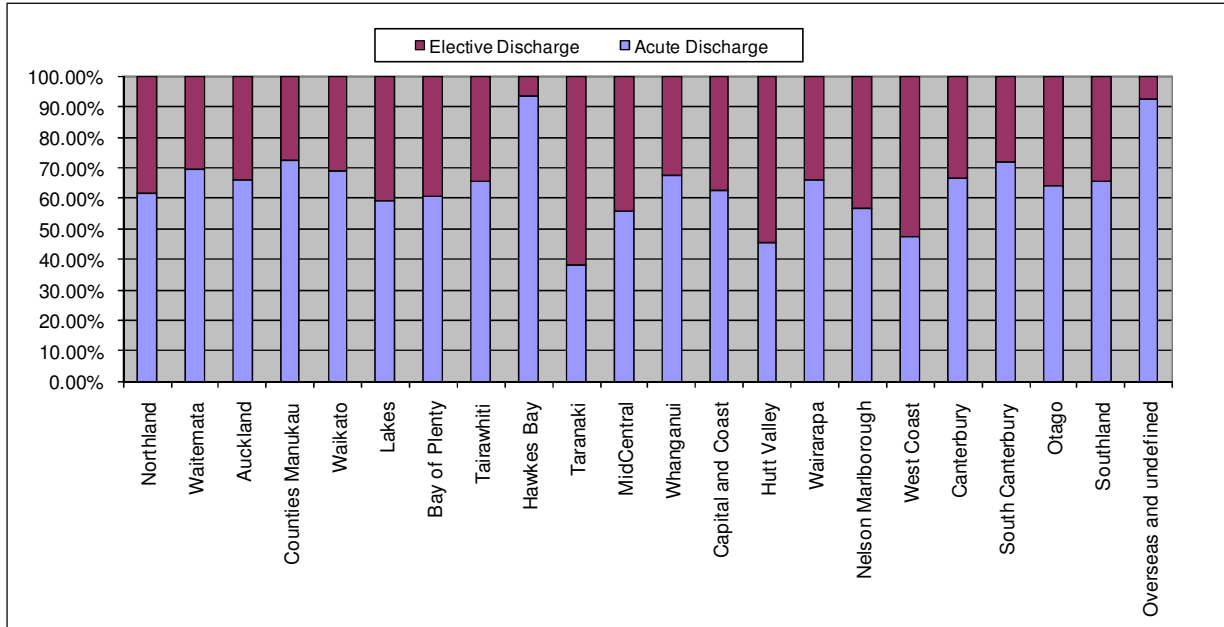
DHB	Angioplasty SDR	Cath Lab
Canterbury	15.99	Yes - PCI
Waitemata	14.73	Yes - PCI
Nelson Marlborough	14.03	Yes - PCI
Southern	12.94	Yes - PCI
South Canterbury	12.38	No
Auckland	11.73	Yes - PCI
Waikato	11.42	Yes - PCI
Capital and Coast	10.76	Yes - PCI
Counties Manukau	10.54	Yes - PCI
Tairāwhiti	10.13	No
Northland	10.11	No
Lakes	9.90	No
Wairarapa	9.86	No
Hutt Valley	9.46	No (use C&C lab for 1 session wk)
Whanganui	8.76	No
MidCentral	8.70	Yes – Diagnostic angiography
West Coast	8.63	No
Hawkes Bay	8.58	Yes – Diagnostic angiography
Bay of Plenty	8.41	Yes – Diagnostic angiography
Taranaki	6.46	Yes – Diagnostic angiography

Acute / elective split - 2009/10

Angiography

The national acute / elective percentage split is 66/34. MidCentral has a slightly higher proportion of elective angiograms (44%) than most DHBs along with Taranaki (highest by far at 62%) and Hutt Valley (55%) and West Coast (53%). Hawke’s Bay stands out with the least electives at 6.5%.

Figure 88: Angiography acute / elective split for all DHBs - 2009/10

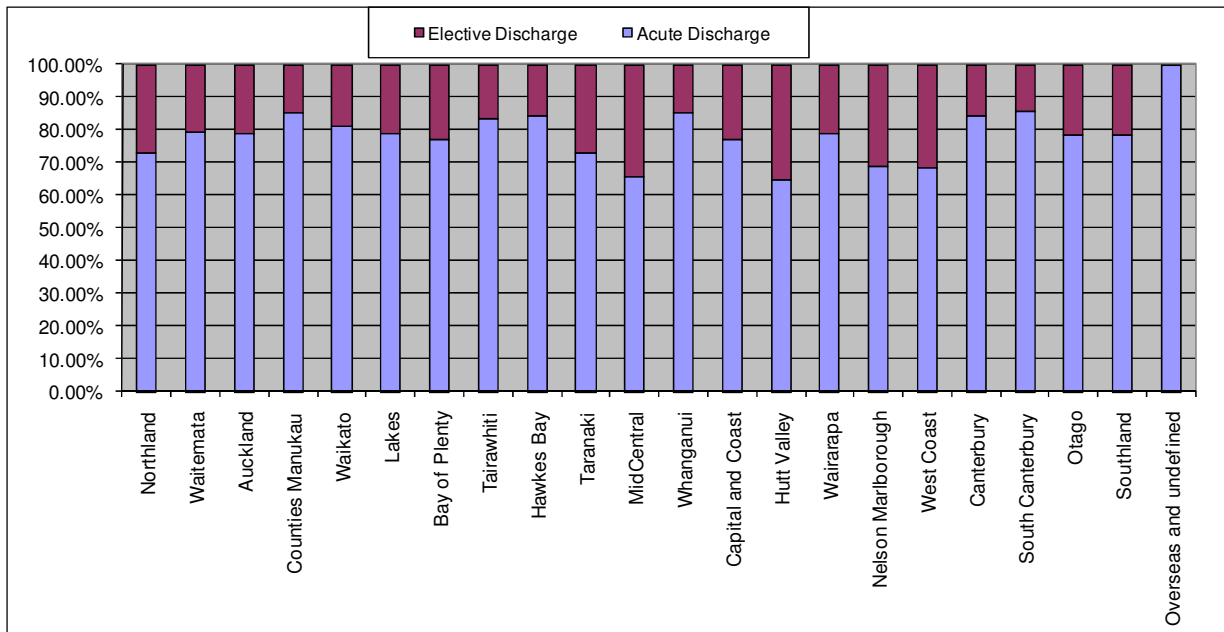


Publicly funded hospital discharges with an Angiography procedure, by DHB of domicile
ICD-10-AM-III codes 3821500, 3821800, 3821801, 3821802

Angioplasty

The national acute / elective percentage split is 79/21. MidCentral and Hutt Valley DHB have the highest proportion of elective angioplasty (34% and 35% respectively).

Figure 89: Angioplasty acute / elective split for all DHBs - 2009/10



Publicly funded hospital discharges with an Angioplasty procedure, by DHB of domicile
ICD-10-AM-III codes 3530400, 3530500, 3531000, 3531001, 3531002

Angiography by TLA

The below table shows there are higher levels of angiography in the Horowhenua and Kapiti Coast TLAs which have higher levels of CVD illness and an older population.

DHB (patient)	Territorial a	2008/09	2009/10	2010/11 YTD	Grand Total	Pop - 2006
MidCentral	Horowhenua	26.22%	28.27%	29.83%	27.81%	18.80%
	Kapiti Coast	7.03%	5.41%	6.08%	6.10%	4.75%
	Manawatu	15.95%	12.89%	12.71%	13.95%	17.79%
	Palmerston North	35.95%	39.92%	35.36%	37.69%	47.56%
	Tararua	14.86%	13.51%	16.02%	14.44%	11.10%
Grand Total		100.00%	100.00%	100.00%	100.00%	100.00%

Angiography by Ethnicity

The table below shows that Māori and Pacific Peoples receive less angiography than the overall population proportions. This is to be expected due to the differing age structures however the proportion of Māori has declined since 2008/09.

Discharges		Financial year			
DHB (patient)	EthGroup	2008/09	2009/10	(YTD 12/11)	Grand Total
MidCentral	Maori	11.62%	8.32%	8.29%	9.50%
	Other	87.57%	90.23%	90.61%	89.34%
	Pacific Is.	0.81%	1.46%	1.10%	1.16%
Grand Total		100.00%	100.00%	100.00%	100.00%

Ethnicity by TLA for angiography 2008/09, 2009/10 and 2010/11 YTD shows the differing proportions. Trends by year showed that the proportion of Māori in Horowhenua was 16.5% in 2008/09 and has since slid to 8.4%.

Discharges		EthGroup			Grand Total
DHB (patient)	Territorial a	Maori	Other	Pacific Is.	
MidCentral	Horowhenua	11.15%	88.15%	0.70%	100.00%
	Kapiti Coast	22.22%	77.78%	0.00%	100.00%
	Manawatu	3.47%	96.53%	0.00%	100.00%
	Palmerston North	8.23%	89.46%	2.31%	100.00%
	Tararua	10.07%	89.26%	0.67%	100.00%
Grand Total		9.50%	89.34%	1.16%	100.00%

Readmission analysis

Readmissions for ACS by TLA – 2005/06 – 2009/10.

Analysis parameters - Excludes electives and M05s (emergency medicine discharges). Base admission ICD I20-I24.1. Readmits at 8 weeks and 52 weeks for IHD (I20-I50). The year date refers to the year when the first admission occurred, the readmission may be outside that timeframe e.g. if first admission occurs on the last day of the year, the readmission will still be counted.

The number of ACS admissions is declining (raw numbers) and the rate of readmissions at 8 weeks is also declining but readmissions at one year is relatively level. No clear patterns emerged in the TLA analysis as shown below – a longer period would likely be necessary to identify any trends.

Figure 90: Acute coronary syndrome readmission rates at 8 wks for IHD (I20-I25)

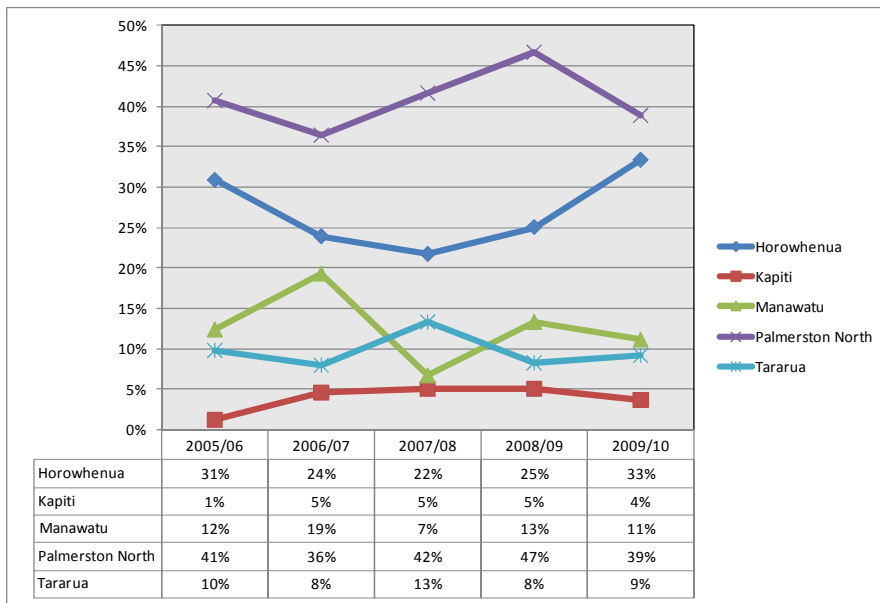
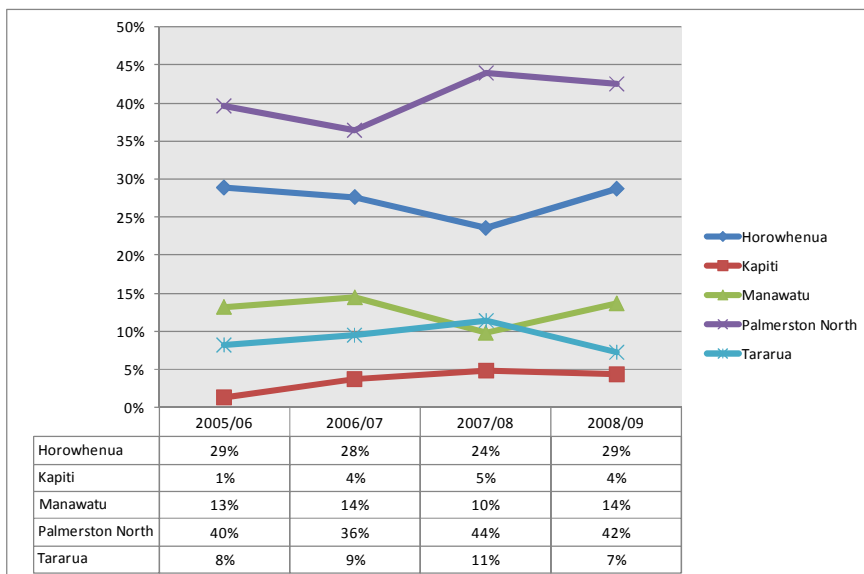


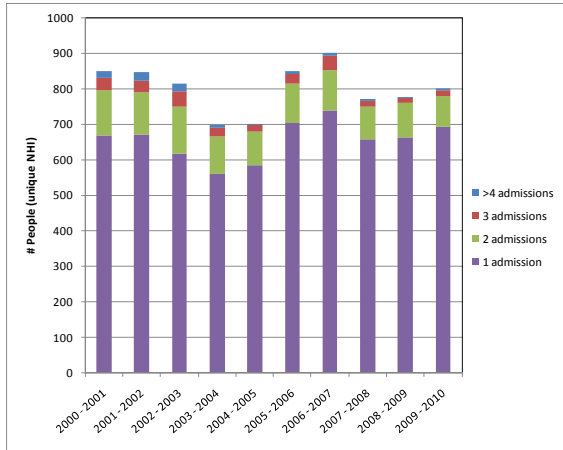
Figure 91: Acute coronary syndrome readmissions at 1 year for IHD (I20-I25)



Percentage of single and subsequent hospitalisations per year over a decade

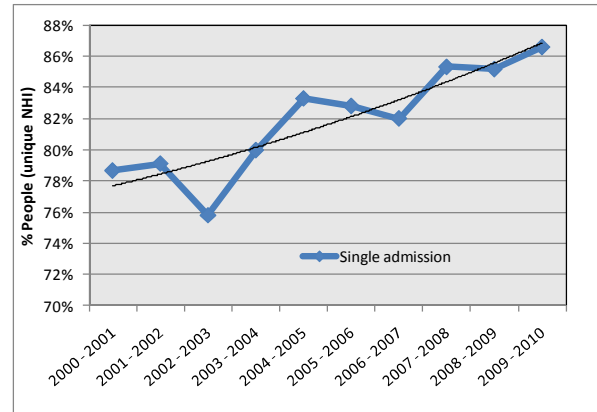
Figure 92 shows static to declining volumes for IHD and the proportions of single and subsequent discharges. Figure 93 show that there has been an increase in the proportion of people with a single hospitalisation for IHD (less repeat admissions within each yearly period).

Figure 92: Number of initial and subsequent discharges for IHD - 2000/01-2009/10



Note: M05s excluded

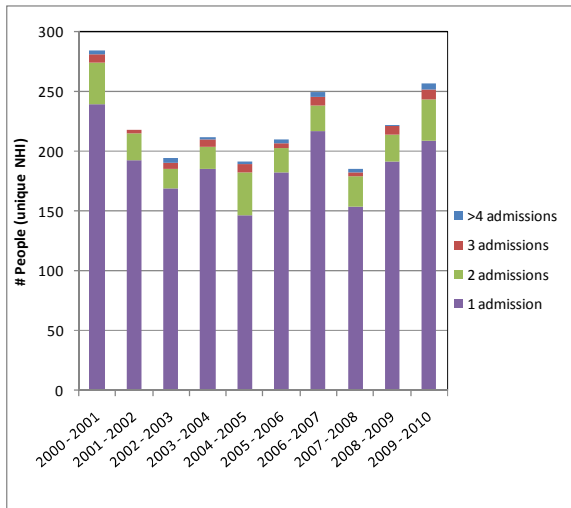
Figure 93: Single admissions as a percentage of total discharges for IHD - 2000/01-2009/10



Note: M05s excluded

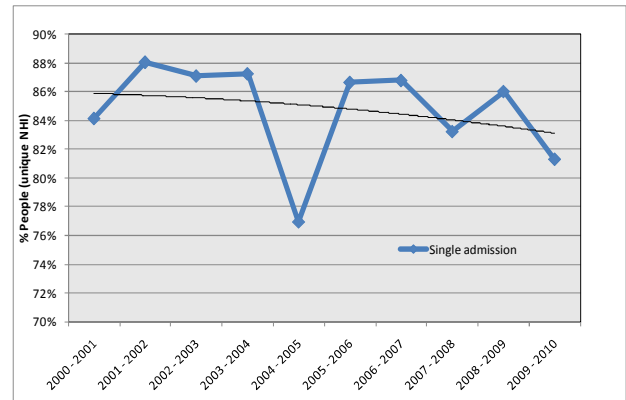
Figure 94 shows static to increasing volumes for heart failure and the proportion of initial and subsequent discharges. Figure 95 illustrates increasing readmissions for heart failure by showing the decreasing rate of ‘first time’ admissions for heart failure in each yearly period over the last decade.

Figure 94: Number of initial and subsequent discharges for Heart Failure - 2000/01-2009/10



Note: M05s excluded

Figure 95: Single admissions as a percentage of total discharges for Heart Failure - 2000/01-2009/10



Note: M05s excluded

Community nursing service

Compass Health (on behalf of Central PHO) provided 935 NHIs of people who had received community cardiology nursing services. The aim was to see if community nursing services have made a difference to the hospitalisation rates for a cohort of patients. The cohort was 381 patients with an admission of ACS within 6 months prior to the first nurse visit. Those with acute readmissions with a primary diagnosis code of IHD or arrhythmias within 12 months were identified. The average number of nurse visits was compared to the group where there was no readmission for IHD or arrhythmias.

The thesis was that the readmission group would have a lower average number of nurse visits than the group where there was no admission.

Result - of the cohort of 381 (ACS)

- 121 people had a readmission within 365 days of their initial admission (in total there were 191 readmissions from these 121 people). The average number of nurse visits for these 121 people was 7.6.
- 260 people had no subsequent readmission within 365 days of their initial admission. These people had on average 4.7 nurse visits.

Table 47: Readmissions/non admissions by nurse visits for ACS

# Nurse visits	Readmitted		Not readmitted	
1-4	61	50%	160	62%
5-8	25	21%	53	20%
9+	35	29%	33	13%
		100%		100%

Those that were readmitted had a higher average number of nurse visits.

The same analysis was also undertaken for people admitted with heart failure (base admission within 6 months before initial nurse visit. The cohort was 60 patients.

Result - of the cohort of 60 patients (Heart Failure)

- 19 people had a readmission within 365 days of their initial admission (in total there were 29 readmissions from these 19 people). The average number of nurse visits for these 19 people was 10.6.
- 41 people had no subsequent readmission within 365 days of their initial admission. These people had on average 5.2 nurse visits.

Table 48: Readmissions/non admissions by nurse visits for Heart Failure

# Nurse visits	Readmitted		Not readmitted	
1-4	11	58%	21	51%
5-8	1	5%	17	41%
9+	7	37%	3	7%
		100%		100%

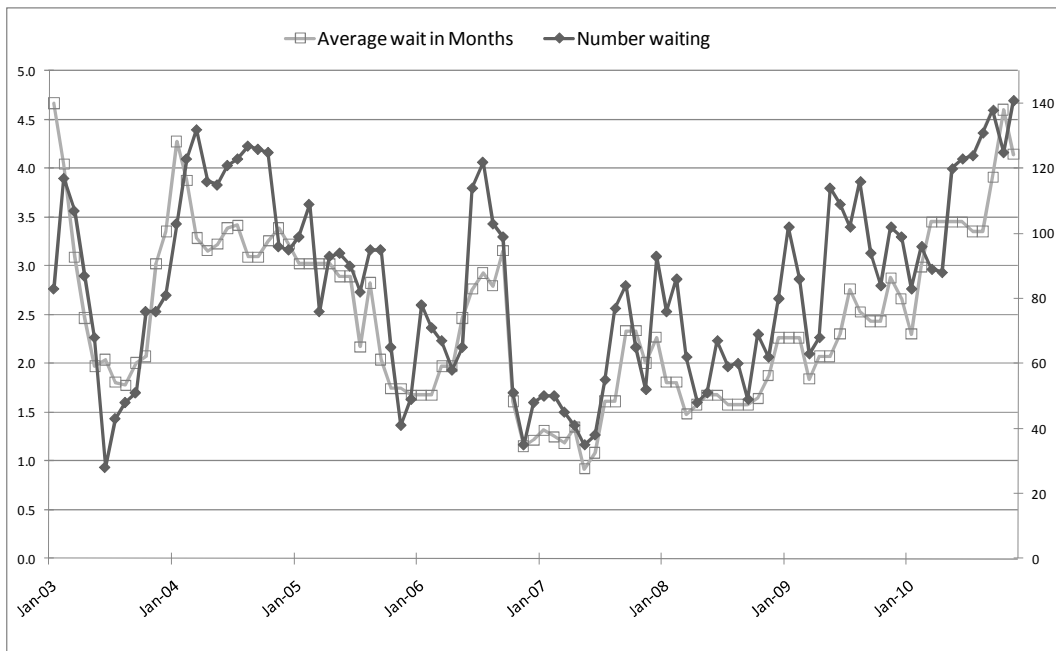
This readmission group had double the number of visits of those who were not readmitted and had more average visits than the cohort of patients with ACS.

Nuclear medicine scans

Table 49: Nuclear perfusion scan volumes

Year	# scans
2003	363
2004	423
2005	391
2006	349
2007	401
2008	440
2009	453
2010	302

Figure 96: Nuclear perfusion scans waiting statistics for Cardiac rest / stress wait



Laboratory volumes

The data has been provided by the Medlab laboratory in the MidCentral DHB and represents volumes delivered by the provider rather than that received by the MidCentral population. The volume of tests is extracted for all disciplines, not only those applicable to cardiology patients. Prices are from the hospital schedule revised in 2004 as MedLab has a capped contract (bulk billing) so will be underestimated especially in the latter years.

Table 50: MDHB laboratory provider volumes and costs 2006/07 - 2009/10

	2006/07		2007/08		2008/09		2009/10		% change	
	#	\$	#	\$	#	\$	#	\$	#	\$
Community										
HbA1c	29627	\$355,524	23549	\$282,588	27958	\$335,496	33179	\$398,148	12%	12%
INR	50002	\$419,017	50641	\$424,372	53285	\$446,528	45367	\$380,175	-9%	-9%
CK (CPK)	3283	\$6,927	3049	\$6,433	3382	\$7,136	3357	\$7,083	2%	2%
Troponin T	3585	\$42,160	3543	\$41,666	3325	\$39,102	3195	\$37,573	-11%	-11%
Thrombin time	118	\$1,587	87	\$1,170	56	\$753	35	\$471	-70%	-70%
Lipids	141380	\$480,920	160093	\$544,581	191231	\$650,426	215591	\$733,321	52%	52%
ProBNP	1611	\$80,550	2551	\$127,550	1907	\$95,350	3479	\$173,950	116%	116%
	199981	\$1,031,161	219965	\$1,145,772	253191	\$1,239,354	271028	\$1,332,609	36%	29%
Hospital										
HbA1c	2819	\$33,828	2953	\$35,436	2965	\$35,580	3046	\$36,552	8%	8%
INR	20442	\$171,304	18762	\$157,226	20042	\$167,952	20938	\$175,460	2%	2%
CK (CPK)	1666	\$3,515	1553	\$3,277	1584	\$3,342	1471	\$3,104	-12%	-12%
Troponin T	16628	\$195,545	14489	\$170,391	14707	\$172,954	14811	\$174,177	-11%	-11%
Thrombin time	2745	\$36,920	2410	\$32,415	2668	\$35,885	2476	\$33,302	-10%	-10%
Lipids	15829	\$53,830	13960	\$47,454	16058	\$54,640	17266	\$58,747.58	9%	9%
ProBNP	2231	\$111,550	2751	\$137,550	3576	\$178,800	3597	\$179,850	61%	61%
	59539	\$572,665	53924	\$548,312	58636	\$613,586	60555	\$624,606	2%	9%
Hospital & Community										
HbA1c	32446	\$389,352	26502	\$318,024	30923	\$371,076	36225	\$434,700	12%	12%
INR	70444	\$590,321	69403	\$581,597	73327	\$614,480	66305	\$555,636	-6%	-6%
CK (CPK)	4949	\$10,442	4602	\$9,710	4966	\$10,478	4828	\$10,187	-2%	-2%
Troponin T	20213	\$237,705	18032	\$212,056	18032	\$212,056	18006	\$211,751	-11%	-11%
Thrombin time	2863	\$38,507	2497	\$33,585	2724	\$36,638	2511	\$33,773	-12%	-12%
Lipids	157209	\$534,751	174053	\$592,036	207289	\$705,067	232857	\$792,069	48%	48%
ProBNP	3842	\$192,100	5302	\$265,100	5483	\$274,150	7076	\$353,800	84%	84%
	259520	\$1,603,826	273889	\$1,694,084	311827	\$1,852,940	331583	\$1,957,215	28%	22%

Information provided by Bruce van den Heever

Appendix G – Indicators of quality improvement

Source: 2008 Diabetes and Cardiovascular Quality Improvement Plan

Bold text indicates priority areas for initial attention. Shaded sections indicate cardiology related areas.

Table 51: Diabetes and Cardiovascular QIP KPIs

Setting	Priority area	Measure	
Primary prevention	Risk assessment	Percentage of people who have had 5 year CVD risk assessment (any person who has had any previous CVD event is at high risk and requires intensive management)	
	Risk management	Percentage of people identified at risk receiving appropriate management according to established guidelines (effective management requires resources for practice management systems, staff training, and access to counselling and support services)	
		Management measures: <ul style="list-style-type: none"> • smoking cessation • Green Prescription • dietary advice • statin uptake for patients with CVD RISK >15% • aspirin uptake for patients with CVD • warfarin use in high stroke-risk AF 	
Treatment of CV events		Acute coronary syndromes	Stroke and TIA
	Patient delay	Time (hrs) from symptom onset to first medical consult	Time (hrs) from symptom onset to first medical consult
	Treatment delay	Time (hrs) from arrival at hospital until start of thrombolysis or PCI	Time (hrs) from admission until imaging CT/MRI +/- USI
		Percentage of eligible patients given thrombolysis or direct PCI	Percentage of eligible stroke patients given thrombolysis in experienced centres
			Percentage of people assessed by an organised stroke service
	Clinical assessment and risk stratification	Classification of MI (ST or non-ST), UA. For all MI patients, assessment before discharge of: <ul style="list-style-type: none"> • left ventricular function • stress testing • coronary angiography 	Classification of stroke and prioritisation of TIA For all stroke patients: specialist neuro-functional assessment (related to needs and personal environment)
	Revascularisation	Percentage of patients receiving PCI before discharge from admitting or receiving hospital	Consideration of need for carotid, cardiac, other vascular, haematological intervention
		Percentage of patients receiving coronary bypass surgery before discharge from admitting or receiving hospital	
	Discharge medications	<ul style="list-style-type: none"> • aspirin • statin • beta blocker • aCE inhibitor • clopidogrel • NRT or other smoking cessation aid 	<ul style="list-style-type: none"> • Anti-platelet agent(s), e.g. aspirin • blood pressure lowering therapy • statin • warfarin in AF or cardioembolic stroke from valvular disease or recent MI • NRT or other smoking cessation aid
	Rehabilitation	<ul style="list-style-type: none"> • referral • attendance • completion 	<ul style="list-style-type: none"> • referral • Attendance • Completion • Environmental rehabilitation / support (therapeutic and prosthetic)

Source: MoH 2008 Diabetes and Cardiovascular Disease Quality Improvement Plan

AF=atrial fibrillation, CT/MRI +/- US = computed tomography/magnetic resonance imaging, ultrasound; MI = myocardial infarction; NRT = nicotine replacement therapy; PCI = percutaneous coronary intervention; UA = unstable angina

Appendix H – Cardiac Network 2010/11 Regional Action Plan

The goal of the Cardiac Network is to enhance the collaboration and integration of cardiac services throughout the Central Region by improving equity of access and quality of services, reducing service inefficiencies, ensuring service sustainability both clinical and financial, providing the opportunity for innovation and shared learning, and to influence policy decisions at a national level for cardiac issues.

Project / Initiative		Goal	Outputs / Measurements (including timeline)
1	Cardiac Technicians/ Technologist Workforce Project - Phase Two	To increase and sustain the number of appropriately trained cardiac technicians/ technologists and enhance skill mix.	Complete continuing professional development programme for Cardiac Physiology staff within the Central Region. Implement the recommendations from the evaluation report (2010) on the regional trainer position by July 2011. 100% pass rate of all Cardiac Physiology students by November 2010.
2	Community Based Cardiovascular Risk Assessment Programme	To ensure cardiovascular Disease (CVD) risk assessment, is undertaken and measure and track clinical management in those patients identified with high cardiovascular risk.	Monitor and report on CVD uptake within the region and build on the opportunistic screening currently being undertaken by September 2010.
3	Expanding Pre Hospital Thrombolysis	To ensure equity of access to pre hospital thrombolytic therapy in rural areas throughout the Central Region.	Facilitate and monitor the implementation of pre hospital thrombolysis throughout the region by June 2011.
4	Access to care	To work towards providing equity of access to cardiac procedures.	Review and monitor waiting times for cardiac procedures and implement corrective action plans as required.
5	Ethnic Disparities in Cardiac Revascularisation	To undertake analysis of ethnic disparities in accessing cardiac revascularisation within the Central Region and compare nationally.	Complete research and produce report on findings with Te Rōpū Rangahau Hauora a Eru Pōmare (Wellington School of Medicine and Health Sciences) by April 2011.
6	Cardiac Rehabilitation	To reduce the inequalities and disparities of access to cardiac rehabilitation within the Central Region.	Ensure over time 95% of eligible patients access this service through: - developing and implementing self management programmes by August 2010. - developing and implementing a cardiac rehab at home model by June 2011. - develop and implement a heart manual that is culturally appropriate and acceptable to Māori and Pacific peoples by June 2011. Establish links on all DHB websites to cardiac rehabilitation directory by July 2010. Complete regional audit of people who have suffered acute coronary syndrome and number who have attended some form of cardiac rehabilitation by December 2010.
7	Regional Development Plan for cardiology and cardio thoracic services	To gain regional agreement of scope of service provision within each CRDHB for cardiology and cardiothoracic services.	Complete a strategic vision document of cardiac service provision including local versus regional provision, staffing levels and ratios per 100,000 population etc by November 2010.
8	ECG's in Primary Care	To move primary referred ECG's to the community to reduce waiting times and allow earlier appropriate intervention.	Identify gaps in current primary care ECG services through a survey and identify training needs by September 2010. Develop and implement a training programme by May 2011.

Appendix H – Cardiac Network 2010/11 Regional Action Plan

9	Document Clinical Pathways	To gain standardisation of cardiac clinical pathways to enhance quality of service, improve patient outcomes and increase productivity.	Investigate the use of the map of medicine pathway technology to support regional cardiac initiatives and if appropriate implement across the region by March 2011.
10	Heart Failure	Improving equity of access to heart failure services and moving the focus to primary care.	Facilitate and monitor the delivery of community based services to people with heart failure throughout urban and rural areas by June 2011. Develop and facilitate the implementation of a region wide heart failure education plan for health professionals in partnership with General Practice and relevant NGOs by May 2011. Standardise information, education and resource materials for people with heart failure by July 2011. Gain regional agreement and report quarterly on standardised key performance indicators for heart failure such as: <ul style="list-style-type: none"> - 100% of DHB areas have HF pathways in place. - acute hospital bed days reduction target 20% by June 2011 and further 10% by June 2012. - reduce 30 day readmission rates by 40% by June 2011 and 60% by June 2012.
11	Treatment of STEMI's	To investigate the establishment of a second centre within the Central Region for PCL.	Develop summary report and if appropriate develop business case by December 2010.

Source: Regional Services Plan (First draft), September 2010

Appendix I – Bibliography and references

Adamson, P., Ayling, J., Gillespie, J., Walker, J., Hamer, A. & Fisher, N. (2009). The first New Zealand experience of percutaneous coronary intervention without onsite cardiac surgery. *Heart, Lung and Circulation*, [Abstracts 538]18S-S1-S286.

Ahmar, W., Quarin, T., Ajani, A., Kennedy, M. & Grigg, L. (2008). Improvement in door-to-balloon times in management of acute ST-segment elevation myocardial infarction STEMI through the initiation of 'Code AMP'. *Internal Medicine Journal*, 38, 714-718.

Asch, S.M., Kerr, E. A., Keeseey, J., Adams, J.L., et al. (2006). Who is at greatest risk of receiving poor-quality health care? *The New England Journal of Medicine*, 354,(11),1147-56.

Capewell et al., (2000). *PLoS ONE Circulation*; 102:1511-1516 in *Aspelund T et al. November 2010; 5; 11: e13957*

Beller, G.A. (2001). Coronary Heart Disease in the First 30 Years of the 21st Century: Challenges and Opportunities. *Circulation*, 103, 2428-2435.

Bridgman, P. G., Ashrafi, A. N., Mann, S., & Whalley, G. A. (2008). Survey of clinical echocardiography in New Zealand (SCANZ). *The New Zealand Medical Journal*, 121(1269), 34-44.

Blankenship, J.C., Scott, T.D., Skelding, K.A., Haldis, T.A., Tompkins-Webber, K., Sledgen, M.Y., ... Berger, P.B. (2011). Door-to-balloon times under 90 min can be routinely achieved for patients transferred to ST-segment elevation myocardial infarction percutaneous coronary intervention in a rural setting. *Clinical Research: Interventional Cardiology*; 57, 272-279.

Cardiac Surgery Services in New Zealand. (2008). *Cardiac Surgery Service Development Working Group Report*. New Zealand: Author.

Carroll, G. (2007). *Acute Coronary syndromes. Who needs an invasive approach and when?* [Presentation] University of New South Wales: Wagga Wagga

Central Region Technical Advisory Services. (2006). *Cardiology Services Review*. Wellington, New Zealand: Author.

Central Region Technical Advisory Services. (2008). *Cardiac Technicians and Technologists*. Wellington, New Zealand: Author.

Central Region Technical Advisory Services. (2010). *Cardiac Key Performance Indicators – December 2010*. Wellington, New Zealand: Author.

CSANZ (2008). Guidelines on support facilities for coronary angiography and percutaneous coronary intervention (PCI) including: Guidelines on the performance of procedures in rural sites. *The Cardiac Society of Australia & New Zealand*.

European Society of Cardiology. (2010). Guidelines on myocardial revascularization. The Task Force on myocardial revascularization of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS), *European Heart Journal*, 31, 2501-2555.

European Society of Cardiology. (2008). Management of acute myocardial infarction in patients presenting with persistent ST-segment elevation. The Task Force on the management of ST-segment elevation acute myocardial infarction of the European Society of Cardiology (ESC), *European Heart Journal*, 29, 2909-2945.

Appendix I – Bibliography and references

Ellis, C., Devlin, G., Matsis, P., Elliott, J., Williams, M., Gamble, G., Mann, S., French, J., & White, H. (For the New Zealand Acute Coronary Syndromes [NZACS] Audit Group). (2004). Acute Coronary Syndrome patients in New Zealand receive less invasive management when admitted to hospitals without invasive facilities. *Journal of the New Zealand Medical Association*, 117(1197).

Ellis, C., Gamble, G., French, J., Devlin, G., Matsis, P., Elliott, J., Mann, S., Williams, M., & White, H. (For the New Zealand Acute Coronary Syndromes [NZACS] Audit Group). (2004). Management of patients admitted with an Acute Coronary Syndrome in New Zealand; Results of a comprehensive nationwide audit. *Journal of the New Zealand Medical Association*, 117(1197).

Ellis, C., Devlin, G., Elliott, J., Matsis, P., Williams, M., Gamble, Hamer, A., Richards, M., & White, H. (For the New Zealand Acute Coronary Syndromes [NZACS] Audit Group). (2010). ACS patients in New Zealand experience significant revascularisation treatment especially when admitted to ono-interventional centres: results of the second comprehensive national audit of ACS patients. *Journal of the New Zealand Medical Association*, 123(1319).

Elliott, J., & Richards, M. *Journal of the New Zealand Medical Association*. (2005). *Heart attacks and unstable angina (acute coronary syndromes) have doubled in New Zealand since 1989: how do we best manage the epidemic?* 118(1223).

Fisher, N. (2010). *District Wide Cardiology Department Annual Report for year ended 30th June 2010*. Nelson Marlborough, New Zealand: Author.

Heart Foundation Conference. (2011). *Cardiac Aria: A geographic approach to measuring accessibility to cardiac service before and after an acute cardiac event.*. Retrieved from <http://www.heartfoundation2011.org/abstract/217.asp>

Heart Foundation Conference. (2011). *Pre hospital thrombolysis – Feasibility of in the field administration by paramedics in rural and regional NSW*. Retrieved from <http://www.heartfoundation2011.org/abstract/8.asp>

Hewlett-Packard. (2007). *MidCentral Health Clinical Services Plan*. Wellington, New Zealand: Hewlett-Packard.

Huynh, L.T., Rankin, J.M., Tideman, P., Brieger, D.B., Erickson, M., Markwick, A.J., Astley, C., Kelaher, D.J. & Chew D.P.B. (2010). Reperfusion therapy in the acute management of ST-segment-elevation myocardial infarction in Australia: findings from the ACACIA registry. *The Medical Journal of Australia*, (193)9, 496-501.

Medscape.com. (2010). *FDA Approves First Cryoballoon to Treat AF*. Retrieved from http://www.medscape.com/viewarticle/734637_print

MidCentral District Health Board. (2005). *Cardiovascular Service Plan*. Palmerston North, New Zealand: Author.

MidCentral District Health Board. (2008). *Health Needs Assessment*. Palmerston North, New Zealand: Author.

Ministry of Health. (2003). *Cardiovascular Disease: DHB Toolkit: Cardiovascular Disease* (2nd ed.). Retrieved from <http://www.moh.govt.nz/moh.nsf/indexmh/cardiovascularisease>

Ministry of Health. (2004). *Family Doctors: methodology and description of the activity of private GPs: The National Primary Medical Care Survey (NatMedCa): 2001/02. Report 1*. Wellington, New Zealand: Author.

Appendix I – Bibliography and references

Ministry of Health. (2007). *Elective Services: Comparative Analysis of DHB Intervention Rates for selected Elective Services*. Retrieved from <http://www.moh.govt.nz/moh.nsf/indexmh/electiveservices-interventionrates>

Ministry of Health. (2008) *Diabetes and Cardiovascular Disease Quality Improvement Plan*. Wellington, New Zealand: Author.

Ministry of Health. (2010). *Saving Lives: Amenable Mortality in New Zealand, 1996–2006*. Wellington, New Zealand: Author.

National Heart Foundation of Australia and Cardiac Society of Australia and New Zealand. (2006). Guidelines for the management of acute coronary syndromes 2006. *Medical Journal of Australia*, 184(8), S1-S30.

New Zealand Guidelines Group. (2009). *New Zealand Cardiovascular Guidelines Handbook: A summary resource for primary care practitioners*. 2nd ed. Wellington, New Zealand: Author.

Page, A., Tobias, M., Glover, J., Wright, C., Hetzel, D., & Fisher E. (2006). *Australian and New Zealand Atlas of Avoidable Mortality*. Adelaide, Australia: PHIDU, University of Adelaide.

Rafter, N., Connor, J., Hall, J., Jackson, R., Martin, I., Parag, V., Vander Hoom, S., & Rodgers, A. (2005, October 7). Cardiovascular medications in primary care: treatment gaps and targeting by absolute risk. *The New Zealand Medical Journal*, 118(1223).

Sandhoff, B.G. Pharm, D., Kuca, S. RN., Rasmussen, J. PharmD., & Merenich, J.A. (2008). Collaborative Cardiac Care Service: A Multidisciplinary Approach to Caring for Patients with Coronary Artery Disease. *The Permanente Journal / Summer*, 12(3), 4-11.

Sarah Wild and colleagues. (2004). Global Prevalence of Diabetes - Estimates for the year 2000 and projections for 2030. *Diabetes Care*, 27, 1047–1053.

Scottish Intercollegiate Guidelines Network. (2007). *Acute coronary syndromes. A national clinical guideline*. Scotland, UK: Author.

Tang, E.W., Wong, C., Wilkins, G., Herbison, P., Williams, M., Kay, P., Restieaux, N. (2005). Use of evidence-based management for acute coronary syndrome. *The New Zealand Medical Journal*, 118 (1223).

Terkelsen, C.J., Sorensen, J.T, Maeng, M., Jensen, L.O., Tilsted, H., Trautner, S., ... Lassen, J.F. (2010). System Delay and mortality among patients with STEMI treated with primary percutaneous coronary intervention. *Journal of the American Medical Association*, 304(7), 763-771.

Te Rōpū Rangahau Hauora a Eru Pōmare. (2010). *Summary of Central Regional Data for Acute Cardiac Events*. Wellington, New Zealand: Eru Pōmare Māori Health Research Centre.

van Gaal, W.J., Clark, D., Barlis, P., Lim, C.C.S., Johns, J. & Horrigan M. (2007). Results of primary percutaneous coronary intervention in a consecutive group of patients with acute ST elevation myocardial infarction at a tertiary Australian centre. *Internal Medicine Journal*, 37, 464-471.

Van de Werf, F., Bax, J., Betriu, A., Blomstrom-Lundqvist, C., Crea, F., Falk, V., Filippatos, G., Fox, K., Huber, K., Kastrati, A., Rosengren, A., Steg, P.G., Tubaro, M., Verheugt, F., Weidinger, F. & Weis, M. European Heart Journal. (2008). *Management of acute myocardial infarction in patients presenting with persistent ST-segment elevation*. 29, 2909-2945.