Using information and communications technology to enable the exchange of information between New Zealand clinicians and health providers

Ross McKenna

Abstract

Aim The aim of this paper is to examine the current state of healthcare information exchange in the New Zealand health and disability sector. The paper describes the priorities and main drivers and barriers to creating a free flow of health information in the New Zealand health system.

Method The paper draws on findings from extensive research of over 2500 New Zealand clinicians and decision-makers conducted from 2007 to 2009 and other references.

Results The research findings support a view that technology-enabled information exchange could significantly improve healthcare delivery processes and enable person-centred care initiatives. Three-quarters of clinicians surveyed agreed that better electronic access to healthcare information could improve the way they provided health services. The research suggests that the greatest potential for benefit in the sector is in improving the capability to electronically exchange test results, patient referrals, discharge summaries, and medication information. While there is widespread support for improving health information communication technology, there is also a strong belief that a lack of compatible systems, as well as the need for increased funding, are major barriers to progress.

Conclusion Making the priority areas of information available when and where they are needed will require a coordinated approach across the health sector involving funders, providers, vendors, decision-makers and clinicians.

The purpose of this paper is to provide a base of evidence for healthcare providers, Government agencies and vendors to target their efforts and collaborate on information communication technology (ICT) initiatives. This paper is based on findings from recent New Zealand health and disability sector research (the research) commissioned by the New Zealand Ministry of Health (the Ministry) and other research sources. It aims to provide an analysis of the health-sector research results to support concerned groups, individuals and organisations by providing evidence of the expressed ICT needs and opportunities identified by New Zealand clinicians and decision-makers.

When providing health services, clinicians often encounter an ‘inference’ gap. This is the gap between the information available to a clinician at that place and time, and the evidence needed to support the best informed care decision. Improving information ‘liquidity’ through information systems narrows this gap and supports clinical decision-making processes. This flow of information can then follow patients from care setting to care setting along the patient care pathway, supporting a shared
decision-making process that involves patients, clinicians and care teams – a prerequisite for person-centred healthcare.

The New Zealand health and disability sector (the sector) is extremely diverse. This diversity includes wide variations in the size of health provider organisations, how they are owned, managed and funded, the type of services they provide, who they provide them to, and where and when they provide these services. There are an estimated 12,500 health-provider organisations, which can be grouped into more than 200 separately identifiable segments, ranging from sole traders to tertiary hospitals employing hundreds of people.

On a typical day in New Zealand there are thousands of healthcare transactions involving the exchange of information between people, systems and organisations - recorded and communicated primarily by mail and fax. Electronic information exchange in the sector occurs over many different ICT systems. Often these have been built and purchased in isolation and in many situations they are not interoperable or interconnected across multiple enterprises.

Health markets differ from others because the ‘product’ is difficult to define, the outcome of care is not always certain, and payments are made by third parties such as insurers. The interaction of these factors is what makes the health marketplace unique

In New Zealand external funding, targets and incentives are used to balance demographic differences, promote best practice and help ensure overall population health needs are addressed. Health providers are faced with an increasing number of interventions, complexities of disease management, rapid development of medical technologies, and increasing demand for health services.

Changes to business processes are not only driven by business requirements and the requirements of other healthcare providers, but are dependent on the funding controls used by insurers and Government to influence service availability and practice variations.

Once an agreement on any business process change has been reached, the costs of technology to enable and support it must be assessed. If the expenditure is justified then a source of funds must be found. Qualitative research carried out by the Ministry in April 2008 shows it is difficult for most providers to justify and fund technology investments beyond those providing a direct ‘business’ benefit for individual organisations.

These factors, combined with a the high level of specialist skills and knowledge involved in health care make the adoption and integration of information technology to support new or updated business processes particularly challenging. Even with these challenges, the health sector research findings indicate implementing ICT initiatives to improve overall healthcare delivery is a high priority for a significant number of clinicians and organisations.

Method

Research to identify current and future ICT requirements of the health sector was undertaken by UMR Research on behalf of the Ministry from 2007 to 2009 in two phases. The purpose of the first (qualitative) phase of research was to confirm the way the sector was segmented (as an ICT market)
and understand current and potential future use of ICT in the sector. In addition the research was intended to ensure the next, more in-depth, phase of research was targeted correctly. UMR Research conducted eight detailed interviews with sector opinion leaders to develop two topic guides (one for clinicians and one for ICT decision-makers) for the first, qualitative, research phase. These guides were then used in more than 100 face-to-face interviews of representatives of the 12 categories in urban, rural and provincial locations across New Zealand. This research was completed in July 2008 and provided information on the views of a representative sample of health practitioners. For the next (quantitative) phase of the research, the Ministry supplied a database to UMR Research of more than 7,000 clinicians and ICT decision-makers from more than 5,000 health provider organisations. The findings from the qualitative research phase were used to develop the quantitative questionnaires and to confirm and quantify the earlier qualitative findings. The questionnaires provided a selection of choices as well as the option of an alternative response. These questionnaires were tested with sector representatives and tailored to decision-maker (answered on behalf of the organisation and covering technical and financial aspects) and clinical (answered from personal perspective and covering the impact of ICT) respondents. Three questionnaires were mailed to DHBs and non-DHB organisations (organisations separately identifiable as not directly governed by a DHB) and sought information from both clinicians and ICT decision-makers. The quantitative research average response rate was 32% or more and significantly higher than anticipated. The margin of error varied from ±2.3% for non-DHB clinicians, ±3.4% for ICT decision-makers to ±7.9% for DHB clinicians. The Technical Appendix of the quantitative research provides a detailed outline of the methodology used by UMR Research. While international and New Zealand research corroborates the findings of this survey, there are few other health ICT surveys that have covered such a wide range of health providers to this level and none to this extent in New Zealand. All quantitative research data included in this report has been sourced from the Ministry of Health’s quantitative research findings unless otherwise stated.

Results

Organisational diversity—The quantitative health sector research results strongly reinforce that it is a very diverse sector; there are a wide range of “business” types and many of these operating from multiple locations. Despite this diversity, there was widespread agreement on the main opportunities and barriers to improved use of ICT. The sector is typically well served by technology, but respondents often had trouble finding the electronic information needed, were faced with incompatible systems, and were not entirely convinced they were receiving value for money. Some key observations include:

- A third (34%) of all organisations were part of a larger group, a further third (34%) were from sole private practices, and a fifth (17%) were not-for-profits. A quarter (26%) of GP practices were sole practitioners.
- There was a significant variation in the number of patients that clinicians provided health services to on a daily basis.
- More than half (51%) of non-DHB clinicians and three-quarters (72%) of DHB clinicians reported that at least once a day they could not find the patient electronic information they required to optimally treat their patients.
- Nine out of 10 (93%) New Zealand clinicians have Internet access and use email.
- Both DHB clinicians (84%) and non-DHB clinicians (71%) identified that lack of compatible patient management systems was the most significant barrier to
electronically accessing medical or healthcare information from other organisations.

- Almost a quarter (19%) of all clinicians and a quarter (25%) of specialists work in more than one DHB area.
- Just under half (42%) of the specialist segment and a quarter (25%) of the GP segment reported that they worked from multiple fixed locations.

This level of diversity shows the challenge in establishing systems that span multiple health providers and suggests the flexibility to configure technology to meet specific business needs is very important. A ‘one size fits all’ approach to implementing ICT systems in the health market could risk compromising the needs of many health sector organisations.

**Use of ICT in the sector**—By international comparisons, the New Zealand health sector has a high level of modern technology available and widespread electronic connectivity. However, the quantitative research shows only a small number (16%) of health ICT decision-makers reported ‘excellent’ value from their ICT investments. This response implies that a health user’s experience of what capability ICT typically provides does not translate well to their perception of value (cost/benefit).

There appears to be a significant disconnect between the availability of ICT and its productive use in the sector—considered in light of the view that ‘inadequate funding’ is considered a barrier to ICT investment (refer to Figure 5 for further information). The fact that health ICT is considered expensive is unsurprising given the perceived value and ability to fund its purchase.

While nine out of 10 (93%) New Zealand clinicians have internet access and use email, not all health employees have a dedicated account or computer at work. Two-thirds (67%) of non-DHB clinicians accessed email through an email client, while a quarter (28%) used a web browser even though a large proportion were working from a single fixed location.

Email is more commonly used to communicate with non-healthcare organisations than by clinicians to communicate with patients. Use of email varies widely and there is a preference in the mental health segment to use email for communicating with other providers and practitioners, and rural GPs use email to communicate with patients much less than their urban counterparts. The variations in findings between rural and urban GPs reflect differences in information needs identified in other New Zealand surveys.

**Experiences and attitudes**—Half (51%) of non-DHB clinicians and three-quarters (72%) of DHB clinicians reported that at least once a day they could not find the patient electronic information they required to optimally treat their patients. While this appears to be a concerning statistic, clinicians generally found alternative channels to source this information. However, it does indicate scope to reduce the time, resources, and associated costs of sourcing healthcare information, such as repeated tests.

It should also be noted this response was closely tied to the level of ICT use: those segments, such as sole traders and independent practitioners, who recorded lower levels of ICT use and lower numbers of patients treated per day, also encountered
fewer problems accessing information. Other research supports the view that providing clinicians with medical knowledge that is immediately relevant to their practices can have a direct impact on medical interventions and patient outcomes.

Figure 1. Time required by health sector groups to implement ICT

At least 90% of clinicians reported using fax. Findings from the qualitative research show that clinicians and ICT decision-makers believed using a fax was ‘safe’ compared to using other electronic methods of communication, which were perceived as varying in their reliability. The use of paper-based communications is supported by observations in other developed countries and reflects a health sector-wide accepted practice where regulation requires that prescriptions must be signed, and paper records are considered more secure and authoritative.

Health-provider ICT implementation process—As well as discussing current and future ICT requirements with the health-sector providers, the qualitative research explored the decision-making process and timeframes required by non-DHB ICT decision-makers to implement ICT changes. A stepped decision-making process was required to support the adoption of technology.

These results support other survey findings which show that while there are examples of providers that can smoothly integrate new initiatives into their business processes, many do not have sufficient spare management capacity (including IT skills) to implement new projects.

Discussion

Enabling improvements to healthcare delivery—The research strongly supports the belief that technology-enabled health information exchange could improve healthcare
delivery. It shows that at least 80% of clinicians agreed (strongly or slightly) better access to healthcare information could improve the way they provided health services. This belief is further supported by the view of three-quarters (74%) of ICT decision-makers, who agreed that improving their organisations use of ICT was a priority.

The main drivers for investments in electronic systems and applications were reduction in paperwork or manual processing, workflow benefits, and improved access to patient information. These factors were closely followed by savings and revenue increase, and the need for more information to support decision-making.

**Improving electronic access**—There was general agreement on the most significant opportunities for improved electronic access and sharing of health information. The top four clinical priorities were: diagnostic test results, referrals, discharge summaries and medication information (refer to Figures 2 and 3). These priorities are not necessarily ranked in this order when broken down to represent ‘sending’ and ‘accessing’ priorities, for example clinicians were more interested in accessing diagnostic test results than sending them.

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**Figure 2. Summary of clinician interest in accessing information electronically**

These differences are generally due to variations in the role and function of the organisations involved, e.g. some GP practices provide blood testing services.

The barriers to sharing information are not just technical, but depend on clinical relationships and inter-organisational business processes. There are significant differences between the ‘sending’ figures for DHB and non-DHB clinicians, which could be attributed to the different health practitioners’ roles or information requirements. For example, because GPs often repeatedly see the same patients, they typically have access to the patients’ treatment history prior to a consultation. Hospital clinicians however, often need to assess and diagnose patients without the benefit of easy access to their treatment background.
Clinicians consistently agreed (67 to 77%) that accessing diagnostic test results was a top priority. The aged-care, DHB clinician and GP segments had the highest levels of interest in accessing this type of information electronically. As previously stated, most clinicians rated the importance of sending diagnostic test results significantly lower (18 to 28%), with the exception of DHB clinicians (51%) who see ‘sharing’ as significantly important. A strong interest in accessing additional and related patient test information from other organisations was provided as the reason for a greater demand than supply interest in the pathology/laboratory segment.

Clinicians across the board had a high interest in accessing patient referrals (53% to 71%), particularly secondary providers, including DHB clinicians (71%) and specialists (61%) (refer to Figure 3).

Sending patient referrals was of almost equally high priority (46% to 54%), with DHB clinicians (62%) again rating sending as more important than the other clinician groups.

DHB clinicians again see the importance of both accessing (74%) and sending (67%), or ‘sharing’, discharge summaries. Aged-care clinicians also rated both sending (71%) and receiving (76%) as important, and were the most likely to have agreed that sending discharge summaries is important. More than half of GPs (65%) want to access discharge summaries, and a significant number say they want to be able to send them (29%). American research suggests this priority reflects the impact that delayed or incomplete discharge communications can have on the safety and quality of follow-up care management.

All clinicians had a very high interest in accessing patient medication information. Between 68% and 77% of clinicians agreed that accessing was a priority, compared with a significant variation of interest in sending (20% to 56%).

DHB clinicians were a quarter (27%) less interested in sending medication information than accessing it. Most other segments were, on average, half as interested in sending as accessing.
Potential benefits from ICT—Research respondents thought the improved use of ICT would result in an improved quality of care. Specific potential benefits identified were better care coordination, workflow efficiencies, increased professional knowledge, and improved decision-making through availability of timely clinical information.

The research shows all segments surveyed had a strong desire for improved electronic connectivity and exchange of information.

With the exception of ‘reduced hospital admissions’, more than 60% of clinicians agreed the outcomes listed in Figure 4 could be enabled by ICT.

**Figure 4. Summary of potential for electronic access to deliver benefits**

Clinicians rated the top five benefits enabled by ICT as:

- Improved coordination between healthcare providers.
- Improved quality of care.
- Time efficiency.
- Improved clinical processes.
- Better access to patient information in remote areas.

Non-DHB clinicians who identified significant problems finding the information electronically were more likely to agree that reduced hospital admissions were a benefit. This suggests that improved access to electronic information could have a positive impact on the effectiveness of primary healthcare provision and reduce demand on hospitals.
Challenges to realising improved information exchange—While the overall research indicates there is widespread support for improving health ICT, it also demonstrates that a lack of compatible systems and applications, as well as a need for funding, are seen as barriers to progress.

Incompatible systems—The quantitative research respondents identified that “lack of compatible patient management systems” was the most significant barrier to electronically accessing medical or healthcare information from other organisations (refer to Figure 5). This selection of “patient management system” in the quantitative questionnaire most likely reflects a wide interpretation of “patient management system” as relating to IT systems used in the management of patient care. The health-sector research findings show both DHB clinicians (84%) and non-DHB clinicians (71%) indicated that this aspect was the most significant barrier to accessing information electronically from other organisations.

Figure 5. Summary of barriers to electronic access to information

Inadequate funding and resources—The quantitative research findings identify a view that inadequate funding or resources as one of the top four barriers to accessing information electronically (refer to Figure 5). A majority (83%) of DHB clinicians and two-thirds (67%) of non-DHB clinicians believed inadequate funding or resources was a significant issue.

Concerns about privacy and security—Privacy and security issues were also identified by the quantitative research as one of the top four barriers to accessing information electronically, with three-quarters (75%) of DHB clinicians and almost
three-quarters (70%) of non-DHB clinicians having agreed that it is a significant barrier (refer to Figure 5). A substantial proportion of non-DHB clinicians communicated with patients by email, including half (52%) of those who cited privacy and security as a barrier.

The qualitative research identified the main concerns regarding security and privacy as:

- Patient consent;
- Deciding who has access;
- Deciding how much patient information should be accessible; and
- Confidence in the ability to transfer information securely.

**Need for support**—Limited support or direction from other areas of the health sector also emerged as a barrier to accessing information electronically (refer to Figure 5). Clinicians agreed that DHBs, other healthcare providers, and the Ministry of Health had not provided support to the level required. Most non-DHB clinicians (94%) who identified lack of support from the Ministry said lack of support from DHBs was also a barrier.

Just under half of non-DHB clinicians (49%) and DHB clinicians (42%) agreed insufficient support from other health providers was a barrier to accessing information electronically. DHB clinicians were also more concerned about lack of management support (54%) compared with non-DHB clinicians (39%).

**The way forward**—The sharing of electronic information is currently dependent on the interoperability and integration of the various systems and databases used to store healthcare information by different provider organisations, including primary and secondary, public and independent.

There is wide agreement that improving the interoperability and integration of health provider systems and databases has the potential to create significant flow-on benefits for the health sector. These benefits include improved access to health services, increased quality of care, and reduced costs. In the United States a computer model was created to project the impact of IT enabled disease management on diabetes care processes. This modelling projected savings of $US16.9 billion over 10 years from the use of integrated provider-patient systems for diabetes care.

The need to involve vendors, health agencies and clinical groups in agreeing common approaches to interoperability has led to the increasing membership of organisations focussed on finding common solutions to these issues, such as IHE (Integrating the Healthcare Enterprise) which has more than 300 member organisations worldwide.

It is generally accepted that there are steps or levels of health system interoperability. These range from mail and telephone to an ideal state where all systems exchange information electronically using the same formats and vocabularies. Achieving this state across multiple organisations requires organising standards into a set of unified specifications or ‘profiles’ that allow meaningful health information to be shared.
The research suggests that the greatest potential for ICT in the health sector is in improving the capability for specific types of health providers to electronically access and share:

- Diagnostic tests results.
- Patient referrals.
- Discharge summaries.
- Medication information.

The research shows that health providers believed improving capability in these key areas will require leadership from the Ministry of Health and DHBs to drive a coordinated approach to addressing system incompatibility issues. The research also implies that if additional costs are involved in improving system interoperability then funds need to be made available—additional to capitation or fee-for-service types of payment arrangements.

Even with funding available, the implementation of health ICT to facilitate health information ‘liquidity’ will take time. The research shows there is a substantial time delay between health provider organisations making the decision to change and actually implementing the necessary changes.

In addition to the implementation of the new ICT capability, updated process and procedures to utilise the additional capability are required and must be integrated into each organisation involved.

The health sector also wants more guidance and support on how to appropriately deal with patient-identifiable information if the flow of electronic health information is to be improved significantly. The research indicates the issue is not so much the lack of legislation or regulation, but the need for a wider understanding on what is appropriate to share and what controls should be applied.

The research shows that there is significant scope and an overall willingness from health providers to implement health ICT initiatives to improve information sharing in the sector. Clinicians and ICT decision-makers surveyed showed a belief that improving electronic information flows presented significant potential to support a better quality of healthcare to New Zealanders.

There was general agreement by all segments on the barriers that need to be overcome and that the benefits are significant. Making the priority areas of information available when and where they are needed will require a co-ordinated approach across the health sector involving funders, providers, vendors, decision-makers and clinicians. Involving clinicians in the planning of health care and enabling them to make decisions at the closest point of contact with the patient are important New Zealand Government priorities.

While technology has provided us with a range of powerful tools which can enable health information ‘liquidity’, the challenge for all clinicians, health-providers, and government organisations is to employ these tools collaboratively in order to build a better health sector for the benefit of all New Zealanders.
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Author information: Ross McKenna, Portfolio Manager, Health System Infrastructure, National Health Board Business Unit, Ministry of Health, Wellington

Correspondence: Ross McKenna, Portfolio Manager, Health System Infrastructure, National Health Board Business Unit, Ministry of Health, 133 Molesworth St, PO Box 5013, Wellington, New Zealand. Email: ross_mckenna@moh.govt.nz

References and endnotes:

1. The Health Sector Research was commissioned by the Ministry of Health and included both qualitative and quantitative Research. The findings from the research were sourced from both Ministry of Health’s Connected Health: A Qualitative Study. Wellington: UMR Research Limited, July 2008 and Ministry of Health. Connected Health: A Quantitative Study. Wellington. UMR Research Limited, April 2009.


4. Gorman P, Helfand M. Information Seeking in Primary Care: How Physicians Choose Which Clinical Questions to Pursue and Which to Leave Unanswered. Medical Decision Making, 1995;15;113


7. These segments were identified by the New Zealand Ministry of Health, and can be found in: Ministry of Health. Connected Health Market Segmentation, version 3.5. Wellington: Ministry of Health, July 2008.


10. All Qualitative information included in this research paper was sourced from the New Zealand Ministry of Health’s Connected Health: A Qualitative Study. Wellington: UMR Research Limited, July 2008.

11. As defined by UMR Research as being recognised as leading opinion within the New Zealand Health Sector.


13. “DHB Clinicians” are classified in the research as clinicians who were employed directly by District Health Board (DHB) care providers, and “non-DHB Clinicians” are those clinicians who were employed by organisations other than DHBs, for example primary and secondary health care providers such as private hospitals. “ICT Decision-makers” are representatives of health provider organisations, other than DHBs, responsible for making decisions about ICT investment and implementation.


15. Please note that multiple ICT Decision-makers selected more than one option to define the type of organisation they worked for.

17. The Ministry of Health Quantitative research findings showed that there is widespread electronic connectivity and availability of ICT in the New Zealand Health Sector.


27. See: [http://www.ihe.net/governance/member_organizations.cfm](http://www.ihe.net/governance/member_organizations.cfm) for a list of IHE member organisations

