Refereed papers

Adoption of information technology in primary care physician offices in New Zealand and Denmark, part 4: benefits comparisons

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ABSTRACT
This is the fourth in a series of five papers about the use of computing technology in general practitioner (GP) practices in Denmark and New Zealand. This paper looks at the reasons why physicians use computers with a particular emphasis on the benefits gained from automated medication prescriptions. It includes an assessment of the growth of key applications in New Zealand as well as a comparative summary of the success factors in both countries.

Keywords: critical success factors, electronic medical records systems, evaluation and comparison, medical and health informatics

Introduction

This is the fourth in a series of five papers about primary care computing in Denmark and New Zealand. The ranking in Table 1 (with 1 being the most important) is based on estimates drawn from small samplings in each jurisdiction.

Reasons why physicians use computers

The use of technology by Danish physicians has historically been voluntary. It was not until the primary care physician contract of 2004 and the specialist contract of 2006 that using computers and MedCom was mandated. Apparently, as long as ten years ago, patients would consider a primary care physician to be ‘second rate’ if he or she did not use a computer.

The major reason why Danish physicians use their computers is because of the communication benefits it brings them. They report a much improved dialogue with hospitals (e.g. where they used to wait five days for test results, they now receive them almost as soon as they come off the equipment). They are automatically notified when a patient is registered in an emergency department in most hospitals. Hospital discharge summaries now arrive within two days (this used to take four-plus weeks) due to the policies set and enforced by the counties.

For more than a decade New Zealand has had a high proportion of physicians using highly functional electronic clinical systems. This uptake has occurred via a process of incremental improvement. As in Denmark,
there is a general expectation by New Zealanders that their general practitioner (GP) will use a computer to record details during appointments.

One of the key features that has driven the development of computerisation has been the widespread availability of electronic communications. Electronic delivery of pathology results into patient records was a major productivity boost for New Zealand practices endeavouring to put in place a paperless practice. It was also the first clinical application in Denmark. Likewise, delivery of electronic discharge summaries and specialist letters removed a swathe of paper-based communications. Today it is commonplace for a medical practice to exchange clinical information electronically with 50–60 other medical organisations on a daily basis.

In the New Zealand health sector there are only two applications for which electronic communication is mandatory; electronic claiming for payment from government and connection to the national child immunisation register. However, there are a number of other healthcare programmes that GPs cannot participate in unless they use electronic communications. Today, there is a general assumption that any new service or healthcare programme will use electronic systems.

The initial growth of electronic communications in New Zealand occurred because of the efficiency benefit it brought to general practice. Today, use of electronic communication between primary and secondary care providers continues to grow at approximately 30% per annum. There is a general expectation that any information sent from a hospital, after-hours clinic or specialist will be in the patient’s file on the referring doctor’s computer within two hours of the patient being seen.

The advent of online enquiries and web services-based ‘real-time messaging’ has further extended these expectations and now clinicians want to have systems that will allow them instantaneous access to information such as approval to prescribe medicines that are not part of the medicines schedule.

### Automated medication prescriptions

Simplified repeat medication prescribing is a major benefit to Danish physicians. A process that used to entail having to pull charts and hand write a script now takes ten seconds – interestingly, this is a comment frequently made by British primary care physicians as well. Danish physicians say that they have much quicker access to all of their patient data – particularly recent reports and results. They are able to finish all that needs to be done while the patient is still present.

The automation of medication prescriptions not only addresses legibility concerns, it can be a significant time saver, particularly for repeat prescriptions, and offers the potential to make use of decision support capabilities – in some cases as part of a national pharmaceutical association database. Simplified prescribing, including access to lists of generic drugs is often seen to be of value also.

In Denmark, primary care physicians enter all medications themselves. They access a drug database that is maintained centrally by the national Danish Drug Agency. The agency automatically updates the physician office systems every 14 days. Physicians are required to use the lowest cost drug unless a ‘no substitution’ order is given. Most systems provide some decision support in terms of drug–drug interaction, warnings concerning pregnant patients, etc. A major focus since 2007 has been to develop national standards in terms of decision support which all vendor systems will be required to introduce into their systems. The medication decision support is realised using the central medication database and the MedCom virtual private network (VPN) data network. The development and dissemination is a co-operative project with MedCom, the Danish Doctors Association, primary

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**Table 1 Benefits of automation in primary care physician practices**

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>More timely communication with other clinicians</th>
<th>Simplified repeat prescription</th>
<th>Quicker receipt of results</th>
<th>Saving time</th>
<th>Improved patient management (easier to find records)</th>
<th>Legibility of records and forms (who wrote what)</th>
<th>Data for clinical research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>1</td>
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<td>6</td>
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<td>New Zealand</td>
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Care physician vendors and the Danish Medicine Agency.

After the physician has selected the patient’s pharmacy from a pull-down menu (often a default menu), the prescription is sent electronically to the specific pharmacy. Currently, over 85% of prescriptions in Denmark are sent electronically to pharmacies through a national prescription database. All 321 pharmacies with three different information technology (IT) systems are able to receive electronic prescriptions.

As of January 2007, pharmacies receive prescriptions from GPs through the prescription server. An acknowledgement from the pharmacy is automatically sent back to the physician office system. MedCom is considered more secure than normal mail; the value added network (VAN) checks the validity of the phone number calling in. The VAN (the mailbox handler) also uses a VPN technical solution whereby the internet is used; the VPN has a hardware box at both the sender and receiver sites, which encrypts all the data transmissions. All users have a single logon and password, which is never changed. Apparently there has never been a privacy issue with MedCom (which is not the case when it comes to electronic patient records in hospitals).

As of 2005, all dispensed medications are kept in the Danish Medicine Agency central database (as has been the case since 1995 with British Columbia’s PharmaNet system); this database is accessible via an internet portal to those physicians and patients who have a digital signature.

In New Zealand, electronic prescribing is just beginning to take shape. Under New Zealand law, medicines cannot be prescribed electronically without approval from the Director General of Health. However, there are currently applications in front of the Director General and trial implementations in progress. New Zealand’s Government-run drug purchasing agency, Pharmac, sets a schedule of medicines that may be prescribed (and paid for) as a matter of course. GPs and specialists are only able to prescribe medicines outside of the schedule via ‘special authorisation’. Gaining special authorisation is now achieved online using a web-services interface. This is one of a number of web-services applications now either under development or on their way toward widespread use.

Saving time

Though there is apparently little hard data available, some Danish physicians have said they save an hour per day of staff time through using electronic systems – a finding which is different from others’ experience, e.g. with the new ‘Choose and Book’ system in England. As a result, Danish physicians are able to see more patients – the estimate is 10% – which they argue covers the cost of the computer system. Two surveys in 1998 found that a primary care physician saves more than 30 minutes each day as a result of receiving electronic lab results and discharge letters and sending electronic prescriptions.

Danish physicians also report that they now have much quicker access to all of their patient data – particularly recent reports and results; they are therefore able to finish all that needs to be done while the patient is still present. Recent studies in Denmark have found that 50 minutes is saved per day in each primary care physician practice, telephone calls to hospitals are reduced by 66% and €2.3 is saved per message (of which there are 50 million per year).

New Zealand physicians share the same view, that using electronic systems saves staff time, although there has been no formal analysis or study of this.

Growth of key applications in New Zealand

Online forms technology

Use of electronic referrals between general practices and hospitals is proving highly useful and is growing very rapidly. Each hospital publishes a range of referral forms (in contrast to Denmark’s ‘one letter’ system) each of which can be downloaded and automatically populated by electronic medical record (EMR) software before transmission to the hospital as a Health Level Seven (HL7) message. The incoming referrals are then automatically loaded into the hospital’s patient management system and acknowledged.

The key benefits of this process are the efficiency with which the referring GP can effect transfer of care, the automated acknowledgement of the referral receipt and the automatic insertion of the referral into the hospital’s information system.

Web services

More than 80% of New Zealand’s general practices are using web-services technology and the first of a new generation of real-time messaging services. A typical example of this is use of web services to gain authorisation for use of a ‘non-schedule’ pharmaceutical product. The New Zealand Government’s central drug purchasing authority, Pharmac, tightly controls which pharmaceuticals are subsidised. Approval to get a subsidy for a non-authorised medicine has been a cumbersome and time-consuming process, creating significant discomfort for patients.
What was once a process involving a two-week delay and the faxing and posting of forms has now been transformed into a 20-second one, using a real-time online submission process to gain approval. This has been made possible using web services and synchronous HL7 communications with Pharmac’s approval system. A number of online services are being made available to GPs using this technology.

New government initiatives

The New Zealand Government is currently investing significant effort into overhauling its central systems and enabling them to be accessed electronically using web-services architecture.

The general belief that New Zealand will not develop a centralised electronic health record (EHR) has galvanised action behind initiatives to develop a distributed infrastructure. However, no formal discussion has taken place over record sharing and intense debate as to how this will be achieved is now under way. Constant sector reform since 1993, while in many respects disruptive, has provided opportunities to develop IT capacity in support of the structural changes. New Zealand was one of the first countries in the world to adopt HL7 standards. This successful alignment of efforts behind HL7 was instrumental in promoting rapid growth and it eased the system integration headache as more and more vendors improved their support of HL7.

Effective establishment of private–public partnerships, including a very effective Health Sector Integrator model, meant that the New Zealand Government could take advantage of the expertise and agility of the private sector whilst minimising its own investment in technology. This approach also stimulated growth of an industry segment that government could contract with to develop core infrastructure and run services and utilities.

Discussion

Denmark and New Zealand appear to have much in common. In both countries there has been and continues to be considerable effort going into development of IT standards. However, in Denmark this standardisation is performed primarily by one organisation, MedCom, whereas in New Zealand there is a wider consultation process in place and a formal standards development process aligned with international standards development processes.

In both Denmark and New Zealand the governments recognised the importance of IT and gave physicians financial assistance – though the amounts are small in comparison to other jurisdictions within Europe.

In Denmark, MedCom is the focal point for IT collaboration whereas in New Zealand a number of government and private sector organisations are involved in a widespread on-going collaboration. However, implementation efforts in New Zealand have generally been spearheaded by HealthLink, which is a similar organisation to MedCom. Thus, both countries have benefited from having a single, focused organisation taking a lead in development of communications technology and providing integration and support. This has without doubt been a key factor in the level of progress that each country has been able to make.

We would add that having single, focused organisations such as MedCom and HealthLink seems to have helped significantly in each country. While the ownership of each entity is somewhat different, their histories and make-up are remarkably similar.

Finally, there is a generally held view that there will not be any form of single national or central EHR in either Denmark or New Zealand. However, there are groups of people across New Zealand attempting to develop regional repositories of health information, while a major unresolved issue over health information privacy is significantly slowing development of further automation. Industry leaders hope that these issues will be addressed satisfactorily over the next few months, allowing progress to continue.

Conclusion

Box 1 summarises a number of critical success factors in Denmark, many of which generally apply to New Zealand; these findings are based on internal MedCom documentation and on the work of Jonathan Edwards of Gartner. These include:

Viewing standards as a starting point for developing connectivity solutions rather than a panacea that will itself solve interoperability problems is an approach that appears to have served both countries well. Both MedCom and HealthLink have taken a ‘sleeves rolled-up’ approach to developing local implementations of international standards and using them in a manner that makes it easy for users rather than insisting upon rigid conformance at every step.
## Box 1 Success factors

### Denmark

1. Support for adopting standards is paid for by others and not by the physician. Project coordinators at hospitals involved staff in determining the data to be communicated electronically and developed new procedures for handling electronic messages. Data consultants trained physicians and their staff on how to use electronic communications. In Denmark, physicians were paid to help hospitals and regions communicate better with physician practices.

2. Clinicians need to be involved in the precise content of the standards. This process, though time-consuming, resulted in more accurate communications and was critical in educating clinicians about the value of IT.

3. Peer pressure through public monitoring of participation has been a helpful factor in Denmark. The MedCom website displays a running total of electronic messages sent, participating counties and compliant vendors.

4. A gradual approach with realistic time frames is needed. There was an acceptance by all parties that the adoption of electronic communication would take many years and should not be rushed.

5. Financial incentives encourage physicians to adopt EMR systems. Physicians in Denmark are independent contractors who make independent decisions about IT. Physicians who adopted EMR systems and used the MedCom standards were reimbursed more quickly.

6. Incentives to vendors. No-one required healthcare organisations to use a particular vendor. Counties encouraged vendors to upgrade their hospital applications to MedCom standards by committing to purchasing the upgraded applications.

7. Culture of consensus. MedCom is funded by many different stakeholders and is viewed as an impartial organisation.

8. Taking a project-based approach. Approximately half of MedCom’s budget is spent on permanent employees and overheads. The rest is devoted to projects. MedCom believes that this approach has given it more flexibility.

### New Zealand

1. In New Zealand, HealthLink adopted a commercial model which used payment from laboratories, hospitals and government agencies to fund the majority of the costs of service delivery. General practices pay 30% of the costs of the HealthLink service.

2. HealthLink has continued to develop implementation guides to give precise guidance to system developers and to reduce ambiguity in standards.

3. HealthLink’s efforts to introduce new technology have been aided by pressure from GPs to hospitals and laboratories to provide electronic delivery mechanisms.

4. This approach was also adopted by New Zealand.

5. Incentives to assist claiming increased the speed of uptake in New Zealand.

6. In New Zealand, vendors have been paid to add new functionality to their systems.

7. HealthLink is very much like MedCom in this regard.

8. HealthLink likewise spends a large proportion of its budget on projects and it actively seeks out viable new projects that will help it to push the agenda forward.
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CONFLICTS OF INTEREST

None.

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