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Electronic Medical Record Adoption in New Zealand Primary Care Physician Offices

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ABSTRACT: Compared with other developed nations, New Zealand's use of information technology (IT) in health care is among the highest in the world. All of the country's 1,100 general practices use an electronic medical record system with comprehensive functionality to manage patient's problem lists, enter clinical progress notes, perform electronic prescribing, and order laboratory tests and x-rays, among other tasks. Physicians are also increasingly using information technology to communicate with patients and allow them to schedule appointments. New Zealand also stands out in terms of interoperability, with primary care providers, hospitals, radiology providers, and pathology laboratories, as well as most specialists able to use standard messaging to communicate with each other. This issue brief describes New Zealand's primary health care system, discusses its successes and challenges in adopting and promoting health IT, and draws lessons for the United States.

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INTRODUCTION

New Zealand has one of the world's most highly automated primary care systems. All of New Zealand's 1,100 general practices use an electronic medical record (EMR) system and the services of a health system integrator (HSI), a specialized information technology company that has expertise in integrating and supporting electronic clinical messaging, online communications, and security systems to facilitate and support communications with other parts of the health sector.[1] Primary care doctors have

New Zealand Primary Care Practices Have Advanced Information Technology Capacity

- All New Zealand general practitioners (GPs) use electronic medical records.
- All GPs have the capacity to:
  - print medication prescriptions;
  - manage medication lists;
  - receive alerts for potential adverse drug interactions;
  - generate problem lists;
  - enter clinical progress notes;
  - perform clinical messaging;
  - issue automatic preventive reminders;
  - access external decision support programs; and
  - access patients' medical records from outside the office.
- GPs receive rapid automated status messages (detailing hospital visits or admissions, receipt of referrals, or other clinical updates) and electronic discharge summaries for each patient.
- GPs communicate with national registries (e.g., immunization databases) and report quality indicators electronically.

comprehensive EMRs with broad functionality to manage the patient's problem list, electronically enter clinical progress notes, perform electronic prescribing, manage medication lists, order laboratory tests and x-rays, manage diagnostic test results, automatically issue preventive reminders, and access external clinical decision support programs. Primary care practices are also increasingly using information technology (IT) to communicate with patients and allow them to schedule appointments. New Zealand has outpaced most other countries on interoperability—approximately 50 million items of clinical and administrative information are exchanged annually between general practices and specialists, hospitals, and emergency departments. All claims processing between general practices and the government occurs electronically. National policy and standards, financial incentives, active encouragement of private sector involvement, a health system integrator, a unique patient identifier, and robust privacy laws have all combined to create an environment that supports IT uptake and innovation. This case study examines the reasons behind New Zealand's primary care health sector success in making the transition to the information age and looks at the challenges, costs, and benefits to provide lessons for other countries.

COUNTRY CONTEXT

In the early 1990s, the New Zealand health system underwent radical reform, aimed at reducing the overall cost of health care and slowing cost growth. Prior to the reforms, general practice was funded on a fee-for-service basis with direct subsidization for low-income patients. Primary care had no network or support model and each general practice operated on a stand-alone basis with no support infrastructure. There were few, if any, quality measurements or explicit standards. A core component of the reforms was the 2001 New Zealand Primary Healthcare Strategy, an explicit effort to transfer public health care funding away from fee-for-service subsidies and hospital treatment into population-based funding paid to practices, wellness programs, health promotion, and long-term condition management services, and to allocate funding based on the needs of local communities. Today, 50 percent of New Zealand's public health care expenditure is channeled through primary care.

New Zealand is served by 21 geographically defined district health boards (DHBs), each of which runs and maintains one or more public hospitals and various public health services. Primary health organizations (PHOs), funded by the DHBs, but

New Zealand Primary Care Privacy Laws and Data Protection

- The National Health Information Privacy Code limits use of personally identifiable data and requires patient consent to obtain and share such information.
- Health care providers can share information as they see fit; patients can ask providers not to share information. Notices about information-sharing are prominently displayed in general practices and hospitals and the concept is widely understood by patients.
- A National Health Index (NHI) number was introduced in 1992 and is assigned to all patients for use in claims, referrals, pathology requests, and prescriptions. Use of NHI numbers for non-health-related purposes is prohibited by law.

administered by cooperatives of general practitioners (GPs), are the local structures for implementing the national strategy. Primary care is funded on a combined capitation and fee-for-service basis; 95 percent of the population is enrolled with one of 81 PHOs. PHOs receive government funding for health promotion activities and chronic care management. Low-income patients, children, and individuals who require a high volume of services receive subsidized primary care and prescription drugs. In most larger urban centers, PHOs and practices are supported by independent practitioner associations (IPAs), groups that support multiple PHOs and contract with the government to provide regional services.

New Zealand has approximately 2,600 GPs, operating from 1,100 practices, most of which are privately owned. About 15 percent of New Zealand primary care physicians work alone. A typical primary care physician has 1,500 patients up to a maximum of 3,000, with office visits lasting 12 to 15 minutes. Annual income for New Zealand primary care physicians is about NZ$160,000, about US$115,000. This has risen by more than 50 percent over the past five years as a result of increased funding and because of gains made from improved system effectiveness and practice efficiency.[2]

New Zealand's universal coverage health system is financed predominantly through general taxation. Public hospital outpatient and inpatient services are free. There is cost-sharing, however, for most people for primary health care, as well as copayments for pharmaceuticals. Health services are delivered by a mix of public and private providers. Public hospitals are generally used for acute and emergency care, with a small number of private hospitals providing elective surgery and renting their facilities to private specialists. Despite having one of the lowest levels of health care expenditure per capita of Organization for Economic Cooperation and Development countries, New Zealand performs well in international comparisons, such as those conducted by The Commonwealth Fund.[3,4]

HISTORY AND EVOLUTION OF COMPUTING IN NEW ZEALAND PRIMARY CARE PHYSICIAN OFFICES

During the 1980s, a number of GPs had experimented with computer systems within their practices and by the early 1990s some had developed their own computer systems and left general practice to focus upon developing them further. They joined other fledgling EMR system vendors and specialized IT companies selling decision-support systems and chronic care management systems to create a dynamic and highly competitive niche market. By 1993, approximately 30 percent of general practices had computer systems, although fewer than 10 percent were attempting to store clinical information.[5]

Creating an infrastructure: patient identifier, privacy rules, and the role of the private sector

In 1992, New Zealand's director–general of health appointed a deputy director–general for health information who implemented a number of key strategies. These included creating a national health index (NHI), which

provided the sector with a unique individual patient identifier; and implementing a health information privacy code. Additionally, the government actively encouraged the private sector to develop and sell electronic services. These three strategies combined very effectively to support the development of New Zealand's health IT infrastructure.[6]

Data protection legislation and unique patient identifier

Since 1993, New Zealand has had a health information privacy code, a special amendment to the New Zealand Privacy Act. The code is widely understood throughout the sector; as a consequence there is a high level of awareness of the importance of individuals' privacy. The code limits the reuse of personally identifiable data and mandates obtaining individuals' agreement (whether implied or explicit) for retrieving and sharing personally identifiable health information. The code has played a significant role in shaping the development of New Zealand's health information landscape. A privacy commissioner acts as a complaints authority to enforce the code.

Also since 1993, New Zealand has given each citizen (and visitor) a NHI number, which acts as a unique health identifier. The NHI number is now universally used and it is required on all claims, referrals, pathology requests, and prescriptions. Privacy legislation prohibits the NHI number from being used for non-health-related purposes. Using the NHI, all data—not matter where it is stored—is accurately linked to a patient. Typically however, very little data is aggregated. It is retained at the source and then accessed on an as-needed basis.

The richest source of information is the primary care provider's EMR, which has a comprehensive record of all GP-related communications plus all patient interactions (e.g., test results, specialist results, hospital discharge information), which can be shared with other providers on an as-needed basis. The NHI is crucial in enabling the creation of an information-rich environment. In some regions of New Zealand, GPs are given secure online access to their local hospitals and nursing homes, enabling them to track and observe their own patients' care.

HealthLink, a health system integrator

In 1993, the New Zealand Ministry of Health approved the formation of four value-added networks (VANs) (A value-added network is the pre-Internet term for a private communications network that is used by a number of organizations in an industry group.) Among these was HealthLink, then a division of Telecom New Zealand. HealthLink's approach differed from the other three VAN services in that it developed services targeted at primary care rather than the hospital sector.

In 1993 HealthLink introduced pathology result reporting, which was seen as a major boon by the 10 percent of general practices that were attempting to store clinical information electronically at that time. This feature encouraged many additional GPs to purchase EMR systems.[7] In 1995, HealthLink was purchased from Telecom New Zealand by a group of the company's staff. Encouraged by the success of its initial applications, HealthLink began working with groups around the sector to develop further services, with an immediate focus on developing electronic discharge letters and specialist reports. Over the following decade, the organization worked with health care providers to develop and establish electronic transfer of all outbound hospital correspondence and communications between GPs, specialists, and ancillary care providers. New Zealand became the first country in the world to use HL7-based (i.e., an internationally recognized health IT standard) messaging for delivery of pathology and radiology information to general practices and for referrals and discharge summaries on a widespread basis.[8]

The arrival of the Internet posed challenges. While it significantly improved the quality of communication technology available, it also had a potentially disruptive effect upon parties providing VAN services. The arrival of the Internet also created security risks and prompted a wider understanding of the importance of health information privacy. HealthLink redeveloped its software to connect its messaging services via any Internet connection. Public key infrastructure (i.e., digital signatures) became widely used to authenticate users.

Health System Integrators

A health system integrator (HSI) is a specialized information technology company with expertise in integrating and supporting messaging, online communications, and security systems.

Potential benefits of encouraging formation and development of health system integrators include:

- concentrating specialized expertise to solve a series of complex and demanding issues;
- the ability to demand an explicit contractual commitment to use precise technical standards and external governance;
- achieving better quality management of high-risk activities, such as health information exchange and interoperability, thereby minimizing risk and providing reassurance to patients and health professionals;
- encouraging and rewarding the private sector to invest in complex, expensive information technology architecture, and thereby reducing government's own investment risk;
- creating pragmatic solutions driven by market forces; and
- exploring the potential to create a competitive environment, thereby driving innovation and user adoption without necessitating direct investment.

HealthLink, for example, provides electronic communications and data security services to health care organizations across New Zealand, Australia, and the Pacific. With 70 staff members, the organization provides commercial health information exchange services enabling the delivery of more than 60 million items of clinical information annually. It also provides technical support for a wide range of New Zealand government-owned and operated data facilities and health management programs.

In 1996, HealthLink began working with government agencies to develop an electronic system for claims processing and introduced it to 30 percent of general practices within the first year of operation. Two years later, 70 percent of New Zealand practices were submitting claims electronically and government established incentives to encourage uptake of electronic claims.[9] In the same year, the government adopted new standards for secure communication among health providers, called the "health intranet," now renamed the "Health Network." This standard has had varied success and is mostly used for hospital-to-hospital communications. Some health agencies provide online services to GPs using this standard, with about 60 percent of GPs electing to access the Internet using the Health Network security structure.[10]

The majority of electronic communications within the New Zealand health sector are conducted via HealthLink, over its Health Network and over the Internet (for those organizations that do not have a Health Network connection). The company provides a support desk and implementation service as well as a software team to design and develop new services.

Driving forces to automation: financial incentives, compulsory claims, and patient registers

The movement in the early 1990s toward a primary care–led health system was accompanied by a similar movement toward electronic medical records. In 1998, the government gave general practices in several regions a one-time grant of approximately NZ$5,000 (US$3,600) to purchase computers. At the same time, it notified GPs that it would make electronic claims compulsory within two years. By 2000, more than 98 percent of GPs used a computerized billing and appointment system and more than 50 percent used a computer system for capturing clinical information during patient consultations.[11] Today, 100 percent of GPs have a computerized system and 92 percent have advanced clinical functionality.[12]

A further catalyst for change was the government's requirement to submit patient disease information to registers and to file fee-for-service claims

electronically in order to receive subsidies, combined with financial incentives for primary care. One example of a patient register is the national child immunization register, developed and deployed nationally in 2005, initially in response to an epidemic of meningitis. National diabetes management programs and regional hepatitis B screening programs have likewise played a key role in funding infrastructure and implementation of both registry and EMR functionality. As GPs were mandated to participate and adopt new software, these registry programs spurred EMR capacity in GP offices and EMR vendors were funded to build interfaces to these systems. These functions were all necessary in day-to-day practice and combined to make EMRs an essential "tool of the trade."

Professional colleges and associations

There are several professional bodies in New Zealand that represent general practice, including the Royal New Zealand College of General Practice (RNZCGP), the New Zealand Medical Association, and the New Zealand Independent Practitioners' Association Council (IPAC), who work together under an umbrella group known as the GP Leaders Forum. Each of these organizations has a strong interest in IT, but none is specifically focused on it. IPAC has had the greatest involvement in IT because of the pivotal role it has played in enabling primary health care organizations to perform effectively.[13] The government and non-governmental health sector organizations consult with these organizations on their views of any forthcoming IT initiative.

From the outset of the 1992 health reforms, the independent practitioner associations (IPAs) were set up in collaborations between regional groups of general practices and government. Their intended role was to provide support services and leadership for general practices. Throughout their existence, the IPAs have been instrumental in developing and extending the use of information technology within general practice. IPAs also provide technical computer support to GPs on a regular and as-needed basis. However, unlike the Danish system, there is no formal forum through which GPs can share experiences and learn from each other, although organizations such as IPAC and RNZCGP do have IT subgroups.

Approximately 100 health IT vendors have formed an industry association known as the Health IT Cluster. The cluster provides a useful forum for vendors and a consultation mechanism for government to liaise with when setting policy.

Role of PHOs and IPAs in change management

In New Zealand, the primary health organizations and independent practitioner associations have played a key role in assisting practices with automation. These organizations have dedicated IT staff and clinical staff with IT training who work with EMR vendors and practices to develop and implement systems to assist with management of health care initiatives. Operating on a competitive basis, the IPAs used new funding sources, specifically the sale of IT-based services and systems, which they have sold across Australia, New Zealand, and Canada. This activity enabled some IPAs to develop relatively sophisticated and well-funded IT initiatives that depended on IT, such as electronic clinical decision support for the management of cardiovascular disease and diabetes.[14] These initiatives were very popular and further encouraged GPs to invest in information technology.[15]

INVESTMENT IN HEALTH IT

Most health IT investment has been provided by the government via its central agencies, 21 regionally based district health boards, and occasionally via targeted payments to PHOs. The Ministry of Health's Information Directorate controls an annual budget of approximately US$65 million, from which it runs a number of central systems and administers the standards process. The central government has made core investments into standards development, privacy and security frameworks, infrastructure such as the national health index, and associated systems.

As noted earlier, in 1998, the government gave many general practices a one-time grant of approximately US$3,600 per GP to purchase computers. This relatively simple incentive program had a profound effect on

automation. GPs wanted to ensure they met the deadline to make claims electronically—or face not being paid. In response to strong demand for claims-capable EMR systems, the EMR vendor community worked together with general practices and government to automate the sector. The availability of information exchange services acted as another catalyst to boost uptake, mainly because it made it possible for general practices to transition to a completely paperless record system.

New Zealand's general practices are privately owned organizations, which purchase and maintain their own EMR systems and hardware infrastructures. They purchase various electronic services, including technical support services. The government pays HealthLink for the services it uses to communicate with GPs. Other HealthLink services are paid for by the health care providers that use them (e.g., labs, hospitals, and general practices). Fees are calculated on a "user pays" basis.

Typically, New Zealand spends approximately NZ$300 million annually on health care IT.[16] Of that, approximately NZ$40 million is spent on primary care and the remainder is evenly split between central systems (i.e., national systems, including claims and provider payment systems and patient registries) and the DHBs, which operate the vast majority of hospitals (except a small number of private hospitals performing elective surgeries). New Zealand is currently spending NZ$100 million overhauling its national payment systems, which oversee payment of more than NZ$5 billion annually to health care providers. A typical general practice with three full-time GPs will spend NZ$25,000 per year on IT, including rental of practice management software, general purpose software, hardware, communications services, and technical support and maintenance. Further investment is made by the IPAs and PHOs to provide regional support systems—this amount is estimated at NZ$20 million, which comes directly from the practices' operating budgets.

Most health care organizations, including general practices, specialist practices, PHOs, and all private hospitals, are expected to fund their HIT investment out of their operating budgets, while conforming with national guidelines and standards. This approach has the benefit of placing the investment decisions in the hands of organizations that use the systems purchased. It is not uncommon for a medium-to-large medical practice to spend US$25,000 to $50,000 to upgrade their practice's hardware and local area network infrastructure. A recent sectorwide survey of health care providers found that nearly half of the health care organizations surveyed stated they had made significant investments in information and communication technology infrastructure during the previous six months.[17] Slightly more than one-third said they had made significant investments in software applications over the same period.

NATIONAL STANDARDS AND VENDOR CERTIFICATION

National standards

New Zealand has used key national standards to good effect since 1993, when the HL7 data communications exchange standards and the British Read primary care coding system were both selected by the Ministry of Health. As a result of these sound choices and minimal supporting investment, parties throughout the sector adopted these standards and largely funded their own use of them. By 2000, New Zealand had achieved nearly 100 percent use of HL7 messaging by primary care.[18] Today, all hospital discharge summaries and a very large number of GP-to-specialist interactions are electronic and use the HL7 standard.

In New Zealand, standards are set by the New Zealand Health Information Standards Organisation (HISO), a sectorwide standards development secretariat under the auspices of the New Zealand Ministry of Health. Prioritization and governance of the standards process was until recently provided by the Health Information Strategy Advisory Committee, a body established in 2006 to provide governance, oversight, and leadership for the implementation of New Zealand's health information strategy. HISO's role includes appointing chairs for standards committees and recruiting members, convening and organizing meetings, and facilitating the consultation

and balloting process. Typically, HISO works with a consortium of vendors and their customers to develop suites of standards required for the execution of specific projects or development of services. HISO also works with the Australian National e-Health Transition Agency and other regional and international standards bodies to ensure consistency with international developments and activities. New Zealand is one of nine charter member countries of the International Health Terminology Standards Development Organization that has purchased the Systematized Nomenclature of Medicine–Clinical Terms (SNOMED CT) coding terminology, expected to be a cornerstone standard within New Zealand.

Certification of Vendor Systems

The Auckland University Health Informatics Faculty is establishing a test facility that will work collaboratively with HealthLink and other parties to provide interoperability testing and accreditation. There are approximately 20 vendors whose products range from physician office systems to specialized systems for physiotherapists, laboratories, and radiology service providers. There are five vendors providing physician office systems for primary care. Of these, one has a dominant market share of 80 percent.[19]

THE CURRENT EMR ENVIRONMENT

Status of EMRs

All of New Zealand's primary care providers, hospitals, radiology providers, and pathology laboratories, as well as most specialists and midwives use HL7 messaging to communicate with each other via standard Internet connections or a secure virtual private network. The messages transmitted include pathology and radiology results, referrals, discharge summaries, specialists' letters, electronic claims for services performed, and status messages sent to patient databases. It is relatively commonplace for a New Zealand general practice to be regularly sending and receiving electronic clinical messages with 50 to 60 other organizations. With the exception of prescription messages, which are in the process of being automated, in most parts of the country, nearly all clinical communication is electronic.

Electronic delivery of pathology results to the patient's EMR was a major productivity boost for New Zealand practices and stimulated the uptake of EMRs. Since then, delivery of electronic discharge summaries and specialist letters has removed a bundle of paper-based communications. Now, information sent from a hospital, after-hours clinic, or specialist will generally arrive in the patient's EMR in his or her GP's office within two hours.

Since 2000, when New Zealand achieved 99.9 percent EMR uptake, clinical messages exchange has shown 34 percent compound annual growth (from 300,000 messages per month to 4,500,000 messages per month) and the use of EMR systems with advanced clinical functionality has increased from 50 percent to 92 percent.[20]

A recent Commonwealth Fund study[21] of 11 countries revealed that 92 percent of New Zealand patients are sent reminder notices when it is time for regular preventive or follow-up care—a figure substantially higher than in most other countries, which were in the range of 3 percent to 48 percent. New Zealanders also had the highest percentage (over 96%) of providers maintaining electronic lists of patients who are due or overdue for tests or preventive care; lists of all medications taken by an individual patient, including those prescribed by other doctors; and lists of patients by diagnosis. Not surprising, New Zealand also rated highest among the countries in terms of the electronic information functions used.[22]

The universal uptake of EMRs in primary care has encouraged the development of new IT services, thus stimulating further investment in practice automation.

Online forms and data exchange

Each of New Zealand's public and private hospitals has a well-developed patient management system linked to a range of specialized hospital clinical systems, via a patient portal. New Zealand's hospitals all have highly functional clinical portals, linking the systems within hospitals like

admissions, emergency department, laboratory, radiology, and pathology, and allowing external parties to communicate with the hospitals using both electronic messaging and online services. GPs can receive electronic discharge summaries and patient status reports automatically from the hospitals. In some regions, GPs are also given secure access to hospital systems, which allows them to gain access to information about their patients' health status and progress. There are no financial incentives nor any requirements for hospitals to send primary care doctors reports or discharge summaries. Hospitals do it because it enables them to work more closely with their referrers, which creates efficiencies and cost-savings for all involved.

Use of electronic referrals between general practices and hospitals is proving highly useful and is growing rapidly.[23] Several regions have systems where hospitals publish referral forms that can be downloaded and automatically populated by EMR software before transmission to the hospital as HL7 messages. The incoming referrals are then automatically loaded into the hospital's patient management system. Key benefits include: efficiency for referring GPs in terms of transfer of care, automated acknowledgement of the referral receipt, and the automatic insertion of the referral into the hospital's information system. These benefits translate into a streamlined transfer-of-care process and are generating widespread uptake.[24]

New Zealand is currently exploring the possibility of allowing a hospital emergency physician to instantly locate and a patient's primary care record and request information at any time of day or night.

Prescriptions

Efforts to automate the flow and management of prescriptions are at an early stage, with delays in identifying a suitable pharmaceutical coding system slowing progress. Collaboration with the Australian government to create a regionally accepted coding system is now moving forward.

Expanding Internet use and real-time messaging

More than 80 percent of New Zealand's general practices are using Internet technology and real-time messaging services.[25] Internet access is used, for example, to gain authorization to prescribe a "non-schedule" pharmaceutical product. The government's central drug purchasing authority, called Pharmac, tightly controls which pharmaceuticals are subsidized. Approval to get a subsidy for a nonauthorized medicine was previously a cumbersome and time-consuming process, often involving a 10-day delay and faxing and mailing forms. Using Web services and synchronous HL7 communications with Pharmac's approval system, this is now a 20-second process. A number of other online services are being made available to GPs using this technology.

The advent of online inquiries and Web services based on real-time messaging increases clinicians' expectations for instantaneous access to information and puts pressure on the sector to develop services for increased automation. Physician demand has had a very positive effect on innovation.

Patient and doctors' access to shared clinical EMR data

At this time, it is unlikely that New Zealand will centralize its patient data in regional repositories or portals. While there are proponents of centralized data repositories and regional sharing of EMRs, there is strong grassroots support for linking EMRs to GP health records and making GPs stewards of their patients' personal health information. Under this scenario, patients could access their medical records and consult with GPs using their home computers. New Zealand takes a very conservative approach to the sharing of personal health information. It is likely that any move to liberalize clinical information-sharing will be made extremely slowly and only after lengthy and vigorous debate. Incremental changes are taking place towards linked EMRs and patient access without much concern or interest from the public, which has a generally high level of trust in the system.

There is, however, experimental work under way to develop patient portals that allow patients to access

some of their EMR data and to communicate with GPs. Using a patient portal, the patient can view a simplified version of their record, view diagnostic test results, ask their GP questions, and request appointments. Further enhancements are planned. Apart from this experimental work, no one else has electronic access to the EMR.

Specialists, hospitals, and emergency care facilities will soon be able to gain electronic access to information held within the GP EMR by sending a structured request to the EMR, accompanied via an electronic signature. This capability is currently under development for use on a trial basis. Using an approach currently under consideration, a health care provider looking for a patient's EMR information may request it from the patient's GP or from any pathology, radiology, or hospital service the patient has visited in the recent past. Using an NHI number helps to guarantee that the right patient's data is acquired. Use of communications standards (HL7 messaging, public key infrastructure security, and Web services) means that any relevant patient information gathered can be automatically inserted into the enquirer's EMR. Information requests will be authenticated via use of an individual practitioner's electronic signature and each information source will be responsible for auditing who has accessed their systems.

NEXT STEPS

Compared with most developed countries, New Zealand's use of IT in health care is among the highest in the world, especially by primary care providers.[26] The next challenge is for information collected by providers to be shared, communicated, and made more easily accessible to other providers and patients. New Zealand's Health Information Strategy, now almost five years old, is clear on its preference for a distributed approach for the safe sharing and transfer of patient electronic health information using interoperability standards set by the Health Information Standards Organization.

There is a growing expectation that patients will have an increasing involvement in the management of their own health records. The most popular approach to achieving this is through an extension of the GP's EMR, enabling patients' access to a "patient-friendly" view of the EMR via the patient's home computer.

Having renewed its commitment to a distributed, interoperable EMR framework, New Zealand is now building on its existing clinical messaging systems to develop more advanced capabilities that will have widespread use across health system. Key objectives include developing systems that will increase patients' ability to manage their own health care and improving the coordination of long-term care for patients with chronic illnesses.

CRITICAL SUCCESS FACTORS IN NEW ZEALAND'S IMPLEMENTATION OF ELECTRONIC MEDICAL RECORDS

As the United States moves forward with its ambitious agenda to implement EMRs nationwide, there are useful lessons that may be drawn from the New Zealand experience. The U.S. should consider the following critical success factors:

- The clarity and purpose of the New Zealand government's overall health care policy, which charted a course toward a primary care–led health system, gave private sector organizations confidence to invest in the relevant technology and systems needed to support the primary care strategy.
- New Zealand has a long-established and universally used unique patient identifier, which is governed by a robust legal health information privacy code. This allows patients' data to be shared and accessed by providers across the system.
- Early on, New Zealand nurtured and supported a highly visible central unifying body or health system integrator, which operated as a national health information exchange and provided key technical services, including a support desk, implementation services, a software team designing and developing new electronic capabilities, and vender accreditation.
- Successful establishment of private–public partnerships allowed the New Zealand government to take advantage of the expertise and agility of the private sector while minimizing its own investment in technology.
- A nationally designated entity that provided governance and leadership for the implementation of New Zealand's health information strategy and that was charged with prioritization and governance of standards processes across health sectors was key to supporting health IT development.
- GPs in New Zealand were quick to embrace new technology when they saw an immediate benefit in personal and practice productivity. But financial incentives, compulsory electronic claim submission, and mandated immunization registers encouraged adoption.
- Adoption of EMRs was aided by providing GPs with technical support. This was made available via EMR vendors, HealthLink, primary health organizations, and independent practitioner associations.
- Another essential component to success in New Zealand has been the grassroots approach to health sector automation, included a relatively modest financial investment and a low-key and incremental approach to automation.
- The public's role was a critical influence. As far back as 1997, there was a general expectation by New Zealanders that GPs would use computers to record clinical details during appointments and maintain all patients' records.

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About the Authors

Denis J. Protti, FACMI, is a professor of health informatics at the University of Victoria and a visiting chair of health informatics at City University London. Professor Protti was the founding director of the University of Victoria's School of Health Information Science in 1981, a position he relinquished in 1994. Prior to joining the University he held executive positions in information systems in Manitoba and British Columbia hospitals. His research and areas of expertise include: national health information management and technology strategies, electronic health records, primary care computing, and evaluating clinical information systems. He was a founding member of COACH, Canada's health informatics organization, serving as its second president. He was also a founding member of the American Medical Informatics Association and one of the first non-Americans elected as a fellow of the American College of Medical Informatics.

Thomas (Tom) Bowden is chief executive officer of HealthLink Ltd, a New Zealand-based health-system integration company that he cofounded in 1993 under an agreement with the New Zealand Government. HealthLink provides electronic communications and data security services to more than 9,000 individual health care organizations across New Zealand, Australia, and the Pacific. HealthLink is currently leading an Australasian-wide initiative to implement electronic referrals between primary care providers and hospitals. Mr Bowden has been involved in a series of international health system comparisons and he has performed consulting assignments for government health care agencies in Australia, Canada, and Denmark.

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