

More Lessons to Be Learned About Primary Care Computing from Another Small Nation

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BACKGROUND TO NEW ZEALAND'S HEALTHCARE SYSTEM

In previous issues, we have been exposed to what the Danes have been able to accomplish with physician office computing and the electronic medical record (EMR). Here is another success story from another small country that has managed to maximize physician use of computers and the use of electronic medical records to improve the health status of its population.

New Zealand has a population of 4.3 million spread over 270,534 square kilometres – the majority centred in the cities (e.g., 1.2 million in Auckland). Seventy-four percent of the population is European (Pakeha), 14% is Maori, 6% is Polynesian, and 6% is Asian. There is a high incidence of diabetes in the Maori and Polynesian populations.

Everyone in New Zealand has a National Health Identifier (NHI). In the last four years, there has been a move to make use of the NHI mandatory for all healthcare providers and encounters; the Ministry of Health has been working on strategies to improve the integrity of the data and the ease with which it can be accessed by authorized stakeholders.

New Zealand spends 8% of its GDP on healthcare; funding is 78% public and 22% private. Within New Zealand's publicly funded

health system there are 21 District Health Boards (DHBs) – the agencies with primary responsibility for funding and providing services. Devolution of responsibility to DHBs is in progress, with services such as public health, disability and some nationwide services still remaining the responsibility of the Ministry of Health.

New Zealand has approximately 3,000 GPs (general practitioners or primary care physicians) working in approximately 1,000 practices. There are about 3,000 specialists, of whom approximately 1,000 work part-time in private practice (covered by insurance), mostly in the more populous regions. As in Canada, patients must be referred to specialists by their GP. In most regions there is reasonable access to primary healthcare, with 79% of all New Zealand adults having visited a GP in the previous year. However, 11% of the total population (approximately 405,000 people) needed to see a doctor but did not, with almost half citing cost as the reason why they or their children had not sought professional care.

The majority of GPs still operate on a fee-for-service basis; however, since 1994 there has been considerable effort to move toward population-based funding and capitation. This has resulted in an increased focus on improving

access to healthcare by those most in need, as well as on developing preventative health activities such as wellness programs. Specialists' income is entirely fee-for-service and paid for directly by the patient or through medical insurance coverage; they do receive some subsidies from Accident Compensation Corporation (ACC) – similar to Workers' Compensation in Canada – for statutory duties such as report writing and legal work.

Currently, an average GP patient load ranges between 1,200 and 2,200 patients. Some practices have successfully employed nurse practitioners to focus on screening and preventive work and thus freed up the GP's time to work on more critical or complex consultations. The average consult is 15 minutes but this can vary; considerable time can be spent after hours in non-contact work such as following up referrals to hospital.

There are approximately 7,600 registered nurses with expertise in primary healthcare. These nurses work within physician office settings and sometimes with other allied health workers such as physiotherapists. Primary healthcare nursing encompasses population health, health promotion, disease prevention, first-point-of-contact care, and disease management across the lifespan.

Adult patients pay \$50 NZD (\$40 CAD) for each visit to a GP. Those on a low income are entitled to a \$15 government subsidy. There are also subsidies or "reduced fees" depending on social circumstances to ensure the chronically ill have easy access to services. GP care for children under six years of age is subsidized completely by the government.

Since 1995, the majority of GPs have been working in collectives called IPAs (Independent Practitioner Associations). While many still have small clinics with only two to three practitioners, more than 84% of GPs are part of a larger network. In response to government funding, these networks have set up systems for innovative healthcare delivery to run specific projects to reach "at-risk" patient groups in their regions. They have, in some areas, included special salary packages to attract doctors to rural and remote areas where primary care coverage is limited.

These initiatives have resulted in new resources, including the provision of people to support the use of IT in general practice. One IPA developed its own EMR for its 220 GP members, although the EMR was later dropped in favour of one of the more common vendor products. Whilst it initially looked an attractive option, the IPA came to realize that system development was not its core business.

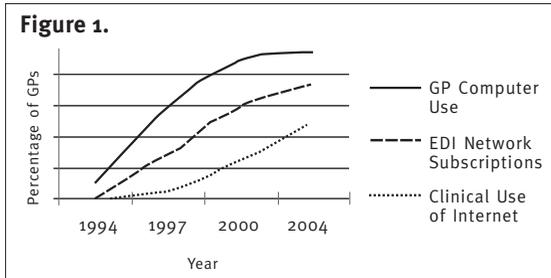
The New Zealand Ministry of Health is now funding the establishment of Primary Health Organizations (PHO) that will work within each District Health Board. The minimal set of requirements to become a PHO are: providing a set of population-based and essential first-line services; national enrolment to ensure patients access services through only one PHO at any point in time; and working with groups in a community that have specific cultural needs or poor health status to ensure their needs are met. More than one million New Zealanders were within a Primary Health Organization (PHO) as of April 2003, with about 700,000 of these able to access low-cost primary health services.

Private community laboratories and radiology clinics handle the majority of laboratory and diagnostic work for both GPs and specialists; only around 10% of lab and diagnostic work is still carried out by publicly funded labs, mainly in the more remote rural areas.

Computerization and Information-Sharing

In 1994, only 10% of GPs were using computers for clinical care, and GP Internet usage was non-existent.

Today, more than 95% of GP offices are computerized and using one of nine physician office EMRs or Practice Management Systems (PMS) commercially available in New Zealand (a few vendors have systems which are able to connect to the network). Almost 75% of GPs use their systems to electronically send and receive clinical messages such as laboratory results, radiology results, discharge letters, referrals, delivery of age-sex registers to their IPA/PHO as well as for electronic claiming information to the government accident insurance organization and general medical subsidy GMS reimbursements. GP Internet use has increased



considerably with around 50% now using the Internet on a regular basis from their offices, including communicating with their patients.

Specialists' use of computers ranges from 30–90% depending on their region. The private specialist (one who works in the private sector as opposed to a hospital – a considerable number due to the two-tiered funding arrangements in New Zealand) use of a full EMR is limited to 15–20%.

Like the Danes, GPs increasingly favour referring patients to specialists who are able to send information back to them electronically. Few offices are totally paperless as there are still paper documents coming in (e.g. consultation reports from non-computerized specialists or physiotherapists). A small number of practices scan such documents into their system.

Almost exclusively, a privately run company called HealthLink handles electronic message traffic and exchange in the New Zealand health sector.

HEALTHLINK – A VIRTUAL PRIVATE NETWORK FOR THE NEW ZEALAND HEALTH SECTOR

HealthLink (originally called Sector Net) was established in 1996, specifically to provide Electronic Data Interchange (EDI) services for the health sector in New Zealand. The ability to develop a service using standardized messages and providing a secure private network limited to the health sector was facilitated as a result of Orion Systems International (which partly owns HealthLink) expertise and its involvement in the early stages of HL7 development in New Zealand. The network was built using one of the early versions of a vendor EDI messaging toolkit that is now provided to more than 10,000 users worldwide. In its first stage, there were only two

laboratories and approximately 200 GPs using two physician office systems. Competition between community laboratories and increased market demand from the primary care sector (despite a low uptake in use of the Internet) drove HealthLink to establish an increasing range of messages.

Message standards have now been implemented in more than 40 computer systems, including seven Practice Management Systems (one running on Macintosh), three physiotherapy systems, five hospital systems, four laboratory systems, three radiology systems and three government funding agencies for claims handling.

HealthLink is used by 75% of all healthcare sector organizations in New Zealand. All hospitals, radiology clinics, private laboratories and about 1,800 general practices use HealthLink everyday. More than 600 specialists, physiotherapists and other allied health workers, including maternity providers, also utilize the network. More than three million messages a month are exchanged, or more than 95% of the total electronic communication in the primary health care sector.

Current HealthLink services include:

- Pathology and radiology results
- Referrals, status and discharge messages
- Status messages – updates sent by a hospital or secondary care organization based on a patient having been referred or admitted to the hospital (includes useful information such as ward admitted to, discharge time and waiting list priority)
- Disease management – delivery of tasks, results of screening, notification or alerts
- Transfer of age-sex registers
- Notifiable disease reporting
- Electronic prescribing and notification after dispensing (under development)
- Medical benefit claims
- Accident insurance claims
- Comprehensive range of messages and file formats (e.g., Flat File, HL7, XML)
- Secure online services such as: EDI Management (scheduler, volume, connection

statistics, message status, electronic acknowledgments), access in some regions to health-care provider directories, and online claiming applications

- Message translation (from one format to another if required)
- HealthLink support desk (toll-free 800 line staffed 24 hours, seven days a week); also contracted to handle all support calls for online real-time billing for healthcare providers claiming from the government-supplied accident insurance organization

HealthLink is the preferred supplier for Certification Authority services (digital certificate generation, distribution, installation, renewal, revocation and support) for the health sector.

The majority of subscribers currently access HealthLink services via dial-up (56K) modem. Users schedule their dial-ups to retrieve and send messages depending on the frequency that reports or data interchange is needed (e.g., five times a day). An increasing number are installing broadband/ADSL connections, which allow for an “always on” connection to HealthLink, and an exchange of messages in real time. All incoming transactions go into an inbox within the GP’s EMR. Once the provider has seen these, they are automatically filed into the patient’s EMR and become part of the patient’s longitudinal record.

To assure confidentiality, there is a formalized, secure transfer process. Once a message is delivered to the PMS, an electronic acknowledgment (ack) is generated automatically to the sending system. This is delivered either in real time or in the next dial-up. If an ack is not received within a certain period of time, the sending system (e.g., a lab) is alerted and takes steps to ensure the GP or recipient receives the result or message depending on which error message is sent back. HealthLink software enables data encryption and compression of files to ensure safety and maximize network efficiency.

HealthLink tests and certifies all Practice Management System vendor systems to ensure compliance with message standards. One FTE staff member, employed by HealthLink, is responsible for certification and providing advice to these

vendors. Vendors participate in the process of agreeing to message formats and standards.

Although a private company, HealthLink has in effect become the de facto national standards body. It works in collaboration with the Ministry of Health and other health sector stakeholders on new standards (e.g. LOINC, XML, electronic security).

Although most GPs generate prescriptions from their PMS, at this stage prescriptions are still delivered manually by the patient to the pharmacist – a process similar to what happens in the United Kingdom. The main reason HealthLink does not currently support electronic prescribing messages between physicians and pharmacies is a lack of broadband usage. For electronic transmission of prescriptions to be truly effective, connections need to be always on, both at the GP end and at the pharmacy. Current dial-up connections used by most GPs and pharmacists are not adequate. In addition, the issue of electronic signatures has yet to be resolved. A paper prescription is still required to be signed; until there is clear direction on this issue there is nothing to be gained by electronic transfer of prescriptions.

The New Zealand Ministry of Health acknowledges that moving to a more coordinated care approach to chronic disease management requires stakeholders to share a wide range of information. As a result, it has steadily supported and encouraged the adoption of computing technology. In October 2001, the Ministry published its WAVE plan (Working to Add Value through E-information). The plan has several recommendations on electronic healthcare that were based upon the success of early HealthLink implementations.

Unlike the Danish success story, HealthLink received no government funding to initiate the service. Its growth and success is based entirely on the market model of supply and demand. Future services currently in development include:

- Additional online services such as lab test ordering, access to National Provider Directory, bookings and referrals
- Allowing certain certificated healthcare users

to improve data integrity of the NHI through on-line updates to patient addresses

- Converting certain messages to XML – this will depend on the cooperation of the PMS vendors; some messages (e.g., lab and claims) may stay as they are for now, since “if it ain’t broke don’t mess with it” seems to be the *modus operandi* at the moment
- Ability to access via open Internet, wireless, satellite, frame relay and ADSL
- Full Linux, Mac, Windows and other OS platform support
- Creation of a vendor training facility.

HOW DID NEW ZEALAND GET TO WHERE IT IS TODAY?

While the HealthLink network was developing traction, with growth rates around 30% per month and two to three new services each year in response to client demands, other similar health sector network initiatives were started. One was sponsored by the Ministry of Health to link hospitals. The service offerings of this network and HealthLink have now merged to support a wider health community. Although they remain competitive, they are interoperable. Mandatory security standards for exchanging health information online have been set by a Health Intranet Governance Board. The presence of other (competing) networks within this market in the early stages did stimulate growth and interest, and has contributed to New Zealand’s current high rate of usage of electronic clinical communications in primary care.

Some of the critical success factors were:

- A national health identifier (NHI)
- Early adoption of HL7
- Development and acceptance of the 1993 Privacy Act and the 1994 Health Information Privacy Code, along with “practical” implementation of these
- Mandatory electronic claiming for GMS (government subsidies for GP care)
- Collaboration with private and public organizations
- Multi-vendor cooperation and understanding of the business opportunities.

In 1997, the government mandated electronic claim submission. This required primary care physicians to purchase a Practice Management System (not necessarily with full clinical capability) and also meant they needed to be connected to the HealthLink network. Although electronic messaging became mandatory for submitting claims, there was little else compulsory about an EMR. Only recently has there been a clear directive from the Ministry of Health for physicians to use an EMR with clinical capabilities in their practices, although this is not yet compulsory.

The development of IPAs (Independent Practitioner Associations) also encouraged the uptake of information technology in primary care in New Zealand. Many IPAs paid the costs for their member GPs to access the HealthLink network as part of their membership services. HealthLink also facilitated change by offering an “electronic claiming only” service for claims submission free of charge for the first six months. Invariably, practitioners and their staff discovered over time that they would like to commence additional services and were happy to pay for these – often before their initial six-month period was over.

The push for IPAs to collect data has been driven by the introduction of capitation-based funding, budget holding and the concept of population health. IPAs and the primary care physicians themselves could see the benefits of capturing statistics about their populations in programs such as diabetes, child health, retinal screening and hepatitis.

The past decade has also seen the emergence of the new position of Practice Manager within a physician general practice. The Practice Manager has become a pivotal person to assist with the installation, management and training for any physician office system. The Practice Manager’s responsibilities include financial management, IT and the human resources function in larger practices. Practice Managers are considered necessary to the day-to-day running of general practice; there is now a university-accredited training program for Practice Managers run in conjunction with the New Zealand College of GPs at the Auckland

University School of Medicine.

Although electronic billing was not of direct clinical benefit to GPs, the mandate for compulsory electronic claims submission was nonetheless a business benefit to GP practices and this was certainly a principal motivator for many of the Practice Managers to take the plunge into using the EMR.

The clinical service that was the most effective in driving increased uptake was electronic laboratory results. Electronic reporting of lab results saves considerable amounts of administrative time when compared to traditional paper-based systems (the exact time saving for each GP depends on the size and staffing of his or her particular clinic). New Zealand savings data is only anecdotal; two Danish surveys in 1998 found that a GP can save more than 30 minutes each day as a result of receiving electronic lab results and discharge letters and generating electronic prescriptions using the EMR.

Other EDI services such as automated status messages (an update sent back to the GP based on a patient who may have been admitted, for whom a referral has been received or any other clinical update to patient care) and electronic discharge summaries have played an important role in the transition to using the clinical EMR and capturing all the visit notes electronically during a patient consultation. Similar to the Danish experience, paper discharges used to arrive five to six weeks after discharge from the hospital and patients would often present for follow-up at the GP clinic before the GP had received information regarding the hospital encounter. Even once the paper discharge summary was delivered, the information was at times incomplete or illegible. Hospitals are now able to quickly produce electronic discharge summaries and deliver these by EDI (or fax) to the GP office within minutes of the patient being discharged (assuming the GP connects regularly and “pulls” or “clears” the mailbox).

The ease of installation and wide range of services along with training, a toll-free 800 service, testing and support services provided free to the vendor marketplace also helped build HealthLink into a value-added network that is integral to today’s New Zealand health sector.

WHAT DOES THIS SERVICE COST AND WHO PAYS FOR WHAT?

The HealthLink nationwide healthcare data network is funded by all of its clients. There are 20 people on staff at HealthLink. Most clients pay a fixed rate of around \$20 NZD (\$16 CAD) per physician per month for a range of services, such as electronic claims submission, lab and DI result reporting and electronic discharge summaries. Those sending large volumes of data (e.g., more than 1,000 messages per month) can pay a monthly rate charged on a kilo character basis depending upon what they send on average in a year. All non-profit healthcare organizations (e.g., hepatitis screening, family planning clinics) have been provided the HealthLink service free of charge to ensure maximum participation. There is also a bulk subscription rate for IPA members. Separate contracts are negotiated with government, DHBs and other clients.

The typical cost of an eight-workstation installation is as follows:

One-time investment costs:

Hardware servers including	
Operating systems	\$10,000
Workstations (\$2,000 x 8)	\$16,000
Server software	\$8,000
Database conversion – hours work and complexity (\$1,000–\$5,000)	\$3,000
Network installation and cabling (\$3,000–\$10,000)	\$5,000
Training following installation (\$550/day)	\$2,000
Total	\$44,000

Annual operating costs for a licence fee for eight workstations, including help desk support and software updates, amounts to \$3,000 per year. Modern networks may also require broadband Internet access with firewall protection.

There is not a great deal of difference between the costs of the different physician office systems, although their licence fees are structured slightly differently. Sales tend to be made on market share, usability and performance. In the current competitive environment, the vendor systems continue to leapfrog each

other as new improved versions are released. Membership in an IPA generally makes the purchase of a physician office system more affordable for GPs, since IPAs have been able to negotiate better purchase prices with vendors.

GPs and all other providers still purchase the software themselves and are free to choose solutions from more than seven PMS vendors operating in the New Zealand market. One PMS vendor has approximately 65% of the market; 98% of the PMS systems in New Zealand are now Windows-based applications.

WHAT CLINICAL BENEFITS HAVE ARISEN FROM THIS SERVICE?

The HealthLink network and its operating environment is now increasingly being used to assist with managing chronic diseases.

As an example, one region recognized that particular at-risk groups, such as children and patients with chronic conditions, were requiring hospitalization because early intervention had not taken place in the primary care setting. Two integrated-care projects were set up to directly improve the health status of these at-risk groups – the KidsLink Child Immunization project and the Diabetes Integrated Care project. This particular region had a population with a lower

socioeconomic level and poorer health status than the average New Zealand population.

These projects use software to enroll and track patients on disease-management programs. The software contains best-practice guidelines for care, and collects the latest clinical data about each patient from laboratory and GP physician office systems. Based on the latest available data, the software automatically issues alerts, reminders and recommendations to the relevant healthcare providers as appropriate for each patient. The road to success for the integrated-care project is to “make the best thing to do” for primary care providers. The project is a classic example about how health professionals are more likely to embrace technology if it is made easy for them in their everyday work routines – particularly if one mimics the typical workflow in a practice. The electronic health record is very much about workflow – minimal change to workflow means reduced need for costly change management.

The most important aspect of this “ease of use” philosophy was the integration with a GP’s own computer systems using a standardized message structure. These messages, sent by the central application, contain advice and reminders and are incorporated directly into the

Figure 2. Examples of Message Types Used in Disease Management Transmitted via HealthLink



Table 1.

Message Type	Description	Sent From/To:
Enrolment Message	Electronic request to enrol a patient in a disease management program	GP or community nurse to the central server
Task Reminder	Reminds GP/nurse that a particular care task is now due for a patient (e.g., quarterly diabetes checkup/social services assessment/18-month MMR inoculation)	Central server to GP/community nurse
Task Overdue Alert	Tells GP/nurse that a particular task is overdue for a patient	Central server to GP/community nurse
Alert Message	Advises GP/nurse that a patient's lab results (e.g., HbA1c levels) fall outside a normal range and provides suggestions for treatment	Central server to GP/community nurse
Task Update	A report filled out by the GP/nurse containing details of a task carried out as part of the program. (e.g., results of quarterly diabetes check), could include lab results and clinical observations	GP/community nurse to the central server
Program Withdrawal	A message requesting that a patient be removed from a disease-management program; normally a reason must be given	GP/community nurse to the central server
Task Declined	A message advising that a patient has declined a particular task (e.g., "Mother declined immunization for baby X")	GP/community nurse to the central server
Episode Ended	A message advising that a patient has recovered from a particular condition, and therefore can be removed from the relevant disease-management program	GP/community nurse to the central server

GP's own electronic medical records irrespective of what office system is used. For most GPs these reminders are incorporated into their daily work routine with minimal disruption.

PATIENT TASK AND ALERT MESSAGES IN A GP EMR

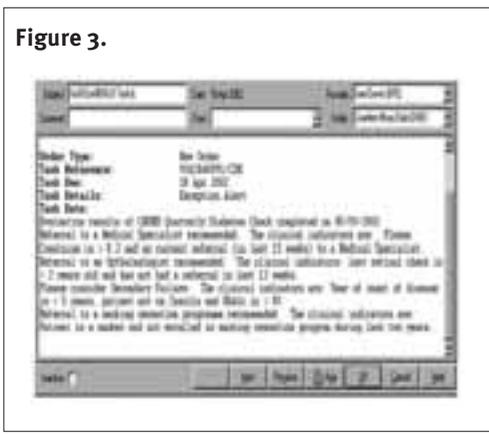
The figure here is an example of an automated alert message sent to a GP regarding a patient enrolled in a diabetes management program.

As a result of these applications of information technology in primary care:

- Child immunization rates increased from 75% to 95%.
- Control of diabetes improved – for patients with HbA1c higher than nine, pre-enrolment was 34% and this was reduced to 7% post-enrolment.
- There was an 80% reduction in wait time for statins for diabetes patients (the prescribing of statins by a New Zealand GP is typically a time-consuming, complex process, with

many patients not able to receive prescriptions or having to wait nine to twelve months for eligibility confirmation). With the new electronic system, eligibility for statins can be confirmed automatically and instantly via best-practice guidelines.

- There was a reduction in acute admissions – this was running at 9% per annum. By 2002, the growth rate was reduced to near 0%.



The collaboration between the various stakeholders in healthcare has allowed at-risk populations (such as those at risk of hepatitis, diabetes, cervical and breast cancer, etc.) to be tracked and screened. Screening programs are rolled out seamlessly irrespective of which physician office system the GP uses.

CONCLUSION

HealthLink is another success story that remains relatively unknown, perhaps due to the fact it was led by private entrepreneurs who took a “heads down just get on with it” approach. Not all the results aimed for have been achieved – pharmacy providers have yet to be successfully incorporated into the network as they have in Denmark. However, this is a development anticipated for the future.

The growth and demand for services has been led by clinicians working in an ever-changing healthcare environment and at one point by a very competitive market (even though it is a publicly funded service). The continued growth for additional services relies to a certain extent on outside factors such as expanding bandwidth.

Could the New Zealand HealthLink model be applied within Canada with the right players? We now have \$1.1 billion for electronic health records; Infoway is facilitating the adoption of interoperable EHR solutions; data and message standards are due to be published soon; vendor collaboration appears to exist as evidenced by the successful VCUR process in Alberta; Master Person Index initiatives are under way in a number of provinces; and the adoption of HL7 messaging standards in electronic health record projects such as PIN in Alberta is common.

Are we able to learn from the Danes, the Kiwis, and others? Can we achieve the same or even better for Canada's healthcare system?

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