

The National Asset Management Programme for district health boards

Report 1: The
current-state assessment

June 2020

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National asset management programme documents

Author	Title	Date
Beca Group	NAMP lessons learnt workshop	2019
Rider Levett Bucknall	All-in ROC ¹ estimates	2019
Beca Group	NAMP methodology for rating seismic resilience	2019
Kestral Group	Background information on seismic risk and seismic assessment	2019
Beca Group	NAMP DHB ² asset condition self-assessment: Data standard and methodology	2019
Beca Group	31 DHB campus assessment reports	2019
Ministry of Health	20 DHB clinical facility fitness for purpose reports	2019
Ministry of Health	Workshops: Introduction to asset management: Writing, living, updating asset management plans	2019
Ministry of Health	Clinical facility fitness for purpose: Assessment tool and methodology	2019
Beca Group	NAMP asset condition survey: Data standard and methodology	2019
Ministry of Health	NAMP updates for district health boards	2018-19
Morrison Low	National asset register: Feasibility report	2018
DHB Working Group	Asset conditions workshop presentation	2018
Ministry of Health	Guidelines for critical and priority buildings and infrastructure in the district health boards and the health sector	2018
Ministry of Health	Asset management plan: Project management plan	2018

¹ ROC = rough order of cost

² DHB = district health board

Asset management source documents

Author	Title	Date
New Zealand Health and Disability review	Interim report: Section 10: System enablers	2019
OAG ³	District health boards' response to asset management requirements since 2009	2016
OAG	Reflections from our audits: Investment and asset management	2017
Audit New Zealand	Asset management and long-term planning: Learning from audit findings 2015 to 2017	2017
Cabinet Office	CO (19) 6: Investment management and asset performance in the state services	2019
OAG	Managing public assets: Discussion paper	2013
King's Fund	Clicks and mortar: Technology and the NHS estate	2019
NSW ⁴ Audit Office	New South Wales Auditor-General's Report: Performance audit: Medical equipment in NSW public hospitals	2017
The Center for Health Design	A guide to clinic design post-occupancy evaluation toolkit	2015
Fronczek-Munter, A	Evaluation methods for hospital facilities	2013
Victorian Government	Medical equipment asset management framework	2012
OECD ⁵	Sizing up the challenge ahead: Future demographic trends and long-term care costs	2011
WHO ⁶ Rechel et al	Investing in Hospitals of the Future	2009
NHS ⁷ estates	Assets in action: An asset management guide for non-technical managers	2003

³ OAG = Office of the Auditor-General

⁴ NSW = New South Wales

⁵ OECD = Organisation for Economic Co-operation and Development

⁶ WHO = World Health Organisation

⁷ NHS = National Health Service

Executive summary

Context

District health boards (DHBs) manage buildings with a replacement value of around \$24 billion, and there is also considerable investment in clinical equipment and information technology (IT). Therefore, capital investment and other aspects of asset management make a significant call on financial resources. Further, the decision-making environment for capital investment and management is complicated by a mix of local, regional and national considerations.

As noted in the Health and Disability System Review interim report (2019, p 263), 'The current state of DHB assets is not good and there is little in the way of long-term planning which can give any confidence that the problem is under control.' Resources have tended to be directed to managing short-term operational pressures, rather than to plan for and invest in longer-term sustainable solutions, including infrastructure.

And it is not just a matter of remediating the accumulated investment deficit; we need to build the capability to support system transformation, especially as models of care evolve, including the advances in clinical equipment and technology that enable shorter hospital stays and more community-based care. In addition, a growing and ageing population will continue to see increased demand for both hospital and community services.

Based on 2018 DHB capital estimates, \$14 billion of investment is required for buildings and infrastructure over the next 10 years. In 2019, the Ministry of Health estimated a requirement for \$2.3 billion for DHB IT⁸ over the same period. The development of a Health National Asset Management Programme (NAMP) is a key initiative to improve the planning and management of health assets. The NAMP process began in 2018–19 to establish a national long-term investment plan founded on a consistent nationwide approach to asset management. This current-state assessment report is the first deliverable, which will be followed by a full National Asset Management Plan with investment scenarios in 2022.

The NAMP is part of a government-wide focus to improve the quality of capital funding decisions, asset management and long-term investment outcomes, in which the primary objective is to deliver the best value from new and existing investments for generations of New Zealanders. The Government has set clear objectives to have asset management plans in place to guide strategic, tactical and operational choices under Cabinet Office circular CO (6) 2019. This circular specifies all aspects of the investment lifecycle for assets and applies to DHBs along with other government agencies. The NAMP is intended to guide strategic investment choices at a sector level, and it is

⁸ This estimate for IT was calculated from DHB operating expenditure during 2018/19, allowing for 2.2 percent additional funding per annum required to lift investment to the benchmark levels identified in the Deloitte (2015) independent review of New Zealand's electronic health records strategy.

expected that, over time, it will provide a consolidated picture of the DHBs' asset management plans.

What does this plan do?

Work to date focuses on bringing together the current state into a national asset register. It provides a consistent picture of the condition, fitness for purpose and deployment of critical assets, including buildings, infrastructure, clinical facilities and IT.

In doing so, this initiative introduces consistent standards for the assessment of asset condition, functionality and consolidation of asset types. It provides a basis for moving towards national prioritisation of investment decisions that meet the Government's wider budget and wellbeing priorities. The current-state assessment provides the framework to evolve into a national asset plan once asset levels of service are identified to inform investment scenarios.

The NAMP has introduced the following enablers to strengthen health sector asset management capability:

- the Health Asset Register Tool (HART), which is a repository for information on DHB-owned buildings, infrastructure, clinical facilities and the capacity of inpatient beds
- a criticality matrix to determine the relative importance of hospital buildings for health services and compliance with the Building Act 2004
- guidelines for consistent condition assessments of hospital buildings and infrastructure that inform both professional assessments and DHB self-assessments
- a methodology to determine the fitness for purpose of clinical facilities that strengthens understanding of the requirements for size, layout and accommodation of new health technologies
- guidelines on seismic risk and a method for assessment of structural resilience that is currently under pilot
- indicative standard costs for refurbishment and replacement of facilities to allow consistent cost estimates in future investment plans
- initial asset management awareness training that was well received and should be continued, alongside revitalisation of the Health Assessment Management Improvement group of health sector asset managers.

This is a significant body of work that is a step-change for health sector asset management capability and long-term investment planning. It will be evolved through future assessments and the development of asset management and investment plans. DHBs have welcomed and embraced the guidelines to date and collaborated on all the assessments.

Not all of the 2019/20 work completed is represented in this report. Other work on the assessment methods and guidelines contributes to the health sector asset management framework and provides a foundation for the asset management plan. The document list at the front of this report includes other reports and material that have been produced by the programme.

This current-state assessment provides evidence to determine the relative investment priorities, which include:

- sitewide infrastructure (eg, pipes and electrical power)
- building operability (eg, passive fire separation)
- mental health and intensive care units, including the fitness for purpose, condition and maintenance of facilities
- core IT applications, including financial management, patient administration and pharmacy management systems.

Public-facing facilities are generally in better condition than the infrastructure, facilities and systems where the condition is less immediately evident.

What does this current-state assessment not (yet) do?

The initial work in this current-state assessment lays the foundation for improving the quality of capital funding decisions, asset management and long-term capital investment to contribute to better outcomes across the health sector. Ongoing work is required to develop a framework for prioritising capital funding and understanding long-term investment requirements. A work programme is being developed and a key checkpoint will be the future delivery of a formal National Asset Management Plan.

We now have a consistent view of the major health facilities, which alongside the other investment management functions currently in development, will support a more robust national investment plan. The other drivers of investment planning to support the NAMP will be national service design and facility standards, settings, frameworks and guidance. As the programme and plan evolve, it will enable the health and construction sectors to develop their capacity and readiness with more certainty.

A key principle of asset management is to develop targets that define the asset levels of service, which is necessary to ensure each asset meets the design and condition requirements to support the needs of health service delivery. An investment plan and/or scenarios will be developed to cost the 'gap' between the current and target asset levels of service. The work to date provides a good assessment of the current state of assets, but targets for asset levels of service have not yet been identified.

Scope of the review

Table 1 sets out the scope of the assets included in the 2018–19 assessments.

Table 1: Scope of 2019 asset assessments

Asset type	In-scope	Not included in this current-state assessment
166 buildings	Expert assessments: Condition of 166 buildings at main hospital campuses built pre-2000.	Health-owned buildings not at main hospital and facility campus sites.
933 buildings	Self-assessments: all 933 other buildings.	Leased property (that DHBs occupy but do not own).
80 clinical facilities <ul style="list-style-type: none"> 56 acute pathway units 24 mental health units 	<p>52 units = 50% of acute pathway units (emergency departments, operating theatre suites, intensive care units) and 19 inpatient units in pre-2000 buildings, along with 4 control units in newer buildings.</p> <p>23 units = 50% of mostly acute mental health inpatient units in buildings pre-2009, 1 control unit in a newer building.</p>	<p>Acute pathway units in post-2000 buildings, most inpatient units and all other types of clinical facilities.</p> <p>Other 50% of mental health inpatient units, 100% of forensic mental health units.</p>
Infrastructure – 31 main campuses	All sitewide reticulated infrastructure (ie, plumbing, electrical, mechanical) except at Dunedin and Whakatāne hospitals.	<p>Siteworks, roading, carparks, open spaces.</p> <p>Reticulated infrastructure at other locations.</p>
Information technology	5 core applications at each DHB. Northern region IT infrastructure, data centres, networks and security (healthAlliance and Northland, Waitematā, Auckland and Counties Manukau DHBs).	<p>Other core applications at DHBs.</p> <p>IT infrastructure, networks and security at the other DHBs.</p>
Clinical equipment		Clinical equipment (will be included in future NAMP reports).
Other minor assets		All minor assets (according to criticality and materiality will be included in future reports).

What did the work find?

The results of the current-state assessment (the review) carried out as part of the NAMP are outlined below in respect of buildings and infrastructure, older clinical facilities and IT. Several factors contributed to the results, including:

- health sector weakness in asset management
- the prioritisation of expenditure on operational rather than capital requirements, which has led to a significant backlog of deferred maintenance
- the demands of rapidly changing health technologies
- the inability of DHBs to adapt quickly enough to changing demands.

Buildings and infrastructure

Buildings are mostly in average to good condition, with those in average condition having various poor components. The review identified key operability issues, including risks levels for structural integrity, seismic restraints, passive fire separation and presence of asbestos. The average age of buildings at DHBs ranges from 28 years at Waitematā DHB to 53 years at Southern DHB. Generally, the older the building, the poorer its condition. This in turn affects the housing of clinical facilities and data centres.

Sitewide infrastructure was in relatively poorer condition than the main campus buildings. Many campuses have significant issues with reticulated infrastructure, including electrical systems and pipes at or near end-of-life and not designed to support continually increasing operational loads.

Many mental health facility buildings are in better condition than main clinical blocks due to their location in low-rise and simpler building types. However, the interiors of mental health facilities were in poorer condition, as identified in the CFFFP assessments.

Older clinical facilities

The review assessed the CFFFP of 75 older and five newer units across five clinical services nationwide. The units were mostly located in older hospital buildings, with many having well-known shortfalls compared to current guidelines. The divergence from current Australasian guidelines was used to identify the relative appropriateness of the clinical facilities to support their models of care. As design standards are established for the New Zealand health sector, new builds will be expected to meet these. The 2019 assessments produced the following results.

- **Mental health units:** Over two-thirds of the older units have facility designs inadequate for the management of patient cohorts, demand pressures, poor maintenance and safety issues.
- **Inpatient units:** Older units generally have poor facility designs and floor areas and they are generally not reconfigurable. There are common issues of lack of storage, clutter causing safety concerns, infection control issues and a lack of spaces and ceiling-mounted hoists for bariatric care.
- **Intensive care units:** Most older units do not meet current guidelines for physical space, configuration and storage. Some also have issues with infection control, patient observation, negative-pressure rooms and with medical gas and suction services.
- **Operating theatres:** Some older theatre suites are too small or have a mix of acceptable and undersized theatre rooms. This partly reflects the need to accommodate continuing advances in clinical and information technologies as the facilities age.
- **Emergency departments:** Most older departments do not meet current guidelines. Issues include undersized bed bays, poor layout and corridors cluttered with equipment. While most do seem to be managing the increased demand, having

appropriate spaces to manage people who require a mental health assessment is an issue.

Information technology

The review synthesized existing material to assess several core applications, along with the state of the digital health environment, data standards and IT infrastructure. There are significant issues with legacy systems and outdated infrastructure, which means that the benefits of health IT to enable health equity and lift health service productivity have not been realised. These assessments found the following.

- **Digital health environment:** Audits found that IT strategy, governance and asset management operate at a basic level. The presence of legacy systems, incompatible devices and outdated infrastructure has created ongoing challenges for users to access and use patient and clinical information across both internal hospital locations and wider health service settings.
- **Core applications:** The sample included selected systems at all 20 DHBs. Assessments found 10 DHBs with poor financial management systems, four with poor or very poor patient administration systems, four with very poor pharmacy management systems and one with a very poor clinical portal system.
- **National data standards:** The slow progress with adoption of four key standards has limited the interoperability necessary to share, reuse and analyse information that would enhance both clinical and management operations.
- **IT infrastructure, networks and security:** These are outdated and not adequate to support the introduction of new systems and to manage the increased cyber security issues. While digital health has become critical to the delivery of services, there are significant risks to services from a lack of system capacity, resilience and business continuity arrangements.

COVID-19 pandemic

While the NAMP 2019 assessments predated the COVID-19 pandemic, the assessment findings contribute to ongoing work on emergency preparedness. This report highlights several issues important for management of large numbers of people with infectious and life threatening illness. The COVID-19 response experience underlines the importance of the next phase of NAMP assessments.

The capacity of sitewide electrical and medical gas capacity can limit the numbers of ventilators and monitoring equipment that can be operated at the same time. The clinical facility fitness for purpose (CFFFP) assessments identify issues with patient separation, clean and dirty workflows and suboptimal surfaces that creates difficulties around infection control. There are older negative pressure rooms, used to isolate infectious patients, that are poorly designed compared to the Australasian Health Facilities Guidelines (AHFG). The design issues include inadequate size, lack of ante-rooms and problems with doors seals and ventilation.

Health sector slowness to adopt standards that enable interoperability between health applications and support tracking of equipment and people is outlined in this report.

The COVID-19 response has also highlighted issues with the procurement and availability of clinical equipment, particularly for intensive care. Better integrated IT and telehealth applications would expedite the provision of services to many people, without the need for a hospital visit. A robust assessment method is being developed for clinical equipment and IT as part of the next phase of the NAMP.

Next steps

The Ministry of Health's Health Infrastructure Unit is working on a prioritised work programme to improve asset management in the health sector. This will be based on the improvement actions that have been identified in this report and are aligned to the available resources. The high priority next steps are as follows.

- Deliver a National Asset Management Plan incorporating investment scenarios to Ministers in 2022.
- Continue to work with DHBs to improve asset management practice and increase capability, including leveraging good practice identified in available asset management plans.
- Develop national service design and facility standards, settings, frameworks and guidance for capital planning.
- Develop asset levels of service aligned to national service design to quantify long-term investment scenarios.
- Develop more extensive and detailed assessments for digital health maturity.
- Develop scope, standards, priorities and complete assessments for clinical equipment.
- Develop a sector-wide capital investment framework and plan.
- Develop renewal and maintenance strategies.
- Incorporate more emphasis on health equity and sustainability in asset management practice, including to reduce greenhouse gas emissions and achieve carbon zero targets.

Section 1

Introduction

This current-state assessment creates a consistent nationwide picture of the condition and fitness for purpose of district health board (DHB) buildings, infrastructure, clinical facilities and information technology (IT) assets. Alongside other prioritisation criteria, it will help inform capital investment decisions and provide a foundation for evidence-based asset management plans to enable effective health service delivery.

In May 2018 the Minister of Health announced the Government's intention to address the poor state of health infrastructure (Minister of Health 2018). At the time, there was uncertainty around the DHBs' estimated need for a \$14 billion investment over 10 years and the dependence on Crown funding (Treasury 2017). As a first step, the Minister commissioned a national asset management plan to establish a consistent nationwide picture of the state of DHB assets and forecast the population demand for services over the medium to long-term. This first report of the National Asset Management Programme (NAMP) outlines the current state of the assets.

DHBs operate with an accumulated under-investment in assets and many believe their assets to be in poor condition and no longer fit for purpose. Work through 2018–19 indicates investments of \$14 billion for buildings and infrastructure and \$2.23 billion for IT are needed over the next 10 years. However, there are financial constraints, capacity issues for the construction sector and a requirement for a national evidence-based prioritisation framework. Further, there are competing demands on DHBs' funds, with increased clinical complexity relating to an ageing population and ongoing developments in health and digital technologies. The direction in the New Zealand Health Strategy is to leverage new technologies and models of care to deliver more services in outpatient and community settings, rather than in hospitals. At the same time, the strategy anticipates that population ageing will increase the demand for health services, including hospital care (Minister of Health 2016).

This report sets out the current state for selected assets in DHBs. Section 1 provides background on the government-wide agenda to improve asset management. Next, it outlines the state of asset management and the context for capital investment decisions in the health sector. It concludes with the role of the NAMP in the sector and a readers' guide for this report.

Government-wide context

The NAMP is part of a government-wide agenda to improve the quality of asset management and long-term investment plans. Other large agencies have been building their capability in asset management and investment, such as the New Zealand Defence Force, the NZ Transport Agency, the Ministry of Education, the Department of Corrections and Kāinga Ora. The Ministry of Health differs from most central government agencies because it funds but does not own the assets. DHBs own buildings and infrastructure with a replacement value of around \$24 billion and a similar investment in fittings, clinical equipment and IT. This asset base is large, with a complex operating environment.

Several agencies have oversight of health sector capital investment. DHBs must seek joint approval from the Minister of Health and the Minister of Finance for investments over \$10 million and where Crown funding is required (National Health Board 2011). The Capital Investment Committee (CIC)⁹ provides independent advice to these Ministers. The Ministry of Health and The Treasury provide advice to their respective Ministers and support the deliberations of the CIC.

There have also been initiatives to encourage improvement in asset management and long-term investment plans. The Office of the Auditor-General (OAG) provides government with independent assurance about the DHBs' asset management and financial performance. The Treasury has used the investor confidence rating (ICR) to assess the quality of financial and asset management for capital-intensive agencies every three years (Cabinet Office 2015). The Health Asset Management Improvement group is a forum designed to encourage improvement and share knowledge in the health sector.

Sustained attention to asset management and long-term investment plans is essential to build health sector capability. As outlined below, the journey to this first report began with the introduction of asset management plans for DHBs in 2009. The NAMP has evolved from the accumulated effort since then, with the second report and plan due in 2022.

2009	Introduction of asset management plans for DHBs
2011	CIC established and regional plans introduced
2014-15	The Treasury and Ministry of Health review asset management maturity
2015	Health Asset Management Improvement (HAMI) group established
2015	Investor confidence ratings introduced
2016	OAG reports that DHB asset management is immature
2017	Long-term investment plans introduced for DHBs

⁹ The CIC is a committee established under legislation to advise the Ministers of Health and Finance.

2018	18 DHB long-term plans submitted to the Ministry of Health
2018	First long-term investment plan for the Northern Region produced
2017–19	Two rounds of ICR assessment for seven DHBs and Ministry of Health
2018–19	First NAMP assessments undertaken
2020	NAMP Report 1: Draft current-state assessment
2020–21	NAMP Phase 2 programme of work
2022	NAMP second report: National Asset Management Plan

Health sector asset management

Audits of DHBs found that poor asset management has compromised the quality of long-term plans (Office of the Auditor-General 2016). Internationally, poor asset information has been linked to suboptimal allocation of health sector capital (Marriot et al 2011). In 2020 the COVID-19 pandemic response also highlighted weaknesses in health sector asset management, notably around the capacity of facilities, sitewide infrastructure, clinical equipment and IT.

In 2018, the NAMP and Morrison Low visited 11 health agencies to assess the quality of asset information. Included were healthAlliance and the Auckland, Waitematā, Counties Manukau, Tairāwhiti, Taranaki, Capital & Coast, Hutt Valley, Wairarapa, Nelson Marlborough and Canterbury DHBs. All agencies were willing to engage and share information for the benefit of the health sector.

To provide detailed feedback for DHBs, Morrison Low constructed a 1–3 rating to indicate progress on 22 areas of asset management practice for buildings, infrastructure, IT and clinical equipment. Of the 11 agencies, eight were assessed for IT asset maturity, because healthAlliance manages IT assets on behalf of the Northern Region. Only the 10 DHBs were assessed for management of clinical equipment assets. Figure 1: shows:

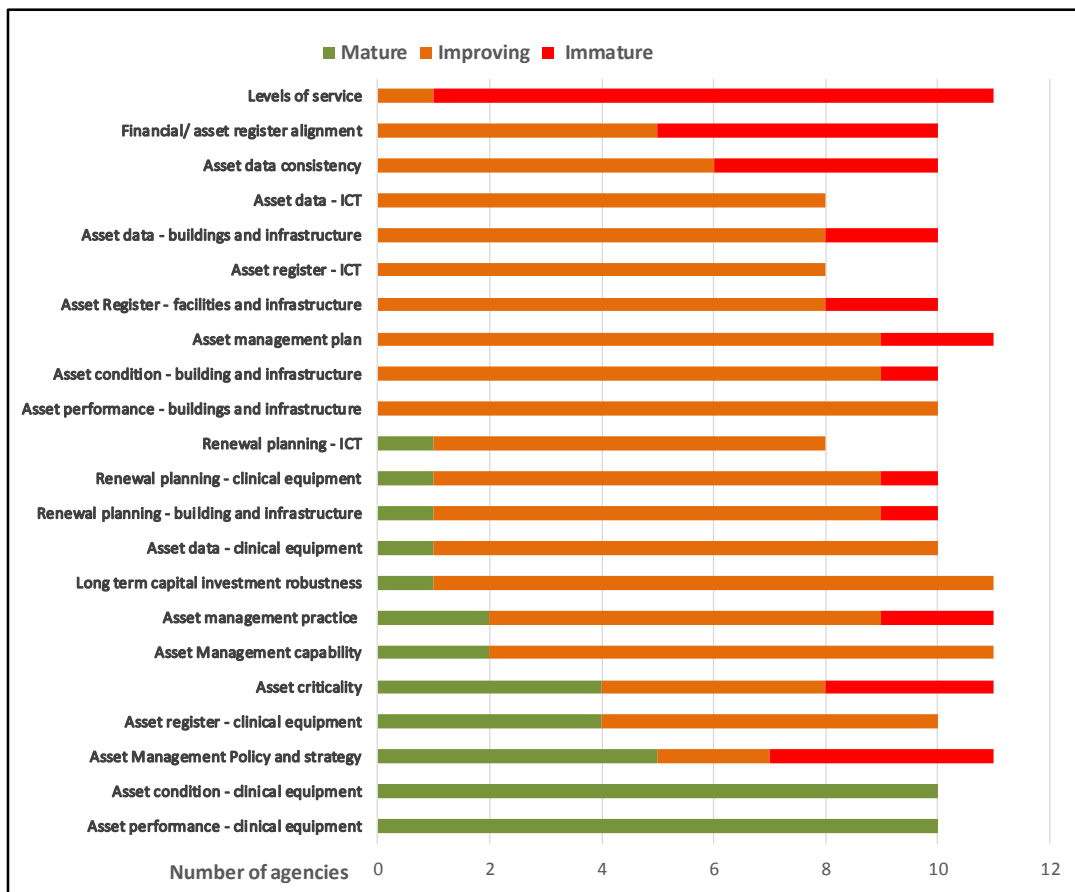
- least mature in red: asset levels of service; alignment of multiple asset and finance registers; consistency of data; and completion of asset management plans
- improving in orange: asset registers and condition and performance assessments for infrastructure, buildings and IT
- most mature in green: condition and performance assessments for clinical equipment.

This is a less detailed assessment than completed for the ICR. Conducted by The Treasury, the ICR takes a more in-depth look at the performance of individual agencies in the management of their investments and assets. It provides an indication of the level of confidence that investors (such as Cabinet and Ministers) have in an agency's ability to realise a promised investment result if funding were committed. Seven DHBs and the Ministry of Health have been assessed through two rounds of the ICR, which includes scoring of their asset management maturity and asset performance.

The results of the ICR are on The Treasury's website treasury.govt.nz/information-and-services/state-sector-leadership/investment-management/review-investment-reviews/investor-confidence-rating-icr/results-investor-confidence-rating-icr

The ICR process has encouraged Waitematā, Auckland, Counties Manukau, Waikato, Capital & Coast and Canterbury DHBs to develop asset management plans, although there was no national framework to enable a consistent nationwide picture. The NAMP has been established to achieve this.

Figure 1: Asset management maturity assessed by Morrison Low in 2018



The capital investment process

Under the current process of capital investment allocation, DHBs develop business cases to bid for a share of the annual capital available. The information used for decisions comes from stakeholders operating at different levels of the health sector. At the highest level, capital budgets are set as part of a whole-of-government budget process. For DHBs, business cases are variously constructed from a range of information about population need, asset condition and service enablers like models of care, workforce, information and clinical technologies. These business cases are often developed in isolation from DHB neighbours and regional partners. An exception is the long-term investment plan developed in 2016 by the four northern DHBs, which are developing a 10-year roadmap for capital investment. Overall, there is limited consistency and transparency of information at either the local, regional or national levels.

The immaturity of health sector investment and asset management means that asset management plans have not informed the business case process. This has increased the effort and time for DHBs to develop each business case. It has also lengthened the process of business case review as further information and clarification has been necessary to establish a level playing field in the decision-making processes of capital allocation.

In addition to the issues around information quality, capital investment decisions in the health sector are complex. While buildings can have a life of 30–50 years, the designs for effective health facilities change more rapidly. Government and DHBs face a mix of competing considerations for capital investment decisions, including:

- changes to demographics, affecting the types and quantity of services required
- delivery of equitable health outcomes across regions and populations
- current government priorities such as outcomes for mental health and Māori
- the condition of buildings and infrastructure and the optimal time for renewal
- shifts of health services from hospital to community settings
- optimal leverage of health and information technologies, workforce and models of care
- improved availability and access to services for consumers
- synergy with regional and local initiatives and stakeholders
- value-for-money and service sustainability
- advances in technology and innovation that support environmental sustainability.

In this environment it is essential to consider changes in facilities design, health sciences, models of care, IT and clinical equipment, rather than replace assets like-for-like. An optimal investment could be to build an ambulatory care centre located to facilitate access for vulnerable populations or co-located with primary care teams rather than within a hospital. A mature asset management approach focuses on the services required and ensures that non-asset solutions are included in decision-making.

Why have a NAMP?

The NAMP is an important part of the Ministry of Health's stewardship of the health system. It will inform the capital investment plans to enable effective service delivery and improve health outcomes. For the wider economy, the 2020 current-state assessment and the plan due in 2022 will encourage the construction sector to understand the long-term capital pipeline and develop and retain a skilled workforce (Minister for Building and Construction 2018).

For the health sector, the NAMP will:

- provide leadership and expertise to improve the maturity of DHB asset management

- inform national and regional investment plans by supplying a consistent current-state picture of the condition, lifecycle and capacity of the health estate, along with the forecast demand for services
- provide a transparent source of information to underpin robust discussion around capital allocation among DHBs, the Ministry of Health, The Treasury, the CIC and other stakeholders
- form an important part of the Ministry's work to improve long-term plans, including the development of guidelines on asset assessment, service plans, facilities standards, models of care and sustainability.

The NAMP will influence a shift to strategic and lifecycle considerations in the management of capital investments. Research shows that moving too quickly through the conceptual and planning phases for new health facilities risks poorer long-term outcomes. The costs prior to occupancy are likely to account for only 6 percent of the lifetime costs of the building. Best practice is to maintain focus on health service strategy, the facility's fitness for purpose and its operational cost, prior to occupancy (Bjorberg and Verweij 2009).

What is the NAMP?

Begun in 2018, the NAMP is a high-level strategic programme. Over time it will create investment pipelines to inform capital allocation, allowing for different scenarios for government investment. This includes funding from DHB budgets and additional capital allocations.

The NAMP will provide guidelines to consistently identify and assess assets across DHBs. This includes the assets' condition, expected life and cost of renewal. Information on the population demand, along with the assets' level of service and expected life, will be used to plan the timing of large investments. This will form the basis for consideration of what types of assets and technologies should be deployed to replace those that are approaching end-of-life.

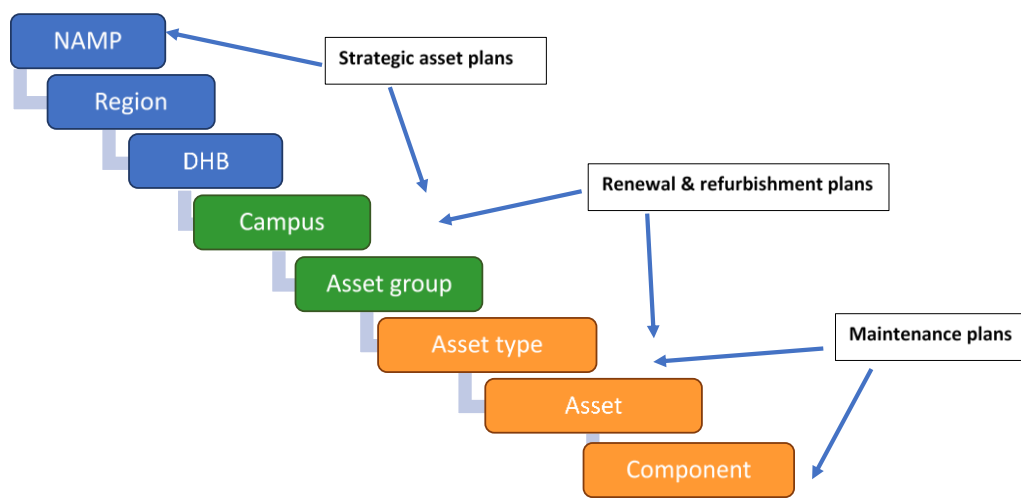
In 2018–19, to establish the inaugural assessments, the programme delivered:

- a framework to determine building criticality in health services
- professional onsite inspection of 166 selected older and critical hospital buildings
- self-assessments by DHBs of 993 other buildings
- professional onsite assessments of infrastructure on 31 campuses
- professional onsite clinical facilities fitness for purpose (CFFFP) assessments of 75 clinical units and five control units
- Ministry of Health DHB digital systems landscape survey of core applications in DHBs
- self-assessments by DHBs of the condition of their top 20 critical IT assets
- assessment of asset management maturity in DHBs
- a national electronic asset register
- next steps for development of the programme.

The current-state assessment in this report uses data at an aggregated level to understand the condition and performance of assets in the health sector. These assets include buildings and infrastructure, clinical facilities and IT. (Clinical equipment will also be included in the 2022 report).

Figure 2: shows how data is consistently assessed from components to assets, asset types and groups to support plans for maintenance, renewal and refurbishment and strategic asset management.

Figure 2: Aggregation of asset information through planning levels

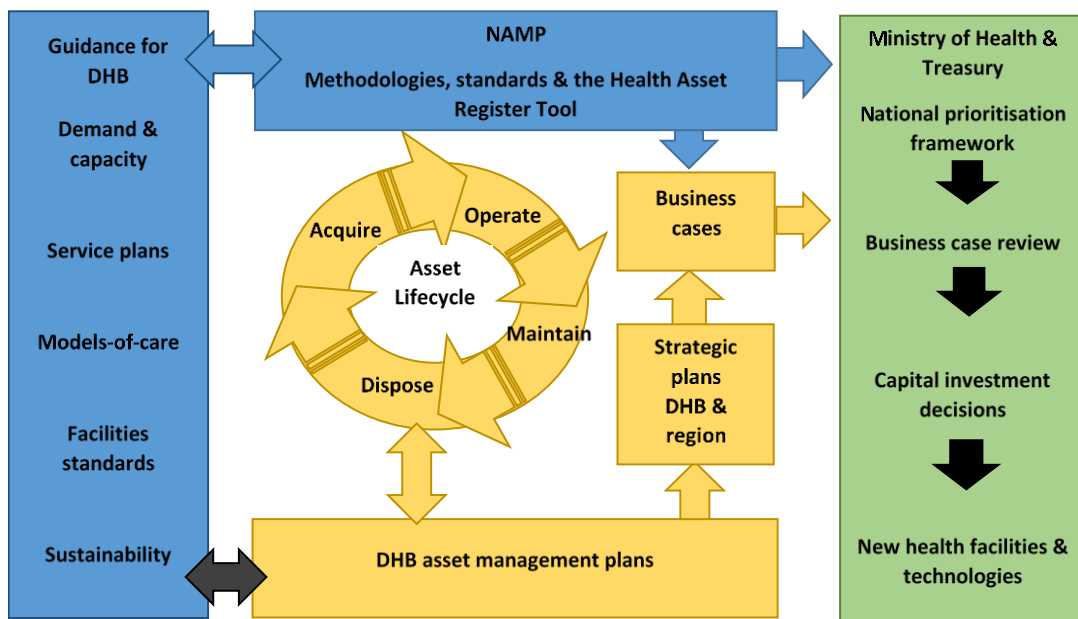


In 2019 the Ministry of Health commissioned the development of an asset management repository, the Health Asset Register Tool (HART). So far, this repository has been populated with the 2019 assessments of building and infrastructure, bed capacity and CFFFP. Development of this asset register is ongoing, with plans to support wider stakeholder access in 2020.

Figure 3 shows how the NAMP will work interactively with DHBs, both bottom up and top down, to improve the information flows that inform investment plans, priorities and decisions.

- The blue boxes show the role of the Ministry of Health's Health Infrastructure Unit to provide guidance on services plans, facilities standards, demand and capacity modelling, models of care and sustainability.
- In yellow is the lifecycle of asset management through acquisition, operation, maintenance and disposal, and the plans and business cases produced by DHBs.
- The green box shows how the NAMP and DHB asset management link to strategic plans, business cases and the national framework for investment prioritisation supported by the Ministry of Health and The Treasury, for the CIC and the Ministers of Health and Finance.

Figure 3: NAMP, asset management and investment decisions



Reading this report

Section 1 looked at the health sector asset management and capital investment context, addressed the questions of what the NAMP is and why it is important and outlined how it will operate in the future to inform health sector asset management.

Section 2 sets out the approach and findings for assessments of 1159 buildings and the sitewide infrastructure on 31 campuses. The building estate is in a mostly average to good condition, as DHBs have endeavoured to maintain assets despite a short-term planning focus. There are elements of older buildings, building operability and sitewide infrastructure in poor condition.

Section 3 sets out the approach and findings for the CFFFP of 75 units in older buildings, along with five comparison units in newer buildings. This was around half of the emergency departments, operating theatre suites, intensive care units and mental health inpatient units nationwide, along with a sample of 20 older inpatient units. As expected, the older units scored from very poor to average, with a poorer range of scores for mental health and intensive care units. These assessments will inform conversations around improvement with DHBs.

Section 4 sets out the approach and findings for the assessments of IT assets. This included DHBs' core applications, the complex and fragmented digital IT environment, the slow progress with adoption of national data standards and poor condition of infrastructure. While DHBs have maintained their IT assets, IT governance and asset management is basic. Significant investment is required to address issues with legacy systems and ageing infrastructure, and to invest in technologies that enable health services to transform to new models of care and increase community-based delivery.

Section 5 sets out next steps for the NAMP through 2020/21 and the second report targeted for 2022.

Section 2

Buildings and infrastructure

Robust investment plans are required to address poor components and shift the overall condition scores from poor or average to good. While DHB buildings are mostly in an average to good condition, the average scores indicate poor components. Also, in many cases the building operability and sitewide infrastructure are in poor condition.

Most buildings assessed were in average to good condition. DHBs have made best efforts to maintain their assets in the current environment of short-term planning. The buildings have an average age of 28–50 years, which indicates they are approaching end-of-life and are likely to have poor components within their average condition scores. For the 31 campuses assessed, scores for mechanical infrastructure were nine poor, 21 average, and one good. For electrical infrastructure¹⁰ scores were one poor, 13 average, 14 good and two very good. Further work is needed to understand the asset levels of service for the buildings and infrastructure in order to compare these to the current-state assessments. This comparison will show whether these assets appropriately support the respective health services.

Under the 2017 changes to the building regulations, there are now 52 buildings at importance levels 3 and 4 considered earthquake prone. A significant number of these buildings are currently being redeveloped at the Dunedin, Taranaki Base and Grey Base hospitals. The 2017 regulations require that remediation work be completed by 2027 for regions with high seismic risk and 2034 for regions with medium risk, although territorial authorities may grant time extensions. There are also opportunities identified by DHBs and the Ministry of Health for investments to improve the components of building operability that protect occupants through disasters. These include the quality of seismic restraints, passive fire separation and continued work on the management of asbestos.

¹⁰ There are electrical infrastructure scores for 30 of the 31 sites. At the time of the inspection, there was no access to assess the electrical infrastructure at Point Chevalier.

This section begins with the assessment approach used by the NAMP and DHBs for this current-state analysis. Next, it reports on the mean age and condition of buildings and their seismic integrity, followed by the buildings' operability including seismic restraints, passive fire separation and the presence of asbestos. The section then reports the condition of sitewide infrastructure on 31 campuses and concludes with schedules of cost estimates for new builds and refurbishments of different types of DHB buildings. Further information is set out in Appendix 4.

Assessment approach

A criticality matrix was developed with DHBs to select 166 buildings and 31 campuses for professional assessments by the NAMP team and Beca Group. DHBs self-assessed the remaining 993 buildings using the assessment guideline and an electronic survey tool.

Consistent methods were used to create a nationwide picture of the health estate. This included identification of key asset components and measures for grading condition. There is consistency between the professional and DHB self-assessments, except that the professional data is more detailed. This ensured the task was achievable for the DHBs. Scores were reviewed with each DHB and only adjusted where evidence supported this.

When making decisions on the future of critical buildings, knowledge of each building's ability to be operational after an earthquake is required. The NAMP, Beca Group and Kestral developed guidelines for DHBs to procure seismic assessments, along with a method to produce a standardised seismic rating to support comparison of the buildings. This method was applied to assess the seismic resilience of 34 properties.

Table 2 shows the components assessed for building condition, seismic integrity and building operability.

Table 2: Assessment components for buildings

Buildings
For buildings, information was collected on the condition, condition variability and estimated time to replacement for: <ul style="list-style-type: none">• building fabric (external and internal)• mechanical, heating, ventilation, air-conditioning and plumbing• electrical, power, lighting, extra-low voltage, lifts, fire systems.
Seismic integrity
For seismic integrity assessments are based on: <ul style="list-style-type: none">• structural integrity: earthquake safety as a percentage of the new building standard (%NBS) from existing initial and detailed seismic assessments• seismic resilience: a pilot study to identify seismic resilience where possible was calculated from detailed seismic assessments

Building operability

Building operability components affect the safety of the building for its occupants day-to-day and through disasters. Risk was assessed as low, medium and high for:

- asbestos, passive fire separation and seismic restraints.

Scores for building operability, including passive fire separation, likelihood of asbestos and quality of seismic restraints, are:



Table 3 shows the components assessed for the sitewide infrastructure that connects services to buildings. These assessments excluded the components assessed for buildings.

Table 3: Assessment components for sitewide infrastructure

Sitewide electrical infrastructure

- Substations
- Site distribution mains
- Main switchboards
- Site generators (backup power supply)

Sitewide mechanical infrastructure

- Steam pipes
- Heating pipes
- Heating plant
- Cooling pipes
- Cooling plant
- Medical gases
- Storm water drains
- Cold water supply pipes
- Hot and cold water site pipes
- Hot and cold water storage
- Sewer drains

Analysis

This current-state analysis is a nationwide picture of the condition of buildings and infrastructure, structural integrity and building operability. In this report, the graphs show mean (average) condition scores across critical and non-critical buildings, regardless of their age. The following factors in this assessment contribute to better mean condition ratings.

- Compared to the professional assessors, the DHBs tend to assign lower scores that indicate better condition to the 993 buildings they assessed.
- The building portfolio includes newer as well as older buildings. Averaging obscures the poor-scoring outliers that are mostly older buildings.
- An average score for a building contains many components. A building with an average score of 3.0 can comprise good and poor components, while any building that scores higher than 3.0 has components with significant issues.
- When all the critical and non-critical buildings are included, a more even distribution score is produced. There is more variation in scores for analysis at the building component level.

Table 4 sets out definitions for the condition scores used for fabric, electrical and mechanical components of buildings and the components of sitewide infrastructure.

Table 4: Condition score definitions for building and infrastructure

Rating	Condition	Definition
1	Very good	Assets displaying no deterioration or only normal routine maintenance required. New or near-new condition or repaired as good as new.
2	Good	Assets displaying limited deterioration that does not affect their use or where limited restoration has been performed. Minor maintenance may be required.
3	Average	Assets that have deteriorated to a degree where maintenance is obviously due, but not to the extent that the function is significantly impaired.
4	Poor	Assets that need repair or renewal in the short term because their condition is severely impacting performance. Barely serviceable, and failure likely in the short term.
5	Very poor	Immediate repair or renewal required. Assets have failed or failure is imminent. May pose health and safety issues and requires urgent attention.

Mean age and condition of buildings

Figure 4: shows the mean age of the buildings at main campuses ranges from 28 years at Waitematā DHB to 53 years at Southern DHB. Generally, the older the building, the poorer its condition, and suboptimal maintenance reduces the useful life of the building. For clinical buildings, refurbishments can be expected after 25 years and major refurbishment or renewal after 50 years. The vertical lines show the age range for buildings in each DHB.

Figure 4: Mean age of major campus buildings for all 20 DHBs

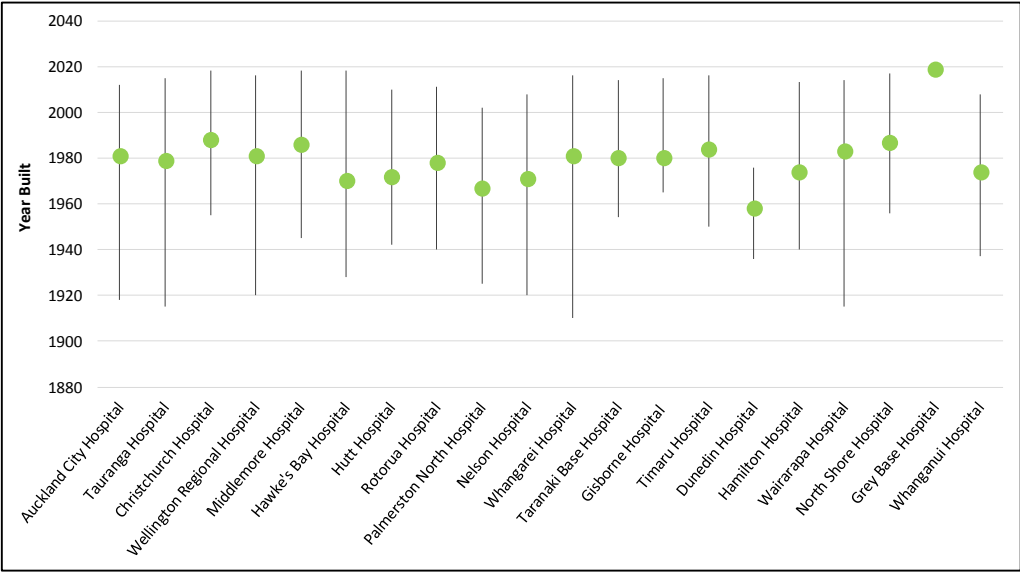


Figure 5: shows the mean condition scores for all DHB buildings, calculated on a gross floor area. There are 10 with good and 10 with average scores.¹¹ No DHBs had poor or very poor scores. However, the average scores indicate the presence of some components in poor condition.

Figure 5: Mean building condition scores weighted for gross floor area

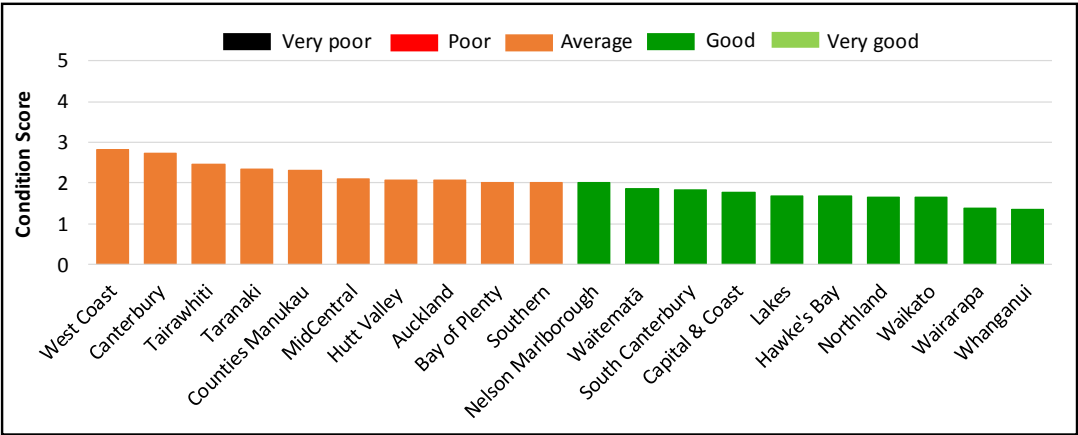
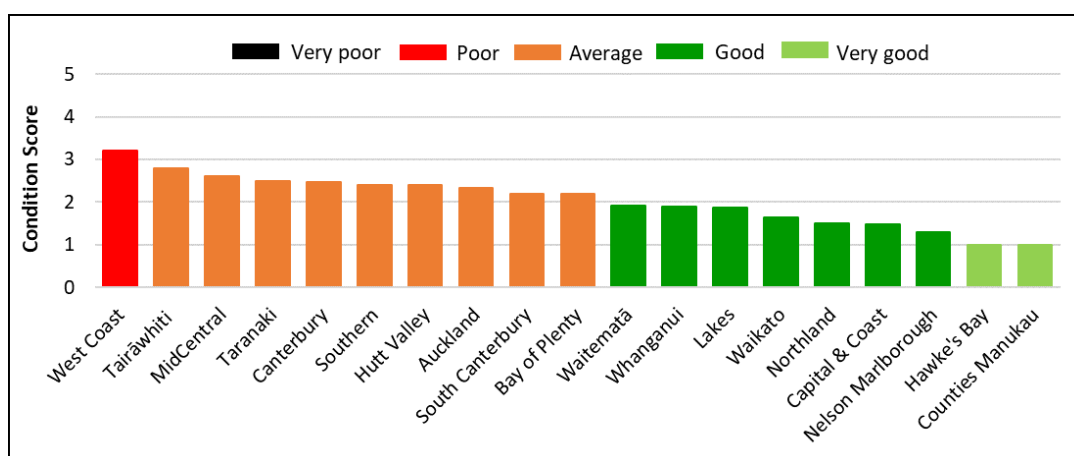


Figure 6: shows a wide distribution of mean condition scores for buildings accommodating mental health inpatient units. There are two very good, seven good, nine average and one poor. Many buildings had been refurbished and repurposed to accommodate mental health units. However, as the poorer scores for CFFFP indicate, many repurposed buildings did not have floor plans appropriate for mental health services, which can compromise service delivery. The buildings are mostly low-rise with fewer mechanical components and therefore easier to maintain. However, in many cases the interiors were found to be in poorer condition compared to the mean condition score for all the buildings. The two with very good building condition scores are newer facilities.

¹¹ West Coast DHB was not included due the current hospital rebuild.

Figure 6: Mean condition scores for buildings that house mental health units



Operability of buildings

Buildings were assessed for operability, which relates to their capacity to be safe for patients, staff and visitors. Assessments included structural integrity, seismic restraints, the presence and condition of asbestos and passive fire separation.

Structural integrity and resilience

In 2019, the Ministry of Health requested that DHBs provide the NAMP with all their %NBS scores for buildings where a seismic assessment has been completed. Previously, DHBs supplied their %NBS scores only for earthquake-prone buildings. This work is currently in progress, with 60 percent of buildings having the %NBS recorded. Scores are not required for non-essential buildings such as garages and sheds.

The building regulations related to earthquakes were changed substantially in 2017, which has had a significant impact in the health sector with its large proportion of importance level 4 and 3 (IL4 and IL3) buildings. The regulations identify buildings with emergency departments and operating theatre suites as IL4, and these buildings are likely to house other critical hospital services. The %NBS requirements are higher for buildings with a higher importance level; for instance, IL4 compared to IL3. Improvements are required for buildings that are identified as less than 33% NBS which are classified as earthquake prone buildings. This includes buildings scored as a D or E in the scoring below for any importance level. The timeframe for improvements depends on the seismic risk, being 2027 for areas with high risk and 2034 for areas with medium risk.

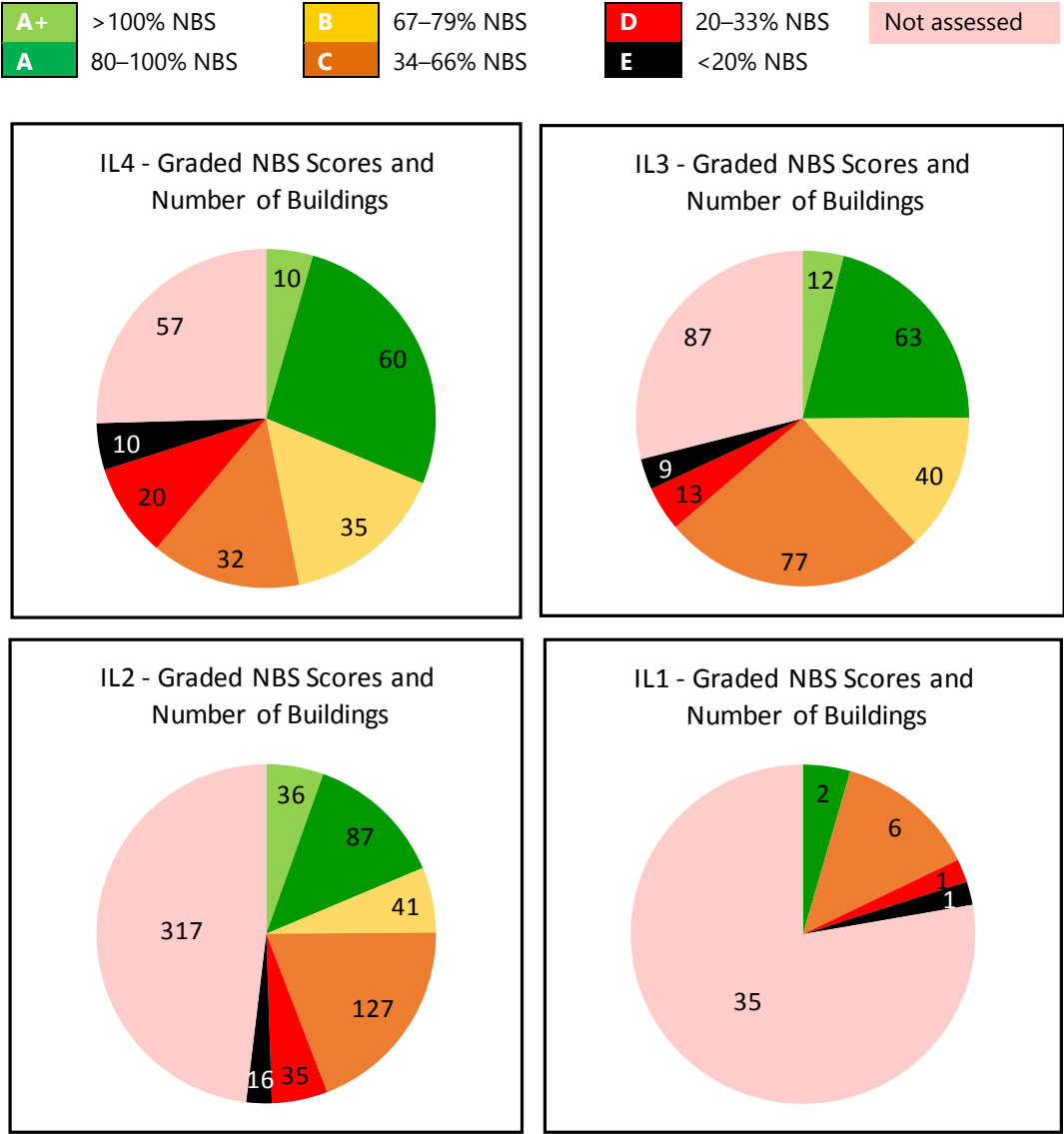
Figure 7: shows the completed structural integrity information for 1229 buildings. It shows the numbers of buildings; the importance level of 1 to 4; and for each importance level the proportion of buildings with a score A+ to E that equates to a %NBS range.

The %NBS scores indicate that there are 52 buildings (30 IL4 and 22 IL3) with scores of D and E, which are earthquake prone according to the new building regulations. All affected DHBs have plans to address these requirements. Among these 52 buildings

are those at the Dunedin, Taranaki Base and Grey Base hospitals currently being redeveloped. The Ministry of Health will be working with DHBs to determine the most appropriate action in relation to the small number of other buildings.

The IL3–4 buildings where there is presently no %NBS data are mostly located in areas of low seismic risk. While the Ministry is encouraging DHBs to assess all IL4 buildings, the building regulations allow up to 35 years for this in areas of low seismic risk.

Figure 7: Importance level of buildings and degree of earthquake risk (%NBS)



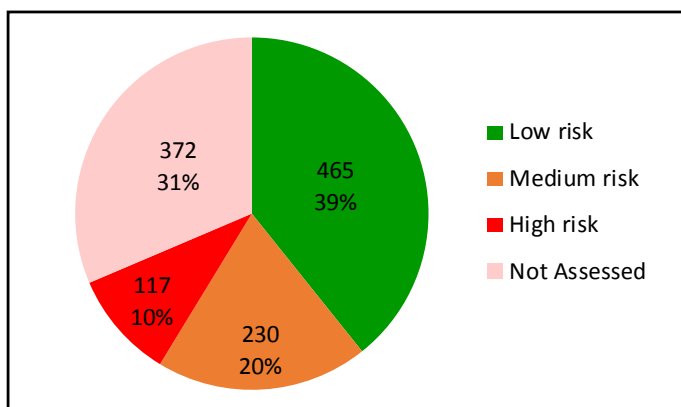
The structural integrity measured as %NBS relates to the building’s ability to protect the life of its occupants through a disaster. The Ministry of Health will work with DHBs to determine asset levels of service that are likely to include seismic resilience. Seismic resilience is a different concept from %NBS. It rates a building for its capacity to provide service continuity following a disaster. A method that uses DHBs’ seismic assessments to assess their buildings seismic resilience has been developed and is being piloted.

Seismic restraints

Most seismic restraints complied with the standards required at the time the building was constructed. In some cases, there have been upgrades to retrofit modern seismic restraints to older buildings. Overall the quality of the restraints varies, from robust frames to secure heavy equipment such as water storage units, to similar units poorly secured with limited restraint. These issues were identified through the joint DHB and NAMP assessments and the Ministry of Health will seek plans to improve seismic restraints.

Figure 8: shows the risk levels of seismic restraints as a proportion of buildings, with 39 percent low risk, 20 percent medium risk, 10 percent high risk and 31 percent not yet assessed.

Figure 8: Risk levels of seismic restraints as a proportion of buildings



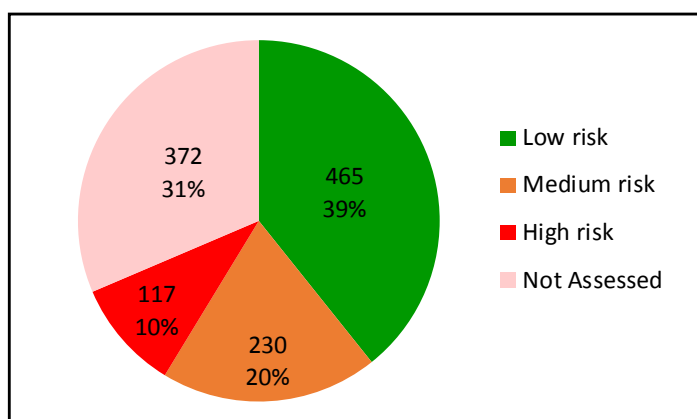
Presence of asbestos

Many DHBs are managing significant levels of asbestos present in buildings, including maintenance of an asbestos exposure register and reports to WorkSafe New Zealand. There are special procedures in place to protect building occupants and the most significant issues relate to the friable asbestos lagging of pipes.

In cases where there were significant issues, the previous and planned work to remove asbestos was discussed with the DHB. Asbestos is generally managed through isolation and encapsulation, with removal where necessary. Removal can be difficult where pipes are in constrained areas or pass through walls. Moderate asbestos is usually encapsulated.

Figure 9 shows the risk levels for presence of asbestos as a proportion of the buildings, with 39 percent low risk, 20 percent medium risk, 10 percent high risk and 31 percent not yet assessed.

Figure 9: Risk levels for presence of asbestos as a proportion of buildings



Passive fire separation

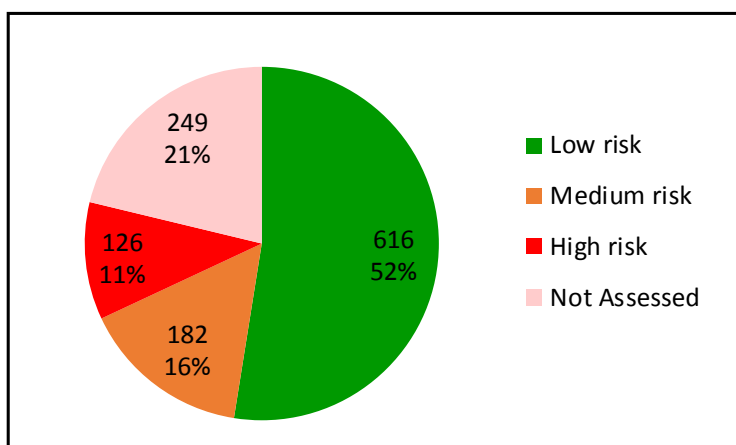
Active fire protection systems include alarms and sprinkler systems that are subject to regular building warrant-of-fitness procedures with local government, so were not included as a specific assessment in this report.

Passive fire separation is usually evaluated against the standards in place at the time of the building's construction. This assessment focuses on the current issues, rather than performance against previous standards. In many cases, passive fire separation has been compromised by poor practices around the installation of new technologies, such as cabling.

DHBs have advised the Ministry of Health that controls are now in place to ensure that fire cells are not compromised by new IT installations. There have been problems with holes drilled through walls to feed cables that were left unsealed or sealed with non-fire-resistant sealants. Unsealed holes enable smoke and flames to spread through buildings, compromising passive fire separation. In many cases, DHBs have remediation programmes that are expensive and time consuming already in progress.

Figure 10: shows the risk levels for passive fire separation as a proportion of the buildings, with 52 percent low risk, 16 percent medium risk, 11 percent high risk and 21 percent not yet assessed.

Figure 10: Levels of risk for passive fire separation as a proportion of buildings



Combined condition and operability

Older buildings generally have accumulated issues at the component level, poor %NBS scores, and may have operability issues. Tables 5 and 6 show extracts from the HART tool. From the left, is the building name, gross floor area, year built, mean condition score, building component score, seismic integrity and building operability. The building components include fabric, electrical and mechanical. The seismic integrity includes the graded NBS score and importance level. The building operability includes risks for passive fire separation, presence of asbestos and seismic restraints. Table 5 also shows the number of facilities in the building that were assessed for clinical facility fitness for purpose (CFFFP) and the mean score achieved on the nine CFFFP design principles.

Table 5 shows all buildings housing clinical services that have poor condition scores. For this group of 24 buildings:

- construction dates range from 1946 to 2011, with many built in the 1970s and three that have previously been refurbished
- 62 percent of the building components were poor
- graded NBS scores range from a good A+ score to a very poor E score
- 11 had CFFFP assessments on some facilities with scores from average to very poor.

The buildings house a range of services, including for the acute care pathway, clinical support departments, outpatients, child services, mental health and aged care. Some of the larger buildings such as at Grey Base Hospital are currently being redeveloped.

Table 5: The 24 buildings housing clinical facilities with poor condition scores

Building name	Year built	Gross floor area (m ²)	Mean condition score	Building component scores			Seismic integrity		Clinical facilities fitness-for-purpose	
				Fabric	Electrical	Mechanical	Graded NBS scores	Importance level	Mean CFFFP score	Number of facilities assessed for CFFFP
NMDHB Nelson George Manson	1960	6,863	3.7	3.6	3.5	4	C	IL4	3.6	1
WtDHB Waitakere Special Care Baby Unit	1964	3,899	3.6	4	3.8	2.8	C	IL2		
CDHB Ashburton Laboratory and Pharmacy	1990	752	3.4	3.5	3.7	3	A	IL3		
CMDHB Ōtara Tāmaki Oranga	1970	509	3.4	3.2	3.5	3.5	B	IL3	3.3	1
CMDHB Ōtara Spinal Unit	1974	5,632	3.3	3.4	3.5	3	C	IL3	4.6	1
HBDHB Hastings Laboratory	1983	891	3.3	3.6	2.1	3.5	C	IL4		
SDHB Wakari Helensburgh	1955/2012	5,623	3.3	3.4	2.6	3.5	A	IL3	4.1	1
WtDHB Mason Rata	2000	1,465	3.3	3.3	3	3.4	B	IL3		
WtDHB North Shore Geriatric	1972/1999 Wards 6A and 11)	8,437	3.3	3.4	1.9	3.9	A+	IL3	3.2	1
WCDHB Buller Medical		0	3.3	3.7	2.9	2.9	C	IL4		
ADHB Point Chevalier Buchanan	1973	2,294	3.2	3.1	3	3.4	B	IL2	2.3	1
CDHB Christchurch Riverside	1980	17,722	3.2	3.2	2.5	3.7	D	IL3		

Building name	Year built	Gross floor area (m ²)	Mean condition score	Building component scores			Seismic integrity		Clinical facilities fitness-for-purpose	
				Fabric	Electrical	Mechanical	Graded NBS scores	Importance level	Mean CFFFP score	Number of facilities assessed for CFFFP
NDHB Whāngārei Child Health	1986	173	3.2	3.6	2.5	2.9	NA	IL2		
SCDHB Timaru Clinical Services East	1976	10,151	3.2	3	2.6	3.8	NA	IL4	4	1
SCDHB Timaru Clinical Services Main	1976		3.2	2.9	2.5	4	C	IL4	3.7	2
SDHB Dunedin Child Pavilion	1945	4,482	3.2	3.1	3.2	3.4	B	IL3		
TarDHB Clinical Services	1968	7,510	3.2	2.9	3.8	3.2	E	IL4	3.8	1
WCDHB Grey Main		15,000	3.2	3.2	2.5	3.5			2.3	1
CDHB Ashburton Radiology and Patient Records	1990	693	3.1	3.2	3	3	A	IL3		
CDHB Hillmorton Forensic Mental Health	1999	2,888	3.1	3.4	2.7	3	NA	IL4		
CCDHB Wellington Grace Neill	1980	17,630	3.1	2.9	3.2	3.3	A	IL3		
NDHB Whāngārei Surgical	1956		3.1	3.1	2.8	3.3	NA	IL3	4	2
NDHB Whāngārei Te Roopu Kimiora	1977	0	3.1	3.5	3.2	2.5	NA	IL2		
NMDHB Wairau Main	2011	3,555	3.1	3	3.2	3.2	NA	IL4		

Table 6 shows the eight buildings with the worst mean condition scores. This includes six buildings that house support functions such as plant rooms, workshops and kitchens and two buildings that house clinical services located at Nelson Marlborough DHB and Waitematā DHB. The results show:

- almost all components were poor
- two are classified as earthquake prone with a score of D, four were average with a score of C and for two the scores were not applicable
- operability scores varied
- date of construction ranges from 1891¹² to 1972.

Table 6: 10 buildings with the poorest condition scores

DHB Building name	Year built	Gross floor area (m ²)	Mean overall condition score	Building component scores			Seismic integrity		Building operability		
				Fabric	Electrical	Mechanical	Graded NBS scores	Importance level	Fire separation issues	Likelihood of asbestos	Seismic restraint issues
ADHB GLane B5	1906	1,462	4	4	4	4	D	IL2	high	high	high
ADHB GLane B6 Costley	1891	1,404	4	4	4	4	D	IL2	high	high	high
NM Tapawera House	1962	57	3.9	4	3.5		NA	IL2	low	low	low
WtDHB Waitakere Woodford Hse	1972	2,023	3.9	4	3.5	3.9	C	IL2	NA	NA	NA
NMDHB Wairau workshop	1950	165	3.8	3.6	4	4	NA	IL2	low	high	medium
NMDHB Nelson George Manson	1960	6,863	3.7	3.6	3.5	4	C	IL4	high	high	high
HVDHB Kitchen	1942	3,233	3.6	4	2.8	3.4	C	IL2	medium	medium	medium
WtDHB Waitakere SNBU	1964	3,899	3.6	4	3.8	2.8	C	IL2	Medium	high	high

¹² Costley Home, a New Zealand heritage-listed building.

Sitewide infrastructure

Sitewide infrastructure is critical for the continuity of hospital services. Plans for this infrastructure must include support for future campus development. Significant issues were found in the professional assessments of sitewide infrastructure on 31 main hospital campuses. This includes electrical systems and pipes at or near end-of-life. The assessors noted that these issues can be overlooked in plans for the replacement and refurbishment of hospital buildings and are not visible to the public.

In general, DHBs have maintained their sitewide infrastructure to supply medical gases, water, sewer pipes and electricity. However, electrical infrastructure upgrades are difficult to manage because hospitals are continuously operational. Assessors noted some suboptimal partial upgrades due to problems taking the electricity supply off-line. Other difficulties relate to the lack of skilled people and replacement parts for repair of old infrastructure to a good standard, such as Pyrotenax cabling. There are also cases where DHBs have constructed new buildings on infrastructure that was nearing its end-of-life.

Many of the boilers were old, of suboptimal design, or converted from oil to gas with low efficiency. Coal-fired boilers should be phased out to reduce CO₂ emissions. There are more effective options to replace reticulated steam that operate at point-of-use. Many chilling systems are old, use refrigerants no longer in production and are harmful to the ozone layer. These systems should be replaced and the old refrigerants safely disposed of.

Some pipework is at the end of its economic life, with many valves that need to be replaced. A programme of certification could be used to minimise health service disruption from these faults. Several sites reported issues with pinholes in copper water pipes that relate to low-grade copper and changes to water treatment practices.

Figures 11 and 12 show the mean scores for the professional assessments of DHB sitewide infrastructure, including 30 campuses for electrical and 31 for campuses for mechanical. The graphs cover sitewide components like pipes and cabling that connect services to buildings. The mechanical and electrical components within buildings formed part of the building condition assessments. Campuses vary in their complexity, for example mental health facilities do not require medical gases to be piped sitewide.

Figure 11: shows the mean condition scores for sitewide electrical infrastructure at 30 campuses, with one poor, 13 average, 14 good and two very good.

Figure 11: Mean condition for sitewide electrical infrastructure at 30 campuses

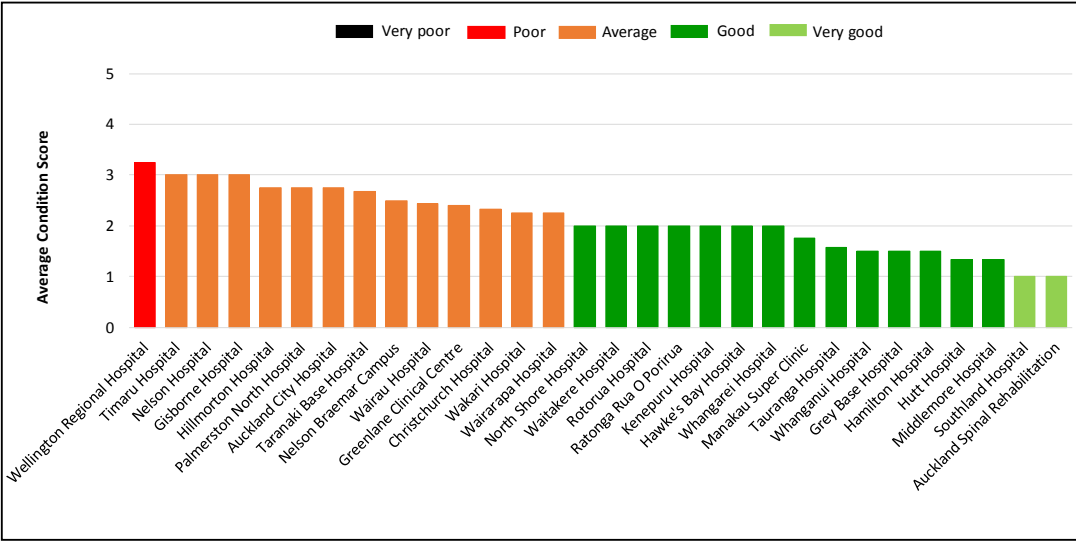
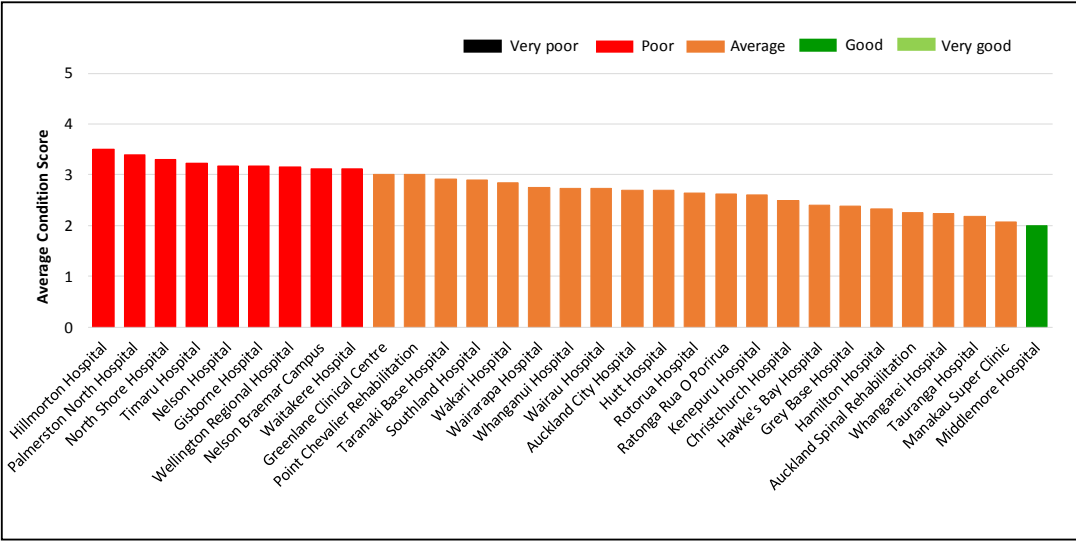


Figure 12: shows the mean condition scores for mechanical sitewide infrastructure at 31 campuses, with nine poor, 21 average and one good.

Figure 12: Mean condition for sitewide mechanical infrastructure at 31 campuses



The poorest mean scores for both electrical and mechanical sitewide infrastructure are at Palmerston North Hospital, Wellington Regional Hospital and Hillmorton Hospital. More details of specific issues are identified by campus in Appendix 4.

Cost estimates

Quantity surveyors Rider Levett Bucknall developed cost estimates per square metre (m²) for replacement and refurbishment of different building types, to support analysis of future investment. This provides an indication of like-for-like replacement or refurbishment and will support consistent cost estimates for investment scenarios.

More detailed estimates will be required at the business case and project stages. Tables 7 and 8 set out these cost estimates.

Included in these estimates were:

- construction costs
- an allowance for siteworks and landscaping (new build)
- an allowance for infrastructure (new build)
- design and construction contingency
- professional fees
- furniture, fittings and equipment
- future escalation in costs during design
- project contingency.

Excluded in these estimates were:

- demolition of existing structures
- remediation of contaminated ground
- ground improvement
- land costs
- development contributions
- specific flood remediation requirements
- sitewide infrastructure
- IT requirements beyond those included in construction costs
- future cost escalation for commencement beyond 2019
- DHB internal project and direct management costs
- car park structure and GST.

Refurbishment costs are for building interiors only and exclude resolution of existing compliance issues.

The costings in Tables 7 and 8 assume a hypothetical completion date that ranges from 2021 to 2028.

Table 7: Health facility new build cost estimates

Building type	Cost estimates per m²
Tertiary hospital	\$13,250
Secondary hospital	\$10,000
Community hospital	\$7,500
Administration B grade	\$5,500
Industrial	\$2,000
Mental health	\$10,000
Forensic mental health	\$12,000

Table 8: Health facility refurbishment cost estimates

Building type & extent of refurbishment	Cost estimates per m²
High technical extensive	\$8,500
Medium technical extensive	\$6,000
Low technical extensive	\$4,000
High technical moderate	\$6,000
Medium technical moderate	\$4,000
Low technical moderate	\$2,500
High technical minimal	\$750
Medium technical minimal	\$500
Low technical minimal	\$500

Section 3

Clinical facilities’ fitness for purpose

Seventy-five clinical units in older buildings were assessed for CFFFP across five services. Many units were undersized and achieved poor scores against the nine design principles, particularly among the mental health and intensive care units.

The assessments looked at how well clinical facilities in older buildings perform compared to the design guidelines for new facilities. Over the last 25 years, guidelines for the sizes of rooms, layout and available therapeutic spaces have changed. Older units were not expected to meet the current guidelines. However, the findings about their ‘relative’ performance can inform conversations with DHBs about improvement strategies and the national priorities for investment plans.

The Australasian Health Facility Guidelines (AHFG) are used to inform the design of health facilities in New Zealand. The Ministry of Health’s new Health Infrastructure Unit will develop additional guidance for the design of new buildings and renewal of older facilities in the New Zealand environment.

The assessments included five clinical services in older facilities: around half of the acute mental health units, emergency departments, operating theatre suites and intensive care units nationwide and a small sample of the oldest inpatient units at 13 DHBs. Each assessment included the unit’s layout, size, physical aspects and use of space and also considered how well it supports the model of care. For each of the five services, a unit located in a newer building was also assessed. The five newer units were expected to achieve better CFFFP scores.

Further work with DHBs is required to consider options to improve seven mental health units, three emergency departments, five operating theatres suites, five intensive care units and eight inpatient wards. Options could include a combination of changes to models of care, strengthening other services in the workflow, unit refurbishment and renewals.

This section begins with the approach for assessment. It then outlines the findings for mental health units, emergency departments, operating theatres, intensive care units and inpatient units.

Assessment approach

The CFFFP survey was developed in 2019 to assess New Zealand hospital units for how well they support their model of care and align with the Australasian Health Facility Guidelines. Assessments considered unit performance against nine clinical design principles:

1. proximity of the unit to external clinical and clinical support services
2. appropriate co-location of key functions and activities in the unit
3. ease of access within the unit
4. adequate size and layout of key patient spaces
5. layout of space to facilitate staff communication and patient observation
6. support of audio and visual privacy
7. management of infection control
8. reduction in medication errors
9. physical security.

A further aspect of the units' fitness for purpose is their size. The AHFG was used to develop a benchmark size for each type of clinical unit. Guidelines have changed over time. Therefore, older units were expected to have poorer scores when compared with these benchmarks.

Table 9 shows that the assessment included around 50 percent of the acute mental health units, intensive care units, operating theatre suites and emergency departments nationwide. A typical inpatient unit was selected from an older ward block at 13 DHBs. Forensic mental health units were excluded from these 2019 assessments due to complexities with access. For each service, a control unit in a newer building was selected for comparison.

Table 9: The 80 units assessed for CFFFP

Type of unit	Number	Sample size	Number of DHBs
Acute mental health	24	Around 50% nationwide	17
Inpatient units	20	Small	13
Intensive care units	10	Around 50% nationwide	10
General operating theatre suites	15	Around 50% nationwide	13
Emergency departments	11	Around 50% nationwide	11

Assessments were piloted at the Nelson Marlborough and Hawke's Bay DHBs, then implemented at the remaining 17 DHBs.¹³ In each case, assessments were completed in collaboration with charge nurses and key clinical staff.

¹³ Wairarapa DHB did not meet the criteria for inclusion because all its clinical facilities are in newer buildings.

For each unit, the analysis includes a total score on the nine clinical design principles, performance on gross floor area and a summary of the themes identified in the survey observations. Table 10 sets out the definitions for the mean scores on the nine design principles. An average score indicates poor performance on some design principles. Poor and very poor scores merit investigation and remediation.

Table 10: Rating definitions for CFFFP assessments

Rating	Fitness for purpose	Definition
1	Very Good	Number, size, layout of key clinical and clinical support spaces and overall configuration of department or unit is appropriate for model of care. Clinical department or unit displaying no deterioration or only normal routine maintenance required. New or near-new condition or repaired as good as new.
2	Good	Generally, the right number, size and layout of key clinical and clinical support spaces and generally, the overall configuration of the department or unit is appropriate for the model of care. Clinical department or unit displays limited deterioration that does not affect its use. Minor maintenance may be required.
3	Average	Likely to be too few key clinical and clinical support spaces. Some may be the right size while others are too small. Layout of key clinical spaces may be compromised. Some elements of the overall configuration of the department or unit may compromise the model of care. Clinical department or unit has deteriorated to a degree where maintenance is obviously due.
4	Poor	Generally, too few key clinical and clinical support spaces. They are generally inadequately sized and may have a poor layout. The overall configuration of the department or unit does not support the model of care. Repair or renewal is required as facility condition is severely impacting clinical safety and performance. May pose health and safety issues.
5	Very Poor	Too few key clinical and clinical support spaces. They are inadequately sized and likely to have a poor layout. The overall configuration of the department or unit does not support the model of care. Immediate repair or renewal is required as the facility's condition is severely impacting clinical safety and performance. May pose health and safety issues and requires urgent attention.

Mental health units

The 24 mental health units assessed were selected from buildings built before 2010. This included 21 acute units, one extended care, one rehabilitation, one psycho-geriatric and one intellectual disability unit. The bed numbers for the wards in these units ranged from 7 to 40, with the largest unit at Auckland DHB accommodating 62 overall.

Around 70 percent of the units have designs that do not provide adequate privacy, safety and therapeutic space to support different diagnoses, stage of illness, culture, gender and age. Managing patients with different needs in a poorly designed unit is

difficult for staff and challenging for patients. The problem is exacerbated in the units with fewer beds and fewer options to separate patients.

Many units lack consideration of the cultural needs of their clients. Cultural spaces, whānau rooms and areas suited to pōwhiri are important for New Zealand mental health facilities. While the Australasian Health Facility Guidelines do not specify these spaces, they do recommend that entry, reception and waiting areas are welcoming and respectful. Tiaho Mai at Middlemore Hospital has a whare entrance and at Tauranga Hospital, there is a large whānau room with outdoor access used to welcome people.

Strategies to cope with excess demand were evident in 70 percent of the units. These included using day, seclusion, interview and meeting rooms as bedrooms. Periodic leave is an important part of the person's transition, but some bedrooms were used for new patients while their occupants were on leave in the community.

Interior maintenance at 70 percent of the units was poor, including poor paintwork, holes in the walls, leaks in ceilings, rippling and worn carpets and poor bathroom facilities. Maintenance was good at the Southland Hospital unit, the older persons unit at Kenepuru Hospital, Kensington in Timaru and Waiaatarau in Waitematā.

Mean scores for nine design principles

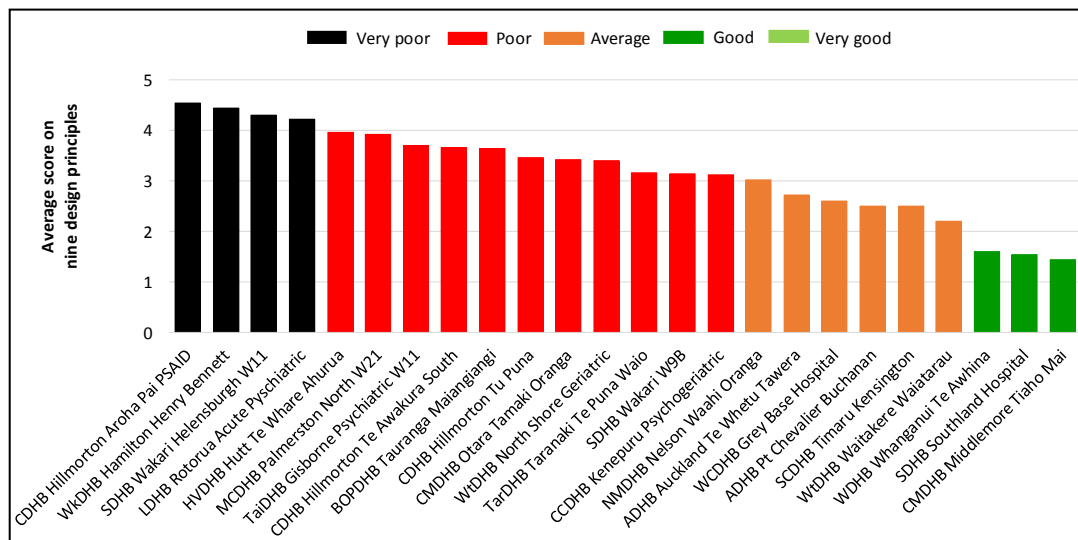
For mental health inpatient units, the key principles involved in poorer scores include:

- lack of privacy for recovery
- inadequate support for staff and patient communication related to poor line-of-sight for observation
- poor lighting in treatment areas and lack of access for staff to computers
- insufficient door sizes and corridor widths for people to circulate and to access therapy areas inside and outside the unit
- for stand-alone units, the distance for access to other clinical services should electro-convulsive therapy (ECT), intensive care and radiology services be required.

Investigation is required to identify the opportunities to address these issues. Initiatives could include a mix of changes to models of care, strengthening community-based alternative services, targeted refurbishments and unit renewal.

Figure 13: lists the older mental health units and wards (W) assessed, along with the control unit. It shows the mean overall scores on the nine design principles ranged from good to very poor, with three good, six average, 11 poor and four very poor. The unit at Hillmorton provides psychiatric and intellectual disability services (PSAID). The control unit Tiaho Mai was among three with a good score.

Figure 13: Mean scores on nine design principles for mental health units¹⁴



Gross floor area

Most (75 percent) of the units are smaller than the AHFG benchmark of 80m² per bed and many have undersized bedrooms. While a significantly undersized unit can compromise service delivery, larger units can also be poorly designed. Six units, including the control unit at Middlemore, are larger than the benchmark size but within an acceptable size range. The gross floor area findings for all units assessed are set out in Appendix 3, Table 22.

Unit configuration

Over 50 percent of the units had various features common to designs first developed for prisons, which do not support modern requirements for safe, quality care for staff and clients. These features include:

- having bedrooms on both sides of the corridors with doors opening outward into the corridor, which reduces privacy and compromises the space for circulation
- having shared bedrooms, shared bathrooms and shared toilets with partial partitioning, which is not compatible with privacy, cohort management, safety and recovery
- a central glass-enclosed staff base that gives people-in-care a sense of being watched and provides no privacy for staff to complete their work
- dead-end corridors that are inflexible for cohort management and create a risk that staff become trapped with an agitated person
- angular geometry with high sloping or raked ceilings that are not associated with a restful supportive environment for recovery
- outdoor spaces entirely external to the unit and fenced, that do not support flexible indoor to outdoor space for different cohorts

¹⁴ DHB names are abbreviated. See Appendix 2 for definitions.

- inadequate separation of spaces between the individuals being treated, the public and the staff.

In contrast, the Tiaho Mai control unit at Counties Manukau DHB is the first example of the new courtyard model, which features:

- wide circulation areas around enclosed courtyards
- separation of spaces for people acutely unwell and those in step-down care
- smaller shared living spaces
- separate and therapeutic areas for interaction among the person in care, whānau and the staff
- off-the-floor staff work areas
- separate access pathways for staff, acute admissions and the public
- more subtle sophisticated security arrangements.

Most (80 percent) of these older units lack spaces for different aspects of therapy compared to the guidance in the AHFG. This includes interview rooms, patient and whānau areas, sensory rooms or gardens, dining rooms, kitchens, activity rooms, lounges and outdoor spaces. Therapeutic spaces are required by a range of staff, including mental health nurses and assistants, social workers, psychologists, psychiatrists, occupational therapists and cultural advisors.

Only half of the units have adequate outdoor space. Helensburgh at Wakari campus Southern DHB is located on the third floor and has no outdoor recreation area. Te Whetū Tāwera at Auckland DHB and Ward 11 at Hauora Tairāwhiti Gisborne Hospital have very limited outdoor space.

The Henry Bennet unit at Waikato DHB has constructed two bedrooms from a single room, which compromises privacy and access to external windows. The North Shore older persons unit has several multiple-bed bedrooms, which offer no privacy or ability to separate patients according to gender, age, acuity, diagnosis or cultural needs.

Only three units – Gisborne, Tiaho Mai and Invercargill – provide en-suite bathrooms for each bedroom. The rest have either a mix of en-suite and shared bathrooms or only shared bathrooms.

Safety

Safety issues included:

- keyed access to doors, rather than electronic swipe card keys
- dead-end corridors where the patients and staff can be trapped
- bedrooms on both sides of corridors with doors that open outward into the corridor, obstructing access and observation
- lack of required anti-ligature fittings.

Most units had just a single clinic room for dispensing medication. Single-point and poorly located dispensaries compromise patient management, as the patients congregate around the clinic.

Emergency departments

Nine emergency departments were assessed, nearly half of all departments nationwide. Included were the Northland, Counties Manukau, Hawke's Bay, Tairāwhiti, Lakes, Taranaki and South Canterbury DHBs. The control unit at Waikato DHB was selected due to its location in a newer facility. Capital & Coast DHB's Kenepuru unit was assessed; however, it operates as an after-hours general practice rather than an emergency department.

All emergency departments have similar models of care, with triage to direct people for minor and more complex problems and resuscitation areas. Most departments have experienced significant increases in demand over the last five years. Some departments report difficulties managing people who require a mental health assessment, due to a lack of suitable space.

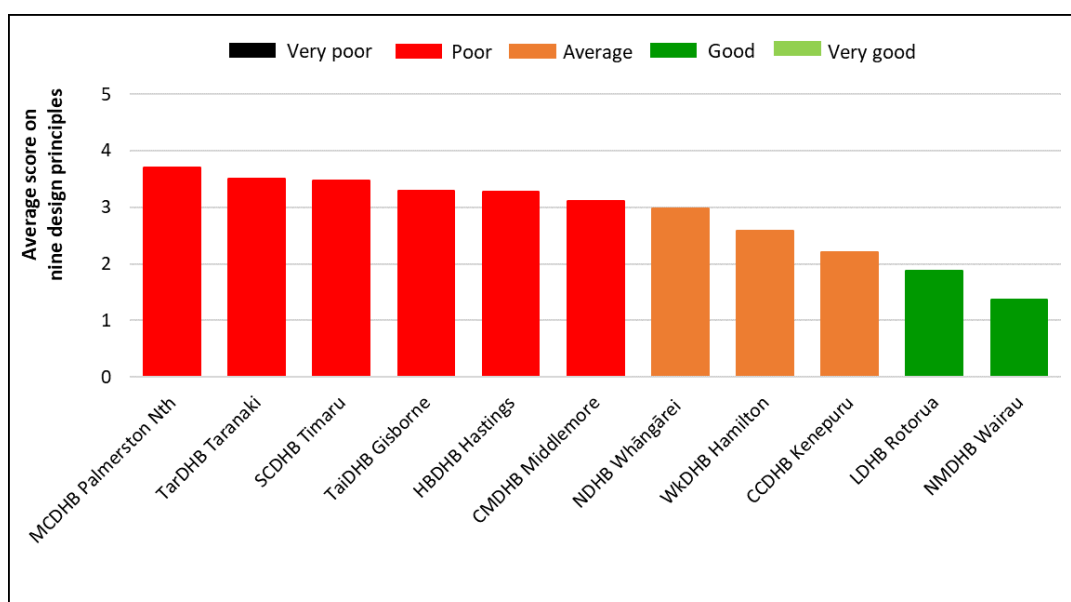
Mean scores for nine design principles

For emergency departments, the key principles involved in poorer scores include:

- infection control issues related to suboptimal separation of patients, separation of clean and dirty workflows and the quality of surface finishes
- lack of privacy for people being treated
- poorly sized and shaped spaces for key clinical work.

Figure 14: lists the older emergency departments assessed, along with the control department. It shows the mean overall scores on the nine design principles ranged from good to poor, with two good, three average and six poor. Kenepuru was the only accident and emergency department included. The control department at Hamilton Hospital scored average.

Figure 14: Mean scores on nine design principles for emergency departments



Gross floor area

Over half (64 percent) of the emergency departments are undersized against the AHFG benchmark of 50m² per bed and all have undersized bays for patient treatment. For 50 percent of emergency departments, most bed bays are undersized compared to the AHFG bay sizes for acute treatment at 12 m², patient resuscitation at 25m² and trauma at 30m².

The smallest emergency department compared to the AHFG benchmark is Whangarei at 38 percent. Departments at Timaru and Palmerston North are also unacceptably small. Three departments, the Kenepuru accident and emergency, Middlemore and Wairau are above the AHFG benchmark. The control unit at Waikato is also above at 104 percent. The gross floor area findings for all units assessed are set out in Appendix 3, Table 18.

Unit configuration

Just under half (40 percent) of the departments have layouts that do not support their models of care. To accommodate demand, Whāngārei, Palmerston North, Gisborne, Timaru and Hastings have incrementally incorporated space from adjacent areas. The resulting layouts are piecemeal, with:

- cramped conditions
- suboptimal configuration for a functional flow of care
- lack of safe separation of patients
- lack of natural light.

A further 50 percent of the departments have some of these problems. Only Wairau has both a layout and the space necessary for a modern model of care for an emergency department.

Almost all (90 percent) of the departments lack adequate clinical spaces to support patients who need:

- a single room
- isolation for infection control
- privacy for mental health assessments
- paediatric care
- obese or bariatric facilities.

A further problem is the use of enclosed single door spaces for mental health assessments that do not meet the AHFG benchmark of two exits, necessary for staff safety.

Safety

The difficulties with undersized bed bays, suboptimal layout and corridors cluttered with equipment compromise the safety of staff and patients. Issues include:

- infection control because cleaning is compromised
- obstructed access in thoroughfares, which can contribute to injuries for staff, patients and visitors
- trip hazards from equipment and cables, which can contribute to injuries for staff, patients and visitors
- risk of work injuries from lifting items stored on floors or at height.

In over half (70 percent) of the units, staff could observe less than half of their patients from a clinical workstation. This compromises patient safety and places additional demands on staff. Whangarei, where just 26 percent of patients were within direct line-of-sight from a staff base, had the poorest score. The best was the control unit at Waikato, with 59 percent of patients visible from a staff base.

Storage

None of the emergency departments assessed have adequate storage. Corridors are cluttered with extra beds and transport trolleys, trolleys for diagnostic tests and treatments, patient mobilisation equipment, electronic clinical devices, portable X-ray machines, computers-on-wheels etc. There is inefficient storage for supplies and inadequate space for disposal of rubbish, waste and soiled linen.

Other issues

Most units (80 percent) reported they have inadequate facilities for bariatric patients, including designated treatment spaces and ceiling-mounted lifting devices.

Not all units had a permanent security presence. Many (40 percent) reported increasing security concerns, particularly the management of people with presentation related to drugs and alcohol.

Operating theatre suites

Nearly half (15) of operating theatre suites nationwide were assessed at 11 of the 20 DHBs. These included units in Northland, Auckland, Counties Manukau, Tairāwhiti, Waikato, Lakes, Hawke's Bay, MidCentral, Capital & Coast, Nelson Marlborough and Canterbury DHBs. Canterbury DHB's Burwood was selected as the control unit due to being in a newer building.

These units perform planned and acute surgeries, except for the elective surgery centre at the Manukau SuperClinic. Over half (60 percent) of theatres reported that demand exceeds capacity. All theatres operate 8 am to 5 pm, five or six days per week, and after-hours for urgent cases. There is limited ability to increase volumes of cases within existing facilities.

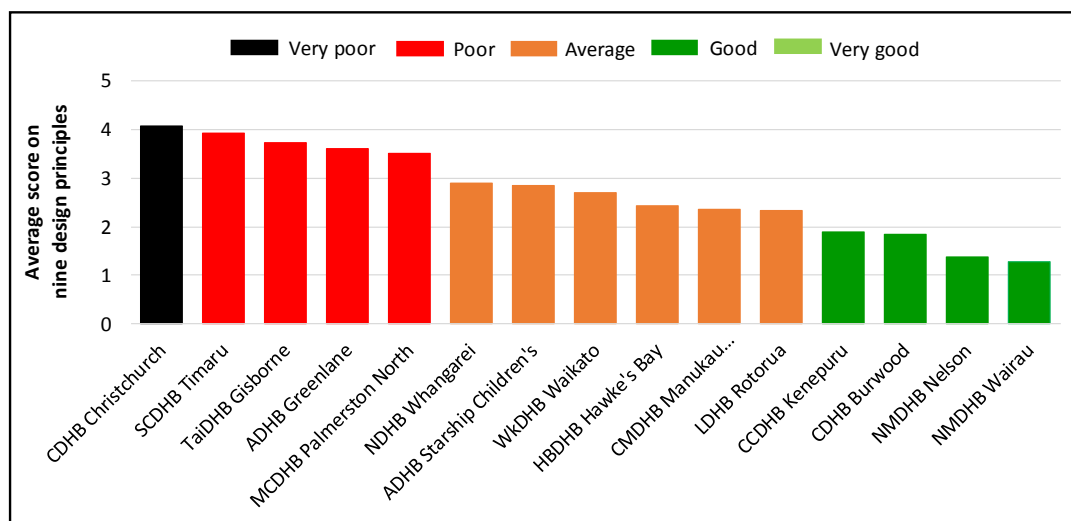
Mean scores for nine design principles

For operating theatre suites, the key principles involved in poorer scores include:

- infection control issues related to suboptimal separation of patients, separation of clean and dirty workflows and the quality of surface finishes
- lack of privacy for people receiving surgery
- poorly sized and shaped spaces, especially operating rooms.

Figure 15: lists the older operating suites assessed and the control operating suite. It shows the mean overall scores on the nine design principles ranged from good to very poor, with four good, six average, four poor and one very poor. The control suite at Burwood was among those with a good score.

Figure 15: Mean scores on nine design principles for operating theatre suites



Gross floor area

Nearly half (40 percent) of the theatre suites were under the AHFG benchmark of 280m² per operating theatre. The smallest was Starship at 76 percent and the largest was Burwood at 125 percent.

Over half (53 percent) report their operating room sizes are too small, and 33 percent have a mix of acceptable and undersized operating rooms compared to the AHFG room size. Since many of these units were constructed, operating room sizes have increased to accommodate advances in clinical and information technologies. The AHFG sizes for general surgery rooms were updated in 2018 and for day surgery and procedure rooms in 2016. Only Wairau and Burwood have adequate numbers of operating rooms at the AHFG sizes.

These findings considered the size of different types of operating rooms, including:

- 75m² for rooms in a high-technology imaging and robotics suite
- 60m² for rooms a general surgical suite
- 42-55m² for rooms in a day patient surgery suite
- 17m² for day procedure, endo and colonoscopy rooms
- 24m² for dual layout day procedure rooms.

Starship's newest operating room and Wairau's new private operating room met the general surgical suite benchmark at 60m². All operating rooms at Burwood were 64m². The gross floor area findings for all units assessed are set out in Appendix 3, Table 20.

Unit configuration

Over half (67 percent) of theatre suites have a layout that only partly supports their model of care, from patient preoperative preparation, to theatre rooms and post-anaesthetic care. The layouts at Timaru, Gisborne and Starship do not support their model of care.

Nearly half (40 percent) of the theatre suites have issues with the separation of their clean and dirty workflows. This includes Starship, Gisborne, Christchurch Parkside, Whāngārei, Greenlane and Hamilton. Burwood, Timaru and Palmerston North have partial separation. The remaining six have a clear separation between these two flows.

Half (53 percent) of theatre suites reported that all their operating rooms are too small, and around 30 percent have only some rooms that are appropriately sized for their purpose. Two DHBs also had operating rooms with ceiling heights below 3.0 m, which created difficulties for manoeuvring around the ceiling-mounted equipment.

Safety

Over half (70 percent) of units have direct line-of-sight from the staff workstation for all their patients in the post-anaesthesia care area, which is crucial for patient safety. However, four units (27 percent) had less than 100 percent visibility. Greenlane has none due to poor layout and the location of the structural columns.

Unit issues contribute to difficulties with infection control through cramped patient areas; older floor, wall and ceiling surfaces that are hard to clean; and poor separation of clean and dirty workflows.

Storage

Most (80 percent) of the theatre suites lack storage space for the increased volumes of prepacked supplies, consignment and loan instruments, implants and specialist clinical equipment. Only Nelson and Kenepuru had fewer storage issues, while Wairau had none.

Intensive care units

Nearly half of the intensive care units nationwide were assessed. Of these 10 units, there are nine that care for both intensive care and high-dependency patients, including Whāngārei, Starship, Waitematā, Counties Manukau, Waikato, Tairāwhiti, Hawke's Bay, MidCentral and South Canterbury DHBs. Starship is a paediatric unit. The control unit at Waikato DHB, selected due to its location in a newer building, is a specialist intensive care unit.

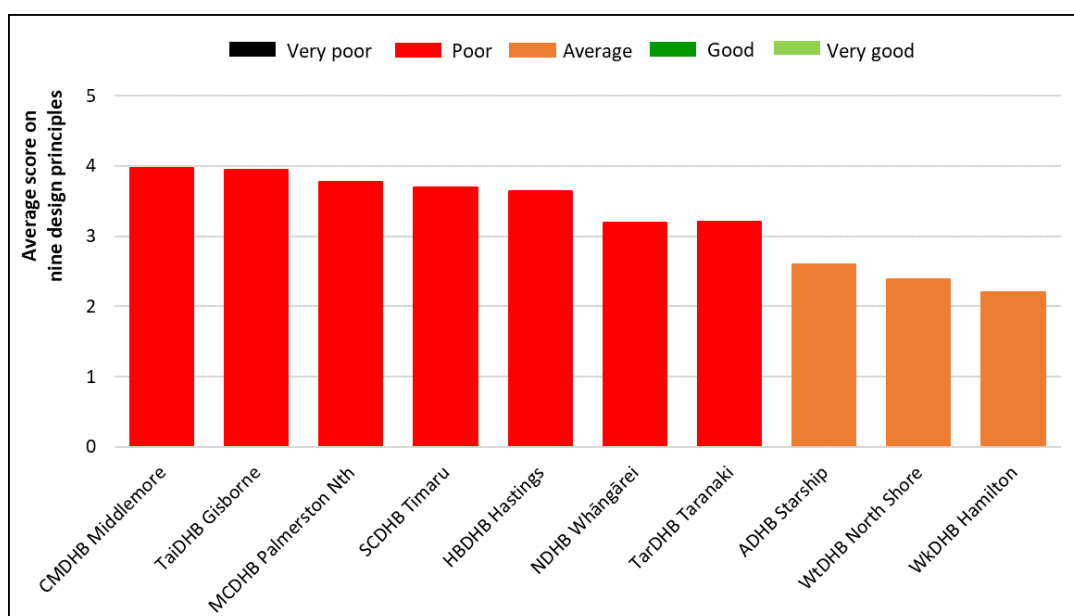
Mean scores for nine design principles

For intensive care units, the key principles involved in poorer scores include:

- infection control issues related to suboptimal separation of patients, separation of clean and dirty workflows and the quality of surface finishes
- lack of privacy for people in care
- poorly sized and shaped spaces for key clinical work.

Figure 16: lists the older intensive care units assessed and the control unit. It shows the mean overall scores on the nine design principles ranged from average to poor, with three average and seven poor. None of these intensive care units that are over 20 years old achieved a good score on the nine design principles. The control unit at Hamilton Hospital had the best score.

Figure 16: Mean scores on nine design principles for intensive care units



Gross floor area

The AHFG benchmark for intensive care is 85m² per bed for units with fewer than 15 beds, and 70m² per bed for those with more than 15 beds. Most (80 percent) of units are beneath the benchmark. The control unit at Waikato is 118 percent of the AHFG.

Over half (70 percent) of the units have bed spaces under the AHFG bed space size of 24-25m², while the remainder have some bed spaces compliant with the AHFG. The gross floor area findings for all units assessed are set out in Appendix 3, Table 19.

Unit configuration

Most (80 percent) of the intensive care units have insufficient enclosed patient bays to support their mix of patients. The AHFG recommends a range of enclosed and open patient bays for the effective management of patients and infection control.

At Taranaki, the unit has been built in a U-shape around a large plant room. This obstructs patient observation across the unit and allows little space for clinical support spaces, staff and storage. At MidCentral and Gisborne, all patient bays are too small, and key clinical and clinical support spaces are missing.

Palmerston North, Hawke's Bay and Timaru have only one point of entry to their units, used for patients, staff, visitors, delivery of goods and removal of dirty linen and waste. Additionally, Timaru has to use an access ramp to their single point of entry.

Safety

Patient observation is compromised at:

- Taranaki, due to the design around a large plant room

- Starship, due to the multiple-bed bedrooms
- Middlemore, due to the layout and column location.

Palmerston North, Gisborne, Hawke's Bay and Timaru have significant infection control issues due to cramped units, inadequate negative-pressure rooms and storage issues, along with suboptimal surface finishes and maintenance.

Storage

Almost all units have inadequate storage. The Starship paediatric unit has significant problems storing age-related beds and equipment for 0–19 years. Most storage at Taranaki and Middlemore is outside the unit.

Other issues

Apart from Timaru, all units have negative-pressure bedrooms. However, only four meet AHFG size recommendations, which are bedrooms of 25 m² with dedicated ante-rooms of 6 m² and typically en-suite bathrooms of 6 m². Provision of negative-pressure bedrooms is essential for managing patients who are infectious. Issues include inadequately sealed rooms, use of a corridor as an ante-room and shared ante-rooms.

Three units have significant issues with the location of medical gas and suction services, including:

- Gisborne, where floor-mounted bollards under the head of the bed mean staff crouch under the bed to operate them and they obstruct clinician access to the patient's airway
- Timaru, where floor-mounted bollards beside the bed create difficulties for staff to operate them and to access the patient
- Hawke's Bay, where ceiling-mounted bollards have poorly maintained articulated arms, which are hard to position and maintain in position.

Almost all units (90 percent) have inadequate facilities for bariatric patients, including designated treatment spaces and ceiling-mounted lifting devices.

Inpatient units

DHB staff nominated an inpatient unit from the 19 ward-blocks over 20 years old at 13 DHBs. These units ranged from 20 to 43 beds and included medical, surgical, orthopaedic, rehabilitation and older persons care. Included were units at the Northland, Auckland, Counties Manukau, Waikato, Bay of Plenty, Tairāwhiti, Hawke's Bay, Whanganui, MidCentral, Capital & Coast, Hutt Valley, Nelson Marlborough and Canterbury DHBs.

Challenges were observed for the care of patients in units with multiple models of care. For instance, the Whāngārei paediatric unit has medical and surgical care, inpatient and

outpatient care, along with child protection and mental health cases. This complicates the workflow, the separation of patient cohorts and the use of clinical spaces.

All units reported excess demand, which has implications for increased staff stress and risks to the quality of care.

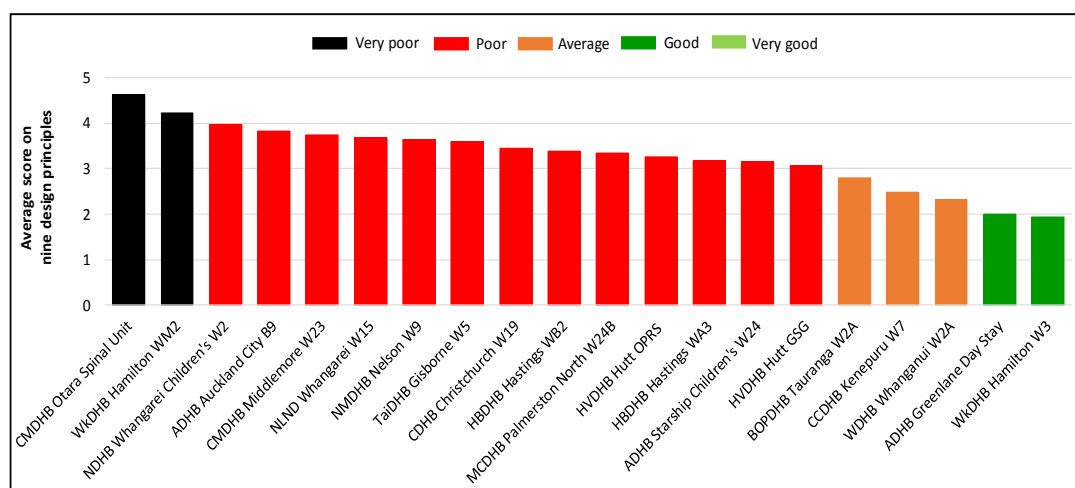
Mean scores for nine design principles

For inpatient units, the key principles involved in poorer scores include:

- infection control issues related to suboptimal separation of patients, separation of clean and dirty workflows and the quality of surface finishes
- lack of privacy for people being treated
- inadequate support for staff and patient communication related to poor line-of-sight for observation, poor lighting in treatment areas and lack of access for staff to computers
- poorly sized and shaped spaces for key clinical work.

Figure 17 lists the older units and wards (W) assessed, along with the control unit. It shows the mean overall scores on the nine design principles ranged from good to very poor, with two good, three average, 13 poor and 2 very poor. The newer control unit Ward A3 at Waikato DHB was among those with a good score.

Figure 17: Mean scores on nine design principles for inpatient units



Gross floor areas

The AHFG benchmark for inpatient units is 36m² per bed. Over half (70 percent) of the units are at or beneath the benchmark. All units have problems with the size of bed spaces in both single and multiple bed rooms. Over half (70 percent) of units were undersized to the AHFG, while the remainder had some bed spaces compliant with the AHFG. The gross floor findings for all units assessed are set out in Appendix 3, Table 21.

Unit configuration

Compared to older units, modern unit designs aim to optimise the natural light for patients, have more single bedrooms and en-suite bathrooms, enable staff access to and observation of patients and have easy access to areas for utilities and storage. Newer units generally accommodate these requirements through increased width and a larger floor space.

The 2019 assessments included nine single-corridor and 11 racetrack style units. The single-corridor configuration usually has multiple-bed bedrooms on one side and single bedrooms, patient amenities, the nursing station and utilities on the other side. Racetrack wards are wider than single-corridor wards, with multiple-bed bedrooms and single bedrooms around the outside, and the nurses' station, patient amenities, utilities rooms and storage in the centre. People circulate around the centre, hence the name 'racetrack'. Each style has difficulties that newer designs attempt to address.

Safety

The clutter in bedrooms and corridors has safety implications, including:

- infection control, because cleaning is compromised
- retrieval of stored items with implications for staff injury
- obstructed thoroughfares, which impact staff, patients and visitors
- trip hazards from equipment and cables, which impact staff, patients and visitors.

Patient observation is a critical element of clinical care. Generally, the single-corridor wards have one nurse-base located centrally, which severely limits patient observation, such as at the Nelson orthopaedic ward. Some newer racetrack configurations have distributed nurse-bases. This is evident at Greenlane's surgical day-stay and in the control unit at Waikato, where nurse-bases are distributed closer to patients' bedrooms.

Modern unit designs have decentralised staff-bases to enable observation of higher dependency patients. The assessors observed improvisations in the older units, including a nurse-base installed in the trauma room of the Christchurch orthopaedic unit and a nurse-base in the Whāngārei rehabilitation unit located in a dead-end corridor to enable observation of the higher acuity patients in an adjacent multiple-bed bedroom.

There are a wide range of design issues that affect infection control. These include whether the floor, ceiling and wall-finishes are easy to clean; whether there is separation between service, patient and visitor flows; and whether there is adequate storage and waste disposal. Seventy-five percent of the units scored poorly across all of these issues.

Storage

Most units (80 percent) had a lack of storage due to the increased demand for supplies and electronic and rehabilitative equipment. This is evident across all specialities,

including medical, surgical, orthopaedic, spinal and rehabilitation care. These difficulties with size and storage space were expected as these units are in buildings over 20 years old.

The changes to short hospital stays with intensive treatment on wards have increased the demand for storage. In older facilities, the space around each bed was designed to include a patient's dresser, wardrobe and tray tables and a visitor's chair. Wards also had medication, linen and supply storage and some equipment such as commodes, bed cradles and dressing trolleys.

Today, there is an array of additional equipment on inpatient wards, including electronic monitoring devices and infusion pump units, large portable hoists, bedside diagnostic devices like electro-cardiographs and portable ultrasound, computers-on-wheels and charging and storage bays for portable electronic equipment. Early mobilisation of patients involves equipment like walking frames, patient bedside chairs, wheelchairs and crutches, along with accommodating more intensive therapy work on the unit. Medication storage has also changed to accommodate more pre-packaged formulations and regulatory guidelines. Some wards retrofit secure specialised medication dispensaries within the unit.

Further analysis could identify opportunities to improve storage hospital-wide and locally in units. For instance, clever storage systems are evident at the Waikato intensive care unit. When equipment is cleverly installed and easy to access, it can facilitate safe and efficient workflow within the unit. There may also be opportunities to redistribute storage in the hospital.

Other issues

Over half (65 percent) of the inpatient units do not have or require negative-pressure bedrooms for their model of care. Of the seven units with negative-pressure bedrooms, only two are compliant with the AHFG. Issues identified include shared ante-rooms, shared bathrooms, poor door seals and inadequate patient observation panels. These older units were built prior to the introduction of the AHFG and lack components in their construction needed to support negative-pressure rooms. There appears to be a poor understanding of the AHFG for negative-pressure rooms, a problem also observed in the intensive care units.

Most (85 percent) of units do not have enough facilities for obese or bariatric patients, such as bariatric beds, hoists and equipment. The exception is the medical ward at Waikato, however at the time, most of the ceiling-mounted lifting hoists were non-functional due to a technical issue with the supplier. The two paediatric wards did not answer this question.

Section 4

Information technology

DHB IT is largely focused on core hospital systems, with asset management practice constrained by a short-term planning focus. Investment of around \$2.3 billion is required over the next 10 years to address issues with legacy systems and to invest in technologies that enable services to transform to new models of care.

New Zealand has lacked the investment levels necessary to embrace rapid changes in health IT technologies. It is estimated that DHBs spend 2.3 percent of their operating budgets on IT, with 90 percent going to support aged and outdated systems and infrastructure. According to Deloitte (2015), this needs to shift to 4.6 percent, with 75 percent spent on maintenance and 25 percent on new investments. Over the last 10 years health professionals have changed from acceptance of departmental legacy systems to expectations that systems support the clinical workflow. This includes support to view and update an integrated patient record, on-the-move, across all care settings and on various devices. A significant lift in investment of around \$2.3 billion is necessary to deliver this digital health environment.¹⁵

DHBs have maintained their IT assets in an environment of accumulated under-investment. Audits have shown that IT strategy, governance and asset management have operated at a basic level (Morrison Low 2018). There are multiple versions and customisations of core applications, ageing infrastructure, limited network capacity and devices not fit for purpose. This reduces productivity, increases costs for maintenance and support and increases cyber security risk. Further, the slow adoption of systems compliant with national data standards limits information sharing across clinical settings and with consumers. Consequently, system users resort to various 'workarounds' to overcome lack of access, multiple logins, poor response times and the lack of alignment with clinical workflows. This means the productivity and quality benefits of clinical IT systems are not being realised.

Health IT is likely to move to a 40:60 percent split between capital investment and operating expenditure through 'as a service' solutions. This will enable DHBs to move

¹⁵ Calculation based on DHB 2018/–19 operating expenditure and 2.2 percent per annum to lift investment levels to the 4.5 percent benchmark.

away from reactive management of complex technology environments, to the development of IT solutions as enablers for the clinical workflow, improved data analytics and new models of care. Modernising technology solutions will also reduce the costs associated with maintaining the diverse skill-base required in the current mix of legacy and newer technologies. Development of a consistent nationwide picture of the fitness for purpose of IT assets will contribute to the prioritisation of long-term capital investment.

This section begins with the assessment approach, then provides an overview of the digital health environment. Next it reports the condition scores for selected core applications in DHBs. The section then looks at the slow progress with the adoption of four national data standards important for health information sharing, system integration and workforce collaboration. The section concludes with an outline of the condition of a sample of infrastructure, networks and security.

Assessment approach

This is an initial assessment. The sources for these assessments include:

- two national surveys for assessment of core applications, although neither were specifically designed as asset management surveys
- two case studies, one from the Northern Region's Information Systems Strategic Plan (ISSP) and the other a review by Hutt Valley Health, along with information held by the Ministry of Health informed assessments of the digital health environment, the adoption of national data standards and the condition of the infrastructure.

To support future assessments, in 2020/21 a more detailed and robust assessment will be developed in collaboration with DHBs. The approach will be similar to that used for the 2019 assessments of buildings, infrastructure and clinical facilities. It will be designed for IT and clinical equipment and consider asset lifecycle, condition and fitness for purpose. There will also be work on asset levels of service.

Table 11 sets out the asset types, sources of data, assessment content and sample size for this current-state assessment.

Table 11: Data sources for health digital technology assessments

Asset type	Data sources	Assessment	Sample size
Digital health environment	Northern Region ISSP, Hutt Valley Health case studies and information held by the Ministry of Health	Narrative and some statistics on demand growth, fragmented systems and complex IT environment	25% of DHBs
Core applications	Grade scores from DHB digital systems landscape survey 2019 Condition scores from national Government Chief Digital Officer survey of top 20 critical systems 2018	Combined grade and condition score	20% of core applications for all DHBs
Data standards	Northern Region ISSP and information held by the Ministry of Health	Narrative on slow progress and the implications	Applies across all DHBs
Infrastructure	Northern Region ISSP	Narrative and some statistics on grade, condition and functionality	20% of DHBs

The Northern Region's Information Systems Strategic Plan (ISSP) is a significant case study as the four DHBs operate similar IT systems to other DHBs. The region covers 20 percent of all DHBs and 39 percent of the New Zealand population from urban Auckland to rural Northland. Work will be completed in 2020 on a methodology for assessments of IT and clinical equipment assets.

Digital health environment

The mobility of the IT landscape has changed dramatically since the widespread adoption of smart phones and similar devices in the late 2000s. Clinical staff expect patient and clinical information to be accessible to view, for collegial discussion conversations with patients and to update on-the-move between patient care areas, offices and community settings. Yet realisation of these expectations is constrained by limitations in funding, infrastructure, legacy applications and the slow adoption of national data standards for interoperability.

DHBs collaborate to varying degrees, as individual organisations and as regional groups. The focus of the collaboration varies, such as the shared management of infrastructure through the joint ownership of the healthAlliance by the four northern DHBs and the sharing of clinical data through a read-only portal across South Island DHBs and community providers. Despite such progress, the core systems that manage hospital departments are seldom shared instances. Additional local systems are also used to integrate information and support clinical work, but functions are limited and implementation slow.

In 2018, an IT business impact review was completed by Hutt Valley DHB that revealed an 800 percent growth in applications, mostly in clinical areas, in little over a decade. The growth included high dependency on Wi-Fi and mobile phones with applications seen as critical to service delivery and patient safety. The implications for IT

management include: significant cyber security risks; requirements to support both legacy and new technologies; and the need for staff to have a diverse range of technology skills. This complexity focuses effort on maintenance rather than on IT as an enabler of workflows and new models of care.

Another review in 2018, in the Northern Region, found over 1,200 applications across its four DHBs. Yet only 10 percent of these applications appeared to be up to date, with the rest obsolete or becoming obsolete. Application lifecycles were poorly managed, deployment was not responsive to the business and there was a lack of automated application testing.

The explosion in demand exacerbates the problems with bespoke and departmentally specific systems that are widespread due to:

- the role of senior medical staff as primary influencers in purchases of IT and clinical equipment related to their own area of specialty. The result can be a complex siloed environment with limited data sharing which is expensive to maintain over the lifecycle of the assets
- lack of investment in the IT infrastructure necessary to keep pace with this clinical demand for applications, devices and network capacity to access information on-the-move across the organisation
- lack of attention to and funding for IT implementation, including clinical process standardisation, comprehensive design of application configurations and the change management important for an integrated organisational approach to IT investment
- little attention to the advantages and slow adoption of the national standards to support data-sharing between applications.

There is a multi-layered environment of clinical data generation, access and reuse within health services. A range of data views are required to support both clinical and management tasks such as:

- accessing a macro view of a patient's clinical history through different care settings
- electronic whiteboard displays of the status and location of all patients in a treatment area such as an emergency department or ward
- analysis of different patients and episodes of care as part of planning and performance review.

When health professionals find systems difficult to access or use, they resort to workarounds with paper forms, email and smart phones. This undermines the integrity of data repositories and compromises the value of information for the clinical workflow and management analysis.

Table 12 lists elements of IT systems important for health professionals to access systems. Issues include:

- multiple sign-ons
- ageing devices, phone and paging systems
- applications incompatible with some devices

- use of insecure and non-integrated systems.

Table 12: Access barriers to clinical information and collegial communication

Access	Issues
Sign-ons	Multiple sign-ons to network and clinical applications increase complexity for users.
Devices – mostly desktop PCs	DHBs may have up to 6,000 devices. It is common for these to be used beyond their expected life (eg, in the Northern Region the Win 7 operating system is out-of-support in January 2020).
Device application compatibility	Many applications are not configured or approved for tablets and phones.
Remote access	Mostly Citrix. Few applications support smart phone access.
Phones	Various ages of Private Automated Branch Exchange (PABX) systems with poor capacity for smart phone use. There are 70 PABX systems in the Northern Region.
Paging systems	Obsolete.
Corporate collaboration	Lack of digital clinical collaboration space, which means personal smart phones and email are widely used for clinical communications.

Core applications

There are multiple instances and versions of core applications, and customisation is common. Data from the 2019 DHB digital systems landscape survey shows approximately 21 core applications in DHBs, including:

- corporate applications like financial management, inventory management, payroll and human resources
- core patient administration systems found in all DHBs, along with specialised systems like mental health and maternity found in some DHBs
- clinical department applications for laboratories, radiology and pharmacy, along with a clinical portal found in all DHBs; medicine charting, radiology and laboratory orders; and general practice referrals in some DHBs.

There are many other applications and various interfaces among these. Even so, many elements of patient records have remained paper-based, particularly at the bedside and treatment bay. Systems need to be expertly designed and configured to support the workflow. Implementation requires significant change management and deployment of large numbers of devices to capture all record-keeping on-the-move for health professionals.

Assessment

Selected for this assessment were five of approximately 21 core applications used across management and clinical operations. These included financial management,

patient administration, clinical portals and pharmacy management used by all DHBs and one newer application for medication charts used by eight DHBs.

The assessment scores are derived from a combination of the condition and deployment scores. Table 13 depicts the matrix used to analyse information from the Ministry of Health's 2019 DHB digital systems landscape survey and the 2018 Government Chief Digital Officer survey.

Table 13: IT asset condition and deployment assessment scores

Condition	Deployment		
	Multiple local	Single local	Shared
Modern	n/a	2	1
Current	4	3	2
Legacy	5	4	3

The condition scores relate to:

- **modern** – a well-managed IT environment with a system generally within its 7-year lifecycle, which could include some elements of 'as a service' delivery for infrastructure and applications
- **current** – a system that may be older than its 7-year lifecycle but has an upgrade path and support available, which may have elements of 'as a service' delivery
- **legacy** – an older vendor product or bespoke system, with no upgrade path, very limited compliance with national standards and generally more expensive to maintain.

The deployment scores relate to the number of instances of the asset.

- **multiple local** – There are multiple versions of the asset within the organisation, which can relate to a history of separate decision-making at different sites and fragmented management of asset renewal.
- **single local** – There are single versions of the asset with a strategic approach to upgrades and renewals.
- **shared** – The asset is managed through shared purchasing, maintenance and replacement or upgrade arrangements among DHBs or at a national level, which is designed to optimise both the solution and its lifecycle cost.

The scores were:

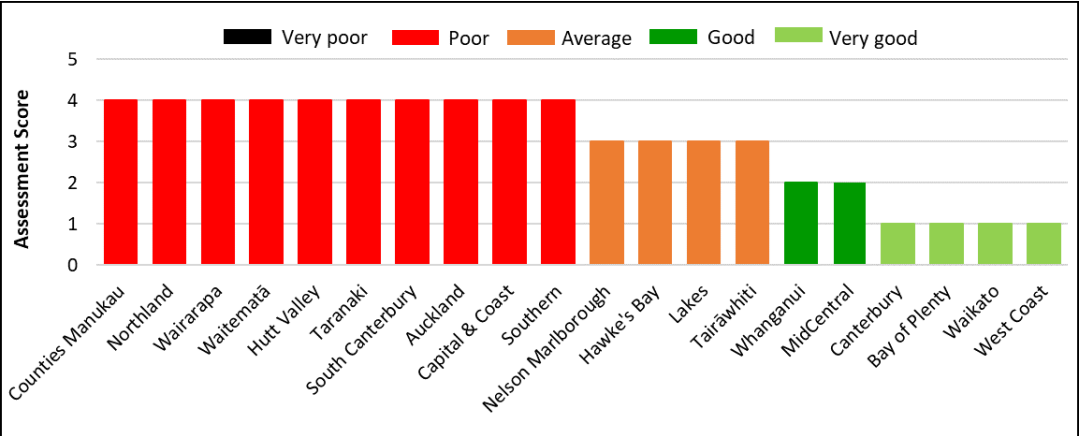
Very poor
 Poor
 Average
 Good
 Very good

Corporate systems: financial management systems

Figure 18: shows the finance systems were assessed as average to very poor in 14 of the 20 DHBs, with 10 poor and four average. There were two assessed as good and

four as very good. The systems rated average to very poor should each have upgrade plans in place, although this information was not sought for this assessment.

Figure 18: Assessment scores for financial management systems

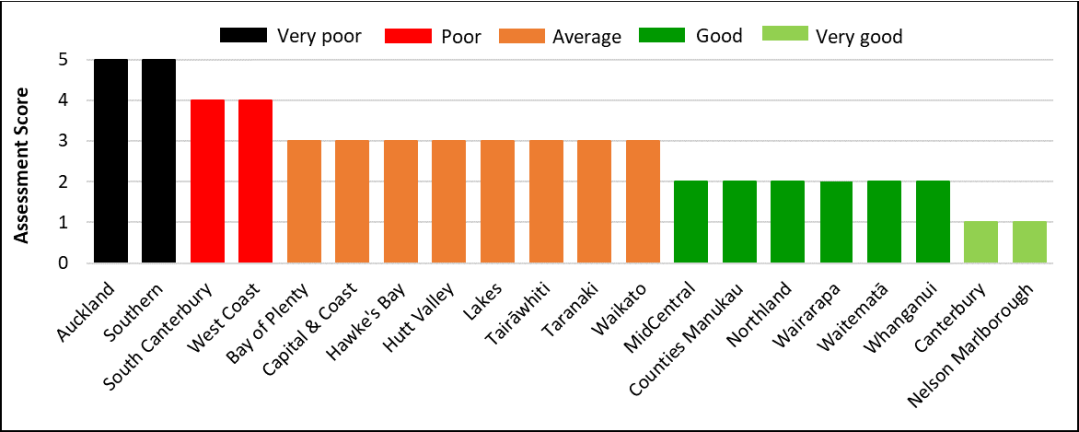


Patient administration systems

Core patient administration systems have a central patient index and support services for the management of medical records, inpatient admissions, outpatient appointments, emergency department and theatres, along with some other functions. Some DHBs use separate systems for emergency department and theatre. Other specialised patient administration systems include maternity, mental health and general practice referrals.

There are 26 core patient administration systems due to legacy systems retained at specific hospital campuses. Figure 19: shows 12 DHBs with patient administration systems assessed as average to very poor (eight average, two poor and two very poor). There are six good and two very good.

Figure 19: Assessment scores for patient administration systems

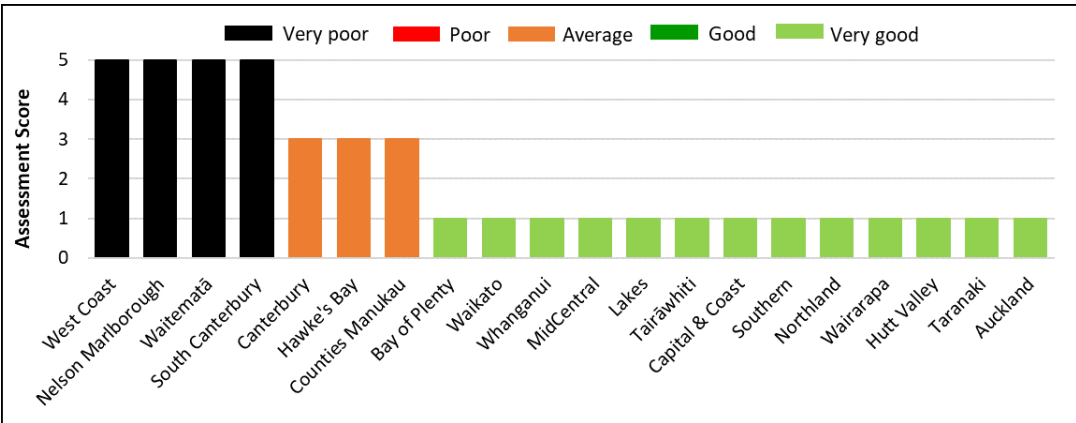


Clinical support systems

The main clinical support departments of radiology, laboratory and pharmacy have specialist information systems. These clinical support systems each have subsystems, including in pharmacy for inventory management and medication dispensing, in laboratory a subsystem for each specialist laboratory department and in radiology for department management and for image capture, storage and retrieval. These systems also include interfaces to a range of clinical equipment to capture inventory and clinical data. Pharmacy was selected for this assessment; laboratory and radiology systems will be considered for the next assessments.

Figure 20: shows that 13 DHBs have pharmacy systems assessed as very good. There are seven assessed as average to very poor (three average and four very poor).

Figure 20: Assessment scores for pharmacy management systems

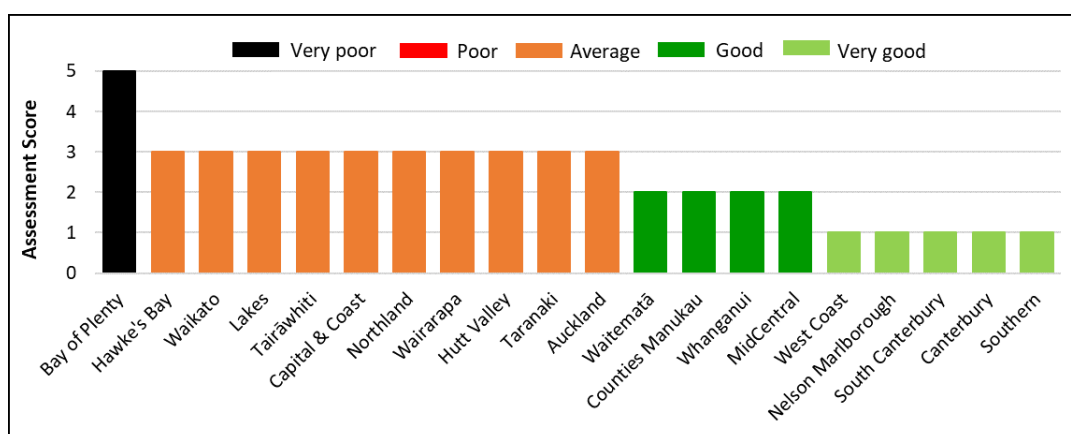


Clinical portals

Clinical portals enable health professionals to view patients' information across different organisations such as general practices and other DHBs. Generally, to update a patient's records, health professionals must sign on to different systems. There is no integrated workspace for health professionals to appraise clinical information and generate actions to progress the activities of care.

Figure 21: shows for the 20 DHBs, nine clinical portal systems were assessed as good to very good (four good and five very good). There were 10 average and one very poor.

Figure 21: Assessment scores for clinical portals

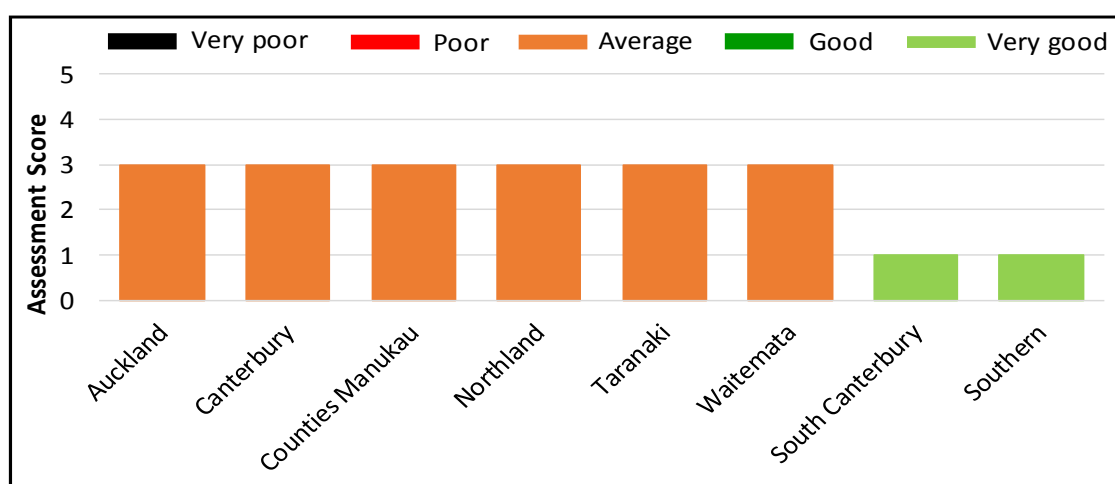


Order entry and medication charts

Order entry systems and electronic medication charts operate at the interface between patient care areas in places like emergency departments, wards, clinics and theatres and the clinical support departments of laboratory, radiology and pharmacy. DHBs typically have a range of order entry systems for laboratories and radiology, both electronic and paper based. Modern order entry systems should provide an integrated workspace for ordering and reviewing of assessments. To be effective, these systems depend on an IT environment that supports on-the-move access to systems for health professionals and adequate change management to standardise the clinical processes.

Like the order entry systems, electronic medication charts operate between the clinical care delivery at the bedside and treatment bay and the pharmacy systems. Electronic medication charts are relatively new in New Zealand and implementation can range from a few patient care areas to organisation-wide. Figure 22: shows electronic medication charts implemented in 8 of 20 DHBs, with two assessed as very good and six as average.

Figure 22: Assessment scores for electronic medication charts



Shared health record repositories hold patient and clinical information from collaborating DHBs and different health information systems. The repositories supply

information to support more integrated views of data, useful for systems such as clinical portals, order entry and electronic medication charts, along with district and regional analytics. Further work is required to develop an asset assessment approach for these repositories.

Data standards, interoperability and analytics

The Ministry of Health's Health Information Standards Organisation (HISO) oversees the selection, development and adoption of all standards for interoperability in health care. However, adoption by the health sector has been slow and inconsistent. Clinical data comes from each core departmental system and there is limited interoperability for sharing among applications, to support work with patients and use the data for analytics. Work to improve core information systems and compliance with data standards, through the clinical workflow, is required to realise benefits from operating a more digitally enabled health system (Health and Disability System Review 2019, p 212). This slowness to adopt digital standards and coded forms of data has related to:

- health professionals' preference for text and reluctance to use coded forms of data in their clinical work
- incomplete and poorly configured implementations of patient administration systems and a lack of standardised approaches to data across multiple data repositories
- lack of attention to strategies for enterprise reporting and analytics, other than the disease and procedures codes that are grouped for funding purposes at discharge from hospital
- poor understanding of national and global standards as key enablers for quality, efficiency, information sharing and analytics.

The Northern Region identified 100 core systems across the four DHBs with data important to the construction of a patient's electronic record. However, the region lacked the necessary data standards and capability for integrated use. Capability issues included:

- low scores on the Data Maturity Model at 1.6 out of 7¹⁶
- separate business intelligence tools and analysts specialised for large applications, such as patient information, pharmacy, laboratory and radiology
- lack of technical support for data security, due to out-of-date integration technologies and legacy security standards
- risks to the integrity of patient data with limited monitoring, alerts and error management capability.

In DHBs, the slow adoption of data standards is also evident in around 30 to 35 bi-directional connections for information sharing between patient administration and other systems, along with numerous interfaces between clinical systems and clinical

¹⁶ Assessed by healthAlliance.

equipment. The Health Level 7 (HL7) framework guides development of application programming interfaces, but this produces bespoke rather than reusable solutions, which are expensive to develop and maintain. The Northern Region identified 240 application programming interfaces on outdated integration platforms, with 50 percent being interfaces with core systems.

HISO has endorsed four key national standards for the New Zealand health sector. These standards enhance productivity through entry and update of data once at its source, with a community of users able to access data with no re-keying. Progress with adoption is slow, despite the productivity opportunities. The four key national standards include:

- **Systematised Nomenclature of Medicine Clinical Terms – SNOMED CT**
SNOMED CT is a global language of health care. New Zealand was a founding member of SNOMED International, which is a not-for-profit organisation formed in 2007 for ongoing development of SNOMED CT. Standardised clinical terms with common codes enable clear exchange and analysis of clinical data to improve patient outcomes. SNOMED CT codes apply to the entire clinical workflow, from a presenting yet undiagnosed condition to diagnostic tests, treatments and outcomes. At present there is discrete use of SNOMED CT in New Zealand by some clinical departments and general practitioners.
- **Global Standards 1 – GS1**
GS1 provides unique identifying codes for organisations, parts of organisations, products and devices. It enables global e-commerce, facilitating transmission of unique product information, through the supply chains, including tracking, product advisories and recalls. In many developed countries, the health sector is the largest government user of GS1. Health care uses include procurement and tracking materials, devices and medicines through health facilities and to patients' bedsides. The New Zealand Business Number and parts of an organisation are GS1 location codes. One use is to enable visitor tracking, such as in the Ministry of Health's NZ COVID Tracer app. New Zealand lags other countries with adoption, particularly in health.
- **New Zealand List of Medicines and formulary – NZULM**
NZULM is a unique identifier for funded and approved medicines in New Zealand. It is an application of SNOMED CT, which can support sharing of medicines information across hospital and community settings. There is also an alternative system with different codes in New Zealand and slow adoption of both systems among general practitioners.
- **Health Level 7 Fast Healthcare Interoperability Resources – HL7 FHIR**
FHIR is the most recent of the HL7 standards that have existed for several decades. HL7 provides a framework to guide interface developments between applications in health. However, this produces bespoke interfaces that tend to be expensive to build and replace. Older applications do not support the FHIR version. Overall adoption of the SNOMED CT, NZULM and GS1 would also reduce the degree of variability in HL7 interfaces.

Infrastructure, networks and security

These assessments were drawn from a review of the Northern Region's four district health boards, completed by the healthAlliance. IT infrastructure assets include:

- systems-as-a-service
- data centres and computer rooms
- shared record repositories
- server operating systems
- networks
- security.

Data centres

DHBs are moving towards having regional data centres managed by specialist providers. They are also moving to 'as a service' and cloud-based services for some of their clinical repositories at an organisational or regional level. Typically, DHBs have large data centres along with campus-based local computer rooms with servers running applications.

Data centres can be vulnerable due to the condition of the buildings and site infrastructure and the data centre design and condition. This design includes flooring, climate control, uninterruptable power supplies, cabling and server racks. Poor condition risks system outages from failures and compromises safety for the technical staff directly involved. It entails significant risk for DHBs because service delivery depends on the continuity of information systems that support patients' diagnostic and treatment processes. Illustrations of recent failures experienced by DHBs include burst water pipes flooding the computer room and fire caused by overheated uninterruptable power supplies.

Assessments of the five data centres in the Northern Region showed these as mostly in average to poor condition. Issues include:

- lack of capacity to support strategic initiatives, including moves to a regional patient administration system, collaborative community care and improved management of user identity access
- requirements to upgrade 50 percent of operating systems in 2020 to avoid being out-of-support and to invest in capacity to increase space, power supply and cooling in 2020
- operating 60 percent of core systems without disaster recovery arrangement.

Networks

Networks in DHBs lack capacity and reliability to support on-the-move access to clinical systems for health professionals. Significant issues include:

- slow response times due to lack of capacity
- loss of data integrity in a multiple-user environment
- extended outages due to lack of network redundancy
- variable Wi-Fi access across clinical settings
- lack of capacity for Internet access for patients and visitors.

In the Northern Region, 50 percent of the network infrastructure will be out-of-support by 2020. Multiple outages associated with network failures have lasted for up to 8 hours for Internet access and 72 hours for communication via the national secure network.

Security

Problems with DHB management of security related both to the complexity of legacy systems and to financial constraints. Issues include:

- lack of security policies and staff training
- multiple applications with inconsistent functionality around user profiles and tracking of data views and updates
- large numbers of users who work across different health organisations require access to several applications – these users can repeatedly join and leave each organisation as they move through cycles of training, without being removed from systems
- lack of IT system configuration and tools to detect security attacks
- lack of skilled IT staff to focus on security.

Conclusion and next steps

The current-state assessment identifies the relative investment priorities using the consistent frameworks developed by the NAMP. The next steps are to develop a comprehensive work programme to deliver a National Asset Management Plan and continue to build the asset management capability and evidence-base across the health sector.

Conclusion

The development of consistent frameworks and asset management enablers such as the HART provide a good foundation for development of a National Asset Management Plan. The information and data provided has already been used by the Ministry. It will continue to inform investment prioritisation and the development of investment programmes.

The current-state assessment provides evidence to determine the relative investment priorities, which include:

- sitewide infrastructure (eg, pipes and electrical power)
- building operability (eg, passive fire separation)
- mental health and intensive care units, including CFFFP, condition and maintenance
- core IT applications, including financial management, patient administration and pharmacy management systems.

There are multiple trade-offs involved to prioritise asset improvement for health facilities. For example, there can be trades-offs between the resilience of buildings, clinical fitness for purpose and sustainability features. It will be useful to clearly set out the priorities and provide an integrated view of the necessary investment. Over time, target asset levels of service and design standards will contribute to assurance that health facilities are fit for purpose over a range of asset performance objectives.

The NAMP is part of a government-wide agenda to ensure generations of New Zealanders receive best value from new and existing investments. Best value outcomes depend on improving the quality of capital funding decisions, asset management and long-term investment outcomes. The Government has set clear objectives to have asset management plans in place to guide strategic, tactical and operational choices under Cabinet Office circular CO (6) 2019. The NAMP is intended to guide strategic choices at a sector level and over time it is expected that it will represent a consolidation of the DHBs' asset management plans.

The team involved in the development of the frameworks and current state would like to acknowledge and thank the DHB staff who were involved in development of the current-state assessment.

Next steps

The Ministry is developing an asset management framework for the health sector and working on a more comprehensive, realistic and detailed work programme to progress asset management across the health sector. This will be aligned to resource levels and asset management standards such as the International Standards Organisation (ISO) asset management standards and the International Infrastructure Management Manual 2015.

Table 14 sets out the asset scope being considered in the design of the programme of assessments for 2020/21. The findings will be presented as part of the NAMP second report in 2022.

Table 14: Asset scope for the second NAMP report due in 2022

Asset type	In-scope	Target data completeness	Target data confidence
Buildings	All IL3 and IL4 hospital buildings	Building condition 100%	Reliable
	Buildings at hospital campuses larger than 1,000 m ²	50–100%	Reliable
	Clinical facilities - Inpatient mental health facilities, including acute and forensic units	80–100%	Reliable
Infrastructure	All sitewide reticulated systems (ie, plumbing, electrical, mechanical and critical utilities supporting campus services)	100%	Reliable
Information Technology	All core applications at each DHB	50–100%	Reliable (will be dependent on data from DHBs)
	Compliance with national standards	50–80%	
	IT infrastructure, datacentres, networks and security	50–80%	

Clinical equipment	Large clinical equipment (eg, radiology including X-ray, ultrasound, gamma cameras, linear accelerators)	100%	Reliable
	Smaller critical clinical equipment, shared across departments	Sample 10–50%	Reliable
Other minor assets	Criticality framework for minor assets established		
	Critical minor assets	Sample 10–50%	Reliable

The priorities to improve asset management through the NAMP include:

- further prioritise the work programme required to progress development of a national asset management plan for the health sector, in consultation with the Health Asset Management Improvement forum and to be approved by Capital Investment Committee
- consult with DHBs and then publish an asset management strategy and policy for the health sector
- complete an asset management framework for the health sector including development of an asset management plan template and guidance
- continue to refine the data and presentation in the HART tool, including analytic and narrative 'A3s' for each DHB including campus data and to make the tool available to appropriate DHB staff
- develop an asset risk and assurance framework for DHBs
- develop an asset sustainability work programme
- develop and pilot a robust assessment for clinical equipment and IT in collaboration with DHBs
- develop asset levels of service aligned to the national service design to quantify long-term investment scenarios
- complete a second phase of clinical facility fitness for purpose in mental health including forensic mental health units
- follow up with DHBs to document plans to remediate any significant issues identified as part of the condition and clinical facility fitness for purpose assessments
- deliver a second report in the series 'a national asset management plan for the health sector' in 2022 with scope dependant on resources.

This will be progressed in the context of work across the Health Infrastructure Unit to:

- develop national service design and facility standards, settings, frameworks and guidance for capital planning
- develop a sector-wide capital investment framework and plan
- incorporate more emphasis on health equity and sustainability in asset management practice, including establishing a sustainability work programme and reducing greenhouse gas emissions.

This list and priorities will be updated once the overall work programme has been completed and aligned with available resourcing.

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Appendix 1

DHB abbreviations

ADHB	Auckland DHB
BOPDHB	Bay of Plenty DHB
CCDHB	Capital & Coast DHB
CDHB	Canterbury DHB
CMDHB	Counties Manukau DHB
HBDHB	Hawke's Bay DHB
HVDHB	Hutt Valley DHB
LDHB	Lakes DHB
MCDHB	MidCentral DHB
NDHB	Northland DHB
NMDHB	Nelson Marlborough DHB
SCDHB	South Canterbury DHB
SDHB	Southern DHB
TaiDHB	Tairāwhiti DHB
TarDHB	Taranaki DHB
WkDHB	Waikato DHB
WrDHB	Wairarapa DHB
WtDHB	Waitematā DHB
WCDHB	West Coast DHB
WDHB	Whanganui DHB

Appendix 2

Scope, data confidence and reliability

Buildings and infrastructure

Table 15 shows the data confidence framework, from the International Infrastructure Management Manual, used to determine the confidence in the asset data used in the assessments for buildings and infrastructure.

Table 15: Confidence grades for 2019 sources of assessment data

Confidence Grade	Meaning
Highly Reliable	Data based on sound records, procedure, investigations and analysis, documented properly and recognised as the best method of assessment.
Reliable	Data based on sound records, procedures, investigations and analysis, documented properly but has minor shortcomings; for example, the data is old, some documentation is missing and reliance is placed on unconfirmed reports or some extrapolation.
Uncertain	Data based on sound records, procedures, investigations and analysis that is incomplete or unsupported, or extrapolated from a limited sample for which grade highly reliable or reliable data is available.
Very Uncertain	Data based on unconfirmed verbal reports and/or cursory inspection and analysis.

Table 16 applies the confidence grades from Table 15 to the assets assessed to show the reliability of assessment data for each asset type.

Table 16: Reliability of data for building and infrastructure assessments

Asset Type	Highly Reliable	Reliable	Uncertain	Very Uncertain
Critical older buildings, expert assessors				
Other buildings, DHB self-assessed				
Sitewide infrastructure – 31 main hospital sites				
Seismic restraint, passive fire, asbestos				
Structural integrity %NBS (earthquake)				
Structural resilience (earthquake)				

Table 17 shows the percentage of completeness of the datasets used to assess each asset type in the 2018–19 assessments.

Table 17: Data completeness for building and infrastructure assessments

Asset Type	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Critical older buildings, expert assessors											
Other buildings, DHB self-assessed											
Sitewide infrastructure – 31 main hospital sites											
Seismic restraint, passive fire, asbestos											
Structural integrity %NBS (earthquake)											
Structural resilience (earthquake)											

Table 18 shows for building and infrastructure assets: whether there was a professional or DHB self-assessment, the focus of sampling for assets and components and aspects that were out of scope.

Table 18: Scope of 2019 building and infrastructure assessments

Asset type & action	Assessment type	Sample focus	Component focus	Out of scope
Building condition	166 professional assessments	Critical buildings at main hospital campuses pre-2000 build	Condition at main component level for: <ul style="list-style-type: none"> – building fabric mechanical and electrical equipment Building operability: <ul style="list-style-type: none"> – seismic restraint passive fire separation, presence of asbestos 	Detailed rating of individual buildings or plant items
Building condition	993 DHB self-assessments	Non-critical buildings at main hospitals pre-2000 build	Condition at main component level for: <ul style="list-style-type: none"> – building fabric mechanical and electrical equipment Building operability: <ul style="list-style-type: none"> – seismic restraint passive fire separation presence of asbestos 	Detailed rating of individual building or plant items (Some DHBs have this detail and used it to inform their ratings)
Infrastructure condition	Professional assessments	Sitewide reticulated infrastructure at 31 main campuses	Mechanical, plumbing, heating, air conditioning	Dunedin (due to rebuild plan) and Whakatāne (due to recent work and a minor campus)
			Electrical power, lighting, fire systems	Dunedin (due to rebuild plan) and Whakatāne (due to recent work and a minor campus)
Building structural integrity	From DHB's initial and detailed seismic assessments	All buildings	Structural rating %NBS	No additional seismic assessments were commissioned
Building seismic resilience	Professional assessments of 34 properties	Buildings with suitable seismic assessments completed	Standardised re-interpretation of initial and detailed seismic assessments	No additional seismic assessments were commissioned

Clinical facility fitness for purpose

Table 19: Completeness of datasets for 2019 CFFFP assessments

Asset Type	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Acute mental health units											
Forensic mental health											
Inpatient units, sample of 20											
Intensive care, coronary care and neonatal units											
Operating theatres – general & specialist suites											
Emergency departments											
Radiology departments											
Outpatient departments											
Therapies departments											
Pharmacy											
Laboratories											

Appendix 3

CFFFP gross floor areas

The Australasian Health Facility Guidelines (AHFG) are intended to support designs for new clinical facilities in Australasia. The AHFG was used to inform assessments of the size of each clinical facility. First, a schedule of accommodation was created for each type of facility and to support comparison, a gross floor area (GFA) per bed (or operating room) was calculated. Next, a ratio was calculated between each facility's actual gross floor area per bed (or operating room) and the AHFG benchmark area per bed (or operating room). Older units can be expected to perform poorly when assessed in relation to these AHFG benchmarks.

Tables 18-22 below shows for each facility assessed in Section 4: the DHB, location, actual gross floor area, number of beds (or operating rooms), GFA per bed (or operating room) and the ratio of the actual GFA to the AHFG benchmark.

Table 20: Gross floor area analysis for emergency departments

DHB	Location	Actual GFA m ²	No. of beds	GFA / bed m ²	%AHFG benchmark@ 50 m ² /bed
NDHB	Whangarei	638	34	19	38%
SCDHB	Timaru	418	13	32	64%
MCDHB	Palmerston North	1162	36	32	65%
TarDHB	Taranaki Base	1019	24	42	85%
HBDHB	Hawkes Bay	1296	30	43	86%
TaiDHB	Gisborne	481	11	44	87%
LDHB	Rotorua	1560	34	46	92%
WkDHB	Hamilton	2659	51	52	104%
NMDHB	Wairau	646	12	54	108%
CMDHB	Middlemore	4470	79	57	113%
CCDHB	Kenepuru A&M ¹⁷	545	6	91	182%

¹⁷ Kenepuru is an accident and emergency service, rather than an emergency department.

Table 21: Gross floor area analysis for intensive care units

DHB	Location	Actual GFA m ²	No. of beds	GFA / bed m ²	%AHFG benchmark @85 m ² /bed for units < 15b @70 m ² /bed for units > 15b
SCDHB	Timaru	365	8	46	54%
TaiDHB	Gisborne	378	8	47	56%
MCDHB	Palmerston North	467	8	58	69%
NDHB	Whangarei	605	10	61	71%
HBDHB	Hawkes Bay	717	11	65	77%
WtDHB	North Shore	966	14	69	81%
TarDHB	Taranaki	934	16	58	83%
ADHB	Auckland Starship Children's	1458	22	66	95%
WkDHB	Waikato	1319	16	82	118%
CMDHB	Middlemore	2537	25	101	145%

Table 22: Gross floor area analysis for operating theatres

DHB	Location	Actual GFA m ²	No. of operating rooms	GFA / bed m ²	%AHFG benchmark@ 280 m ² / OR
ADHB	Auckland Starship Children's	1499	7	214	76%
ADHB	Greenlane	1926	8	241	86%
NMDHB	Nelson	1507	6	251	90%
TaiDHB	Gisborne	1040	4	260	93%
CMDHB	Manukau SuperClinic	3184	12	265	95%
HBDHB	Hawkes Bay	2208	8	276	99%
LDHB	Rotorua	1672	6	279	100%
CDHB	Christchurch	3134	11	285	102%
MCDHB	Palmerston North	2234	5	319	114%
SCDHB	Timaru	1633	7	327	117%
NDHB	Whangarei	1965	6	328	117%
CCDHB	Kenepuru	1333	4	333	119%
NMDHB	Wairau	1716	5	343	123%
WkDHB	Waikato	8368	24	349	125%
CDHB	Burwood	1400	4	350	125%

Table 23: Gross floor area analysis for inpatient units

DHB	Location	Actual GFA m²	No. of beds	GFA / bed	%AHFG benchmark @ 36 m²/bed
HBDHB	HBDHB Hastings WA3	466	18	26	50%
WkdHB	Hamilton WM2	615	23	27	63%
BOPDHB	Tauranga W2A	548	25	22	69%
MCDHB	Palmerston North W24B	864	27	32	75%
NDHB	Whāngārei Children's W2	815	27	30	75%
CDHB	Christchurch W19	688	28	25	76%
HBDHB	Hastings WB2	755	28	27	78%
CMDHB	Middlemore W23	785	28	28	78%
WDHB	Whanganui W2A	1007	29	35	80%
ADHB	Starship Children's W24	676	29	23	82%
TaiDHB	Gisborne W5	710	30	24	82%
NMDHB	Nelson W9	822	30	27	85%
HVDHB	Hutt GSG ¹⁸	916	34	27	94%
NDHB	Whangarei W2 Stroke	815	34	24	94%
ADHB	Auckland City B9	1110	41	27	114%
ADHB	Greenlane Day Stay	1222	42	29	117%
CMDHB	Otara Spinal Unit	890	45	20	124%
WkdHB	Hamilton W3	1213	49	25	135%
CCDHB	Kenepuru W7	1015	51	20	141%
HVDHB	Hutt OPRS ¹⁹	2679	62	43	173%

¹⁸ GSG = general surgery and gynaecology¹⁹ OPRS = older persons and rehabilitation service

Table 24: Gross floor area analysis for mental health units

DHB	Location	Actual GFA m²	No. of beds	GFA / bed m²	%AHFG benchmark @ 80 m²/bed
CDHB	Hillmorton Te Awakura South	617	16	39	48%
SDHB	Wakari Helensburgh W11	793	16	50	62%
WtDHB	North Shore Geriatric	954	19	50	63%
WkDHB	Waikato Henry Bennett W35, W36	1746	33	53	66%
SCDHB	Timaru Kensington	647	12	54	67%
LDHB	Rotorua Acute Psychiatric	786	14	56	70%
WtDHB	Waitakere Waiatarua	2385	40	60	75%
CDHB	Hillmorton Aroha Pai PSAID ²⁰	914	15	61	76%
MCDHB	Palmerston North W21	1631	24	68	85%
SDHB	Wakari W9B	1025	15	68	85%
CCDHB	Kenepuru Psychogeriatric	1133	16	71	89%
HVDHB	Hutt Te Whare Ahurua	1712	24	71	89%
ADHB	Auckland Te Whetu Tawera	4462	62	72	90%
SDHB	Southland Hospital	1544	21	74	92%
NMDHB	Nelson Waahi Oranga	2069	28	74	92%
CMDHB	Otara Tamaki Oranga	1516	20	76	95%
TarDHB	Taranaki Te Puna Waio	1764	23	77	96%
BOPDHB	Tauranga Te Whare Maiangi	1900	24	79	99%
CDHB	Hillmorton Tu Puna	1230	15	82	103%
CMDHB	Middlemore Tiaho Mai	3316	38	87	109%
TairDHB	Gisborne Psychiatric W11	958	8	120	150%
WCDHB	Greymouth	863	7	123	154%
ADHB	Auckland Pt Chevalier Buchanan	1817	14	130	162%
WDHB	Whanganui Te Awhina	1770	12	148	184%

²⁰ PSAID = Psychiatric service for adults with intellectual disability

Appendix 4

Expert assessments for infrastructure

This material is set out in a separate companion document.

