

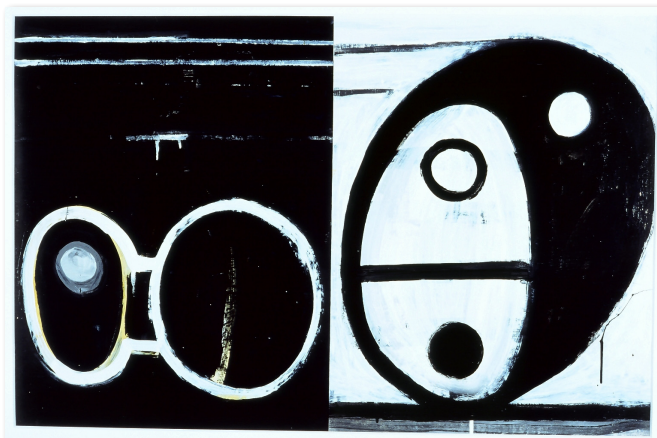
Getting the right mix:

Developing a primary – secondary health provider IT interface in the Waikato District Health Board

Electronic health record systems are often viewed as the “holy grail” of health information technology. Research into GP technology use highlights some of the complexities of interfacing electronically with health providers.

By Jenny L. Gibb and Jarrod M. Haar

New Zealand is among a number of countries that have begun to develop comprehensive and user-friendly electronic health record systems (EHRs). EHRs enable health care providers to share access on individual patient’s health information over an agreed geographic region. These systems have the potential to enhance provider decision-making and ultimately the quality of health care provided to patients. While there is almost universal agreement on the potential advantages of EHRs, these systems have often been fraught with differing views on connectivity: (1) extent of geographic coverage, (2) extent of information shared between providers and patients, and (3) the complexities of implementation. The present study investigates the steps being taken by the Waikato District Health Board to develop an information technology (IT) interface between primary and secondary health providers. This study provides valuable information towards developing an integrated EHR. We identify key issues involved in this interface



MARK BRAUNIAS, *B/W/I*, 1995, enamel on paper diptych.
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including: (1) ensuring a sound secondary health provider IT infrastructure is initially in place, (2) that patient data on the system is based on health industry standards, and (3) an agreed upon patient opt on/off criteria is clearly in place.

ELECTRONIC HEALTH RECORD SYSTEM

The New Zealand health sector is favourably positioned overall in terms of its computer use, ranked second only to the United Kingdom, in the number of primary care users of electronic health records. In 2004 52% of New Zealand general practitioners (GPs) used computers, compared with 59% in the United Kingdom, and 26% in Australia.¹ Didham, Martin, Wood and Harrison² reported 99.8% of New Zealand GPs to have at least one computer in their practice, with 99% using an electronic patient management system. As well as enjoying high levels of technology penetration across some user groups, the New Zealand health IT infrastructure has continued to foster the development of advanced technology programmes such as, health information standards (HISOs) with digital certification, and health level 7 (HL7).³

In New Zealand the Ministry of Health (MoH) governs the health sector, where funding over past 10 years has steadily moved from a market-based structure, to a community-oriented model. Health care purchaser and provider functions are disseminated through the 21 District Health Boards (DHB).⁴ Currently there are 81 New Zealand Primary

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Health Organisations (PHOs) who are responsible for the delivery and coordination of primary health care services. Organisations such as Pinnacle Group Ltd, a not for profit primary health care management support organisation, provides support to a range of primary care organisations and analysis on population, workforce and service utilization that is currently used by the MoH, DHBs and PHOs. Pinnacle Inc. is a not for profit GP network that focuses on high quality general practice that has also been proactive in creating a secure IT network between all its providers.

Executive Brief

Electronic health record systems (EHRs) enable health care providers to share access to individual patient information, and have the potential to significantly enhance the quality of health care provided to patients. The Waikato District Health Board (DHB) is developing an EHR with the intention of integrating primary, secondary and tertiary provider information. This study surveyed the use of computer-based technologies by primary health care providers in the Waikato DHB region. The most frequent activity was related to the practice's own records (patient appointments and consultations) and receiving results from private clinics, with the least frequent activity related to interaction with the DHB. Among the most frequent problem areas reported were the perceived lack of speed of implementation of DHB IT applications and inconsistency in the adoption of electronic business practices between health service providers. The findings indicate some key issues for developing an effective interface between health providers: ensuring a sound secondary health provider IT infrastructure is in place; basing patient data on health industry standards; and ensuring that patient opt on/off criteria is clearly in place.

The Health Information Strategy for New Zealand⁵ (HIS-NZ) provides specific guidelines on how IT can be used to exchange data in order to improve the health of New Zealanders. This strategy, set within the context of the New Zealand Health Strategy and the New Zealand Disability Strategy, also extends previous national health information strategies (e.g. Working to Add Value to E-Information (WAVE) project, 2001). In line with the community-oriented model, it is readily acknowledged that currently no formal framework exists for coordinating IT spending between providers. While the HIS-NZ believes it would be advantageous to adopt a more formal coordinated approach, it also acknowledges the advantages of facilitating autonomy for each DHB.⁶ The HIS-NZ has initiated six priorities to address the connectivity issues present between the key stakeholders (GPs, provider organisations, care providers, policy makers and consumers). These priorities include: (1) enabling secure connections and access to health information; (2) ensuring that national systems anchors are in place; (3) creating and publishing accessible key event summaries; (4) broadening the dialogue between primary and secondary care providers; (5) extending the collection of health information; and (6) ensuring there is safe access to national health related information.⁷ Some

researchers⁸ and practitioners have responded to the Ministry of Health's suggestion to coordinate IT investment between user groups via the implementation of a national EHRs. EHRs are defined as "An individual longitudinal collection of personal health information, usually based on the individual, entered or accepted by health care providers, which can be distributed over a number of sites or aggregated at a particular source. The information is organised primarily to support continued efficient and quality health care. The record is under the control of the consumer and is to be stored and transmitted securely."⁹

The architecture of an EHR typically includes: standards for privacy and security; messaging and coding; an infrastructure with unique patient and provider identifiers; a telecommunications infrastructure; health information events summaries and a skilled IT workforce along with a system that is acceptable by clinicians and consumers.¹⁰

The benefits of implementing EHRs can potentially include substantially improved coordination and quality of health care for patients. It has been suggested that computer-based decision-making can lead to improved provider performance and positive patient outcomes.¹¹ Practitioners can electronically link to current research on patient conditions thereby enhancing the quality of evidence-based care.¹² Patient safety may also be increased where single source patient data has only been available. In the New Zealand context, EHRs can potentially permit approved health provider access to a patient's records throughout the country. Clearly, this level of connectivity would provide medical staff access to current data that may be critical to patient care. Further, aggregated patient data from EHRs at both regional and national levels can potentially improve knowledge of health trends.¹³

Despite these benefits, the development of integrated, accessible, comprehensive EHRs has often been viewed as the "holy grail" of health IT development.¹⁴ Implementing such a system has often been clouded by the inherent challenges in accommodating a diverse range of issues including provider needs, patient confidentiality, human error at data entry and a lack of standardisation on data input.¹⁵ In New Zealand, however, the situation is more positive where HISO plays a key role in developing and implementing national health standards, including those for IT. These standards include HL7 which permits data originating in a variety of formats to be distributed and sent between health providers, diseases classification systems such as ICD-10 and SNOMED-CT that provide an international and universal health care terminology.¹⁶

Indeed, several DHB regions in New Zealand have implemented partial EHRs, some of which include, Counties-Manukau and Taranaki. The systems operating in these DHBs currently enable the exchange of some patient data between primary and secondary health providers in these areas. Each provider applying for access is required to go through a screening process. Patients, however, cannot currently electronically access their data via EHRs. Data fed into these systems are also linked to the National Health Index (NHI),

which enables the medical history of a patient admitted to hospital in one region, to be accessed in another. The Wirral System operating in a region in the United Kingdom is an example of a fully implemented EHR.¹⁷ Clearly, EHRs are being implemented internationally and partial EHRs have begun to appear in New Zealand. The focus of this study is one of assessing the situation of the Waikato DHB.

WAIKATO DISTRICT HEALTH BOARD

The Waikato DHB serves a population of 330,000 that extends from Thames/Coromandel in the north to Taumarunui in the south. The DHB also has wider regional responsibilities to provide specialist tertiary health and trauma services for a population of 800,000 in the upper central North Island. In meeting these requirements, the Waikato DHB Knowledge and Information Service is developing an approach to support continuity of care through the integration of primary, secondary and tertiary information, in the initial development of an EHR. Integral to this is a need to clearly define the information requirements of GPs (a key

primary health provider group), in this region and how they wish that information to be transferred. In addition, a better understanding is required of the impact of electronic data exchange on the efficiency and effectiveness of outputs.

The primary research objectives of this present study were:

- To identify the nature and extent of GPs computer based activity (including comparisons between urban and rural practices),
- To explore the factors that enhance and inhibit GPs use of IT,
- To ascertain the future electronic data exchange requirements of GPs (as primary health providers) from Waikato Hospital (as secondary health provider),
- To identify issues of concern from both primary and secondary health providers in developing EHRs, and
- To understand the impact of IT (EHRs) on the perceived quality and efficiency of general practice outputs both now and in the future.

Methodology

Data was gathered by two methods: surveys and interviews. A postal questionnaire was designed to collect empirical evidence on the impact of computer-based technologies on GPs in the Waikato Region. The items in this questionnaire were developed from data collected during prior interviews with six randomly selected GPs in this region. The questionnaire was pilot tested in September 2006 with the GP Liaison, Chief Executive Officer Pinnacle, a GP, and two academic staff. Additional interviews were conducted with key Waikato DHB members. Feedback from all these sources was used to clarify and improve the clarity and content of the items used in this questionnaire. The final questionnaire, together with a personalised cover letter and reply paid envelope were mailed out in early October 2006. A follow up questionnaire was sent out to non-respondents two weeks later.

A sample of 250 General Practitioners based in the greater Waikato Region was chosen for this survey. The survey was sent to all GPs in October 2006 and a total of 104 usable responses were received, with 8 returns. This yielded a response rate of 43%. Response rates of GPs have been varied, with Didham, Martin, Wood, and Harrison¹⁸ achieving an 80% response rate in New Zealand although they noted some international studies (e.g. Canada) have been as low as 20%. Our response rate is similar to other GP studies (e.g. 50% response rate).¹⁹ Further data was collected via a telephone survey to check for non-response bias where four General Practices who had chosen not to respond were contacted. No significant difference was found between the current computer based technology usage rates of respondents and non-respondents.

TABLE 1 – Profile of Respondents

Characteristics	Total	Percentage
Location of Practice		
• Rural	44	42.3%
• Urban	60	57.7%
Structure of Practice		
• Sole General Practitioner	15	14.4 %
• 2 Partners	22	21.2 %
• 3 or more Partners	67	64.4 %
Main Type of Computer Programme Used		
• Med Tech 32	95	91.3 %
• VIP	5	4.8 %
• Houston	1	1.0 %
• Other	3	2.9 %
Primary Computer Technology Decision maker in Practice		
• General Practitioner(s)	91	87.5 %
• Practice Manager	9	8.6 %
• Other	4	3.9 %
Features	Average	Range
• Age of primary computer technology decision maker	48	30-59
• Computer access (screens) in each Practice	14	3-39
• Total number of patients in each Practice	7162	500-18,500
Total Number of Staff in each Practice	Average	Range
• General Practitioners	5	1-15
• Nursing Staff	5	0-12
• Administration Staff	5	1-15

Descriptive results on key issues resulting from the impact of computer based information technologies on general practitioners in the Waikato District Health Board region are outlined and discussed in the next section .

RESULTS

The impact of computer based technologies on work place practices for general practitioners operating in the greater Waikato Region were considered in this survey by examining (1) the current level of electronic business activity, (2) problems encountered with current levels of electronic activity, and (3) the impact of computer based technologies on current and future levels of quality and timeliness of patient care and general management. Data on these areas were gathered through the method described in the sidebar.

Current Level of Electronic Business Activity

General practitioners were asked to indicate the frequency with which their practice currently engaged in the use of computer related technologies on a range of 14 business activities. These activities included: receiving laboratory and radiology results from the Waikato DHB; sending patient referrals to private physicians, patient communication with private physicians; and patient communication with public health clinicians. Each activity was rated on a scale of 1=never to 5=always. A few GPs (< 5 in total) were found to still prefer to record patient appointments and general data manually. The three tasks most frequently conducted electronically were recording patient appointments (M=4.9), recording patient consultations (M=4.7), and receiving laboratory and radiology results from private clinics (M=4.4). Those tasks found to be least likely to be conducted electronically were patient communication with public health clinicians (M=2.2), ordering general office/surgical supplies (M=2.3), and sending referrals to Waikato DHB (M=2.4). We also examined the top three tasks to be conducted electronically for potential differences between urban and rural practices. We found no difference between these practices for recording patient appointments; however, urban practices were more likely to electronically record patient consultations and to receive laboratory and radiology results from private clinics.

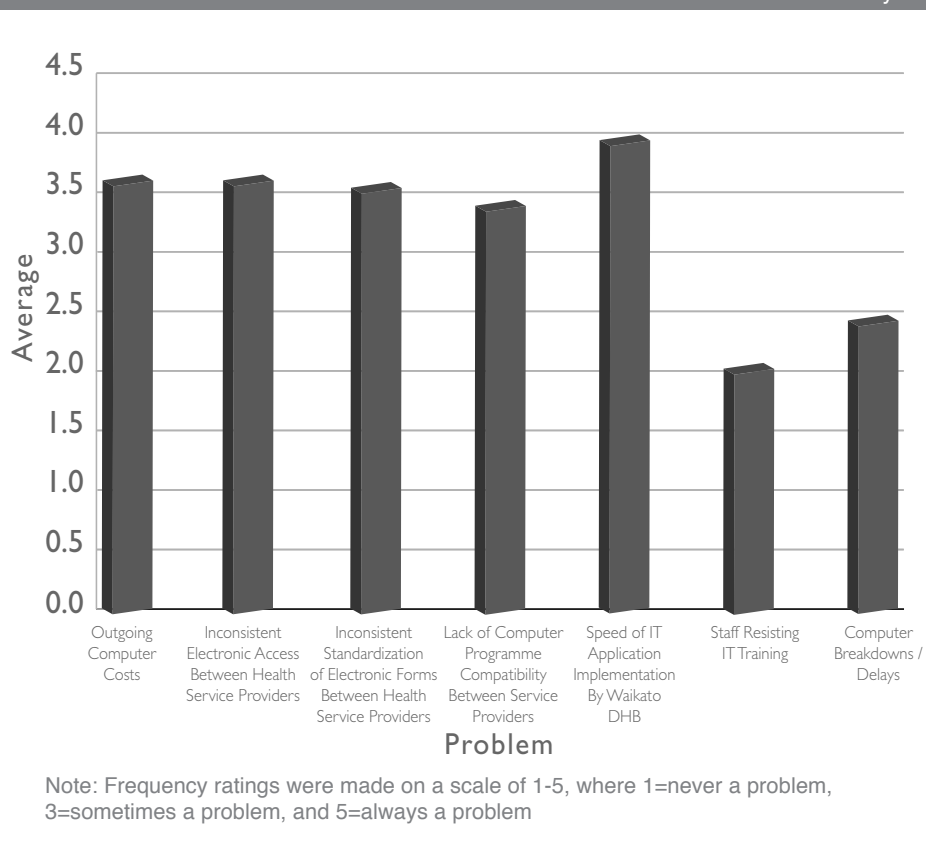
General practitioners were also asked to identify for each

of the 14 business activities whether it would be themselves, their nurses, or their administrators who typically performed that activity. Overall, GPs were identified as the highest computer users for these combined tasks (58.97%), compared with nurses (19.82%) and administrators (21.21%).

Problems Encountered With Current Levels of Electronic Business Activity

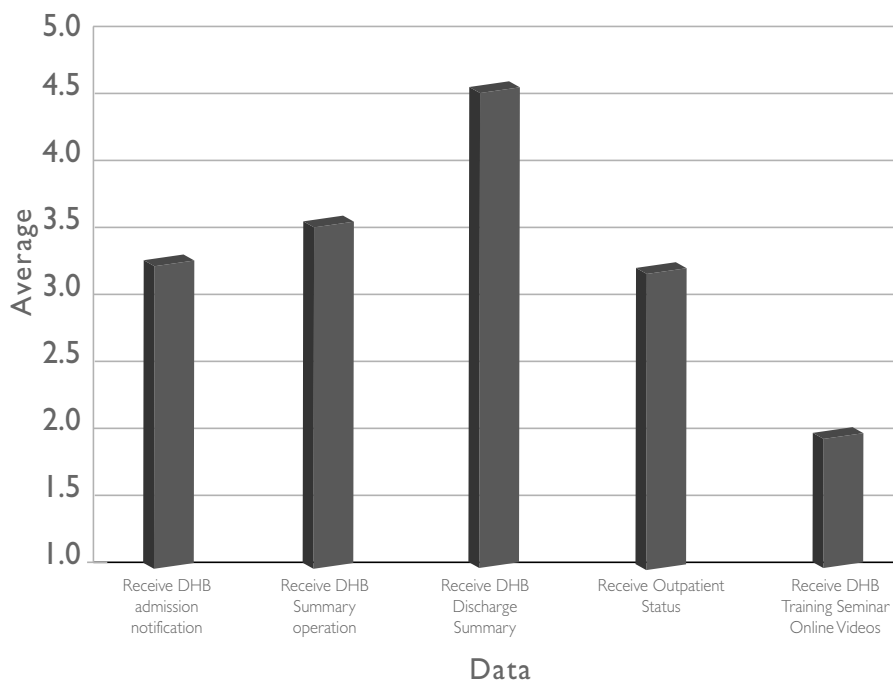
In addition to task frequency, we also asked GPs to report on problems associated with their current level of electronic business activity. The frequency with which GPs incurred computer related problems were rated across seven selected areas as shown in Figure 1.

FIGURE 1: Problems Encountered with Current Level of Electronic Business Activity



The most frequent problem areas reported surround the perceived lack of speed of implementation of Waikato District Health Board information technology applications (M=3.9), the inconsistency in the adoption of electronic business practices between health service providers (M=3.6), and the high ongoing computer related costs (M=3.6). The areas where least problems were reported include computer breakdowns (M=2.4), and staff resistance to computer training (M=2.1). Clearly, to improve the connectivity of GPs with the Waikato DHB requires specific attention towards the speed of implementing change and achieving high levels of consistency with IT systems between GPs.

FIGURE 2: Future Levels of Electronic Business Activity



Note: Frequency ratings were made on a scale of 1-5, where 1=never a problem, 3=sometimes a problem, and 5=always a problem

Future Levels of Electronic Data from Waikato DHB

General Practitioners were also asked to identify to what extent they would value electronically receiving from the Waikato District Health Board the data types shown in Figure 2.

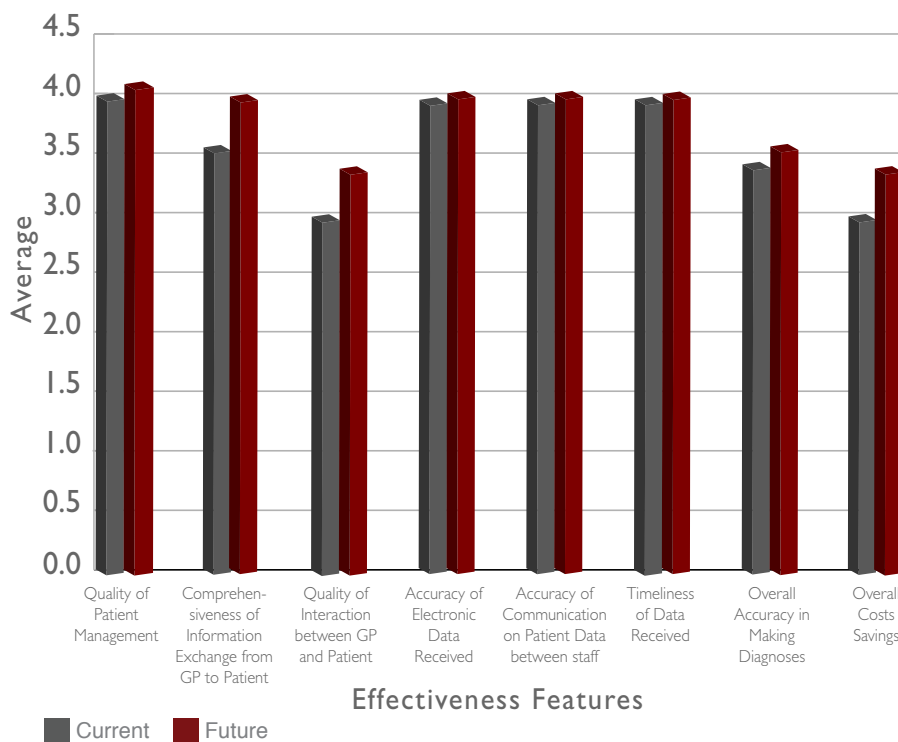
The ability to receive DHB patient discharge data was rated most highly (M=4.6), followed by the ability to receive DHB patient admission notifications (M=3.3), outpatient status (M=3.2), and patient operation summaries (M=3.6). The data type least desired was the receipt of DHB training seminars online (M=1.95).

Impact of Current/Future Levels of Computer Based Activity on Quality and Timeliness of Service

Since GPs increasingly use IT, it is important to understand to what extent GPs perceive the quality and timeliness of their general practice outputs is impacted upon by such technologies, both now and in the future. GPs were asked to indicate the influence on quality/effectiveness of a number of features, shown in Figure 3.

Computer based activity was reported to have the highest impact on the perceived quality of practice outputs as measured by improved levels of patient management (M=4.0), followed closely by improved accuracy (M=3.9), timeliness of receiving data electronically (M=3.9), and communicating patient data with practice staff (M=3.9). The use of computer-based technologies was perceived to have the least impact on the quality of patient interaction (M=3.0) and cost savings within each practice (M=3.0). General practitioners indicated that future computer based technology levels are likely to most positively impact on the quality of patient management (M=4.1). In comparing the perceived impact of current and future computer technology levels on the quality of practice outputs it was found that the largest

FIGURE 3: Electronic Business Activity and Impact on Quality/Effectiveness



Note: Frequency ratings were made on a scale of 1-5, where 1=never a problem, 3=sometimes a problem, and 5=always a problem

improvements were expected to be for accuracy of communication on patient data with the Waikato District Health Board (Mean difference=.5), improved quality of interaction between general practitioner and patients (Mean difference=.4), and overall costs savings (Mean difference=.4).

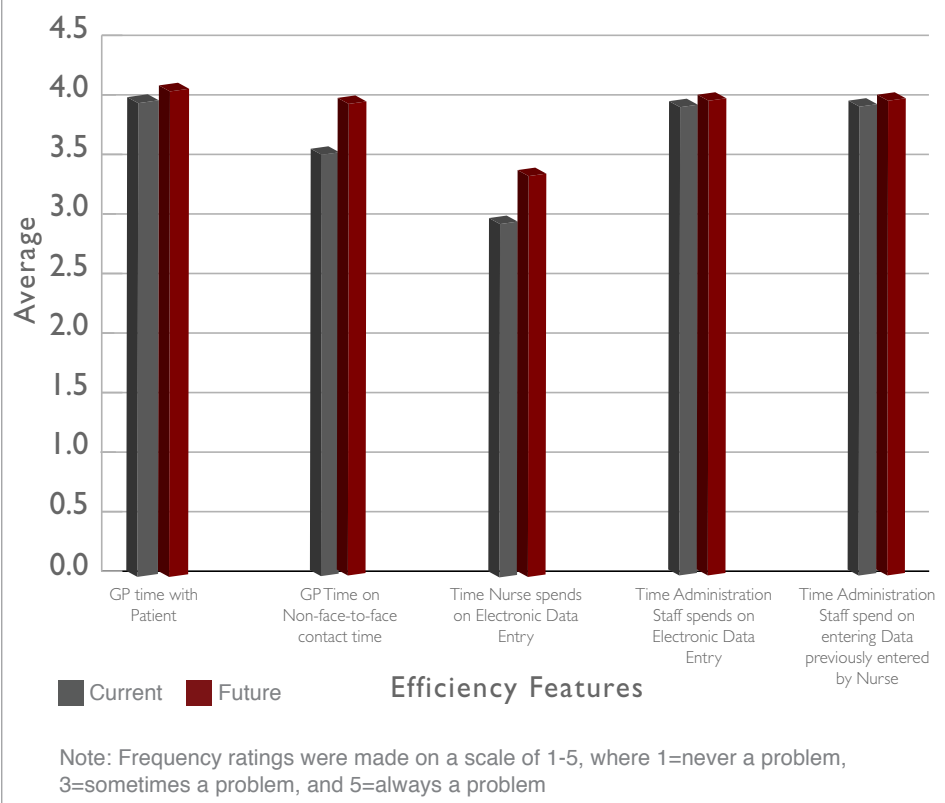
Just as with the quality rating scale used in Figure 3, general practitioners were asked to indicate to what extent they believed computer based technologies impacted on the timeliness of their outputs for the five items indicated in Figure 4.

Those computer-based activities reported to have the greatest current impact on current practice efficiencies were the times nursing ($M=3.4$) and administration staff ($M=3.1$) spend on data entry. Current computer-based technologies were perceived to have the least impact on the amount of time a GP spends with his/her patient ($M=2.8$). GPs indicated that they believed future levels of computer-based technologies were unlikely to bring about any significant overall improvements in the timeliness of outputs from their practice.

DISCUSSION

Overall, we found the majority of responding GPs used computer related technologies, with only a minority (<5%) preferring manual systems. The functions that most frequently used computer related technologies were recording patient appointments, consultations, and receiving results. While receiving results included those both from non-Waikato DHB providers and the Waikato DHB, it was more common to electronically receive results from non-Waikato DHB providers. We suggest this finding links with the challenge that DHBs typically experience regarding the complexities involved in linking the needs of different provider groups and their often disparate IT systems. Currently, GPs are often able to more effectively electronically connect to other smaller providers who have more flexible and faster IT systems. Clearly, the challenge for the Waikato DHB is to work toward providing an integrated IT system with these providers. However, the issue of providing a flexible integrated IT system with speed, in large formalised organisations such as the DHB, also brings with it requirements to balance the standards set by organisations such as HISO. Consequently, it is a challenge for the Waikato DHB to achieve the depth of IT integration at the same speed as GPs have been able to develop with their patient management systems. As such,

FIGURE 4: Electronic Business Activity and Impact on Timeliness/Efficiency



this is a monumental challenge for the full introduction and success of EHRs in the region.

Clearly, other tasks performed with computer related technologies are less popular, in particular, patient communication with public health clinicians and sending referrals to Waikato DHB, which were both at the bottom of activities undertaken. However, again it is very likely that the reasons for this are due more to issues of having disparate systems, rather than a lack of desire to electronically connect. Another issue found to impede the adoption of electronic business was the high associated costs of IT. While hardware costs are less likely to be problematic, the number of computer screens per practice ranged from 3 to 39 (average 14), which for some practices represents a large investment that ideally requires regular upgrades. GPs, especially those operating in smaller practices, report this as a significant component of their expenditure. The patient management system, MedTech32 is used in the majority of GP practices (91% of respondents), cementing itself into a leadership position for Waikato GPs. Didham et al.²⁰ reported that MEdTech 32 held a market share of 42% use for GPs in New Zealand in 2001, which had grown to 61.5% by 2004.

In addition, we explored differences between urban

It was more common to electronically receive results from non-Waikato DHB providers.

and rural practices. Urban practices were more likely to make patient consultations and to receive laboratory and radiology results from non-Waikato DHB providers than their rural counterparts. Further, urban practices were more likely to record data electronically than their rural counterparts. This indicates that urban practices may have

GPs spend much more time on computers than their administrators and nurses by almost 3 to 1.

an advantage over their rural colleagues, perhaps due to issues relating to accessibility to the Internet (e.g. receiving results), as well as general disparities between urban and rural communities regarding access to good, fast, and reliable IT and associated infrastructures.

Clearly, this highlights an area of concern for the Waikato DHB especially given its wide geographical nature, including many rural locations.

This study also sought to provide some benchmarks on the amount of time spent using IT by GPs compared to their staff. The findings indicate strongly that GPs spend much more time on computers than their administrators and nurses by almost 3 to 1. When it came to receiving data, GPs were highly interested in DHB patient data relating to admissions, discharge, outpatient status and operation summaries. This highlights GPs interest in remaining connected to their patients, especially regarding hospital related care. Consequently, an integrated EHR would improve the connectivity between GPs, patients, and DHBs, which should ensure heightened care and service for all. Probing further, GPs were supportive of having direct access to patient laboratory and radiology results and national screening programme data. Consequently, the running costs of EHRs might be reduced by allowing GPs to access the data themselves, rather than the Waikato DHB sending information out on a constant basis.

An integrated EHR would improve the connectivity between GPs, patients, and DHBs.

Overall, there is strong support from GPs in this sample for computer based activities increasing the perceived quality of patient management, improving accuracy, enhancing the timeliness of data, and aiding communication with patients. Similarly, computer based activities are seen as being most beneficial in reducing the time spent by nurses and administration staff on data entry. Although these same time benefits do not appear to be realised by GPs. Given the large amount of time GPs spend on computers, increased technology and EHRs by their very nature are unlikely to lead to less computer time by GPs. However, there are a number of benefits arising from the use of IT and related electronic systems that GPs believe their own practices and the entire health industry can gain from embracing. Clearly, the health industry faces continual cost pressure to adopt new strategies and

capabilities – including IT, that might provide it with additional productivity and performance advantages. As found in this study of Waikato GPs, these benefits are also accompanied by challenges that are required to be worked through before significant gains can be enjoyed. In particular the speed of change and the requirement for the ongoing standardisation of data exchanged is imperative.

Finally, it must be acknowledged that with all cross-sectional studies there are some limitations. Our response rate, while adequate is not as large as some studies in the sector, so clearly the findings here must be taken with some caution. Overall though, we did get a good response from rural and urban GPs that provides us with greater insight into the challenges of adopting EHRs in the Waikato region.

IMPLICATIONS

The present study raises a number of issues not only for consideration by the Waikato DHB, but also for other DHBs and other stakeholders in the health sector as moves are made to continue to implement EHRs. Firstly, it is critical that each DHB has in place a sound IT infrastructure that forms a base from which to develop primary and secondary health provider IT interfaces. Prioritising investments and ensuring compatibility between providers will ensure a solid foundation is created. The need to build a solid infrastructure in the development of IT initiatives is also echoed with the Government's latest information communication technology drive in the Digital Strategy²¹ to ensure a sound broadband infrastructure is implemented before other significant IT related benefits can be enjoyed.

It is critical that each DHB has in place a sound IT infrastructure

It is also important that comprehensive and clear standards for the transfer of patient health information continue to be developed via the HISO in order to guide the development of regional EHRs. Agreed upon standards are required not only between primary and secondary health providers on the amount and nature of information shared but also on the nature of data shared with patients. While patient access to their records from EHRs is generally favoured, it is also acknowledged that this information must be made available in a manner that is clearly understandable and does not require further clinical interpretation. The issue of patient access to their own records via EHRs is something that is especially favoured for those patients with chronic diseases such as diabetes where there are substantial benefits to both the patient and providers if the patient takes an active role in the care and maintenance of their own condition. As such, health benefits (e.g. better diabetic control) and their associated health sector benefits (e.g. reduced costs) are clearly win-win situations for all stakeholders in the health sector.

Once the primary–secondary IT interfaces between GPs and the Waikato DHB are refined, then this interface might be expanded further to include other primary health providers (e.g. pharmacies). Electronic linkages between hospitals and pharmacies can potentially benefit situations such as where a patient is discharged from hospital with a prescription. If the local pharmacist finds the medication is unavailable, then instant electronic communication with the prescribing source can immediately identify a suitable alternative, which in some instances may provide costs savings to the patient. Finally, there is also the issue of patient control of their records under any EHR. The method most favoured by those medical practitioners interviewed was one of giving patients the opportunity to opt out of an EHR system.

CONCLUSION

The role that IT plays in the health sector is large and increasing. Whether this will lead to overall sector gains from EHRs does appear to require some additional work from industry participants, specifically addressing

issues of speed and issues of consistency in programs and practices. Clearly, there are productivity and performance gains to be made from IT for all participants in the health sector by improving their connectivity. However, as with any major sector-wide change, these reforms are complex and it appears that when considering IT solutions, initial foundations need to be built first before subsequent gains are enjoyed. As such, we believe the issues found here will be applicable to other regions in the health sector who are considering adopting EHRs. While GPs are clearly using IT in their practices, the ability to increase their IT connectivity with DHBs and indeed to access the data themselves appears to be of great interest, but impediments need to be overcome initially. The challenge for DHBs is in providing the foundation and format for fast, effective, and efficient IT health services to a diverse range of stakeholders.

As with any major sector-wide change, these reforms are complex.

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