Chapter 1. Generating Value from Health ICTs

Chapter 1 illustrates the types of benefits that can result from implementation of ICTs. It provides examples of how governments are exploiting these technologies as key building blocks in national health reform strategies and to enable innovation in health care delivery.

Introduction

Understanding how ICTs can generate "value" in health systems can help to guide decision about ongoing and future ICT initiatives, underpin the business case for further investment and identify outcome drivers.

The term "value" in this report implies a broader view of how ICTs can produce results than the usual metrics commonly used in return on investment analyses (ROI).

In the health sector there is often no measure of performance analogous to profits for private sector firms. While a non-healthcare business selecting its investments in ICTs might consider only financial return on investment, health care is a sector that places an unusual emphasis on non-financial goals. In health care, a standardised production process is difficult to identify, and, depending on the care setting, there is considerable variation in how and what outputs are produced, and what type and mix of inputs are used to produce them.

For example, if ICT is used by a hospital to raise the quality of care or change the mix of services it provides, the resulting financial costs and benefits to the hospital will depend on how the care is delivered and paid for and the extent of transformation required in workflow and processes. How ICTs are used and the context in which they are used are both critical to maximising potential benefits.

Embedded in this challenge is, however, a substantial opportunity: to improve health care quality and reduce health care costs through ICTs – by improving the efficiency with which health care is delivered, and reducing the delivery of services with little or no value. While the case studies are not perfect, they do illustrate the types of benefits that can result from ICT implementation according to four broad, inter-related categories of objectives listed below:

- Increasing quality of care and efficiency.
- Reducing operating costs of clinical services.
- Reducing administrative costs.
- Enabling entirely new modes of care.

1.1. Health information technology can drive improvements in quality and efficiency in health care

A large body of literature has recently emerged that addresses the experience of specific organisations or providers in implementing a variety of ICT technologies such as electronic medical records (EMRs), e-prescriptions, and Computerised Physician Order Entry (CPOE) systems (Scott *et al.*, 2005; Chaudhry *et al*., 2006; Shekelle and Glodzweig, 2009). Overall, it demonstrates that, given the right conditions, health ICTs can drive improvements in quality and efficiency in health care.

With regard to the quality of the care delivered, the studies tend to agree that the greatest contribution of ICTs so far has been in significantly increasing patient safety. Three types of medical error are common: errors due to forgetfulness or inattention, errors of judgement in planning (rule-based errors), and errors resulting from a lack of knowledge (knowledge-based errors). In 2001, the Institute of Medicine (Institute of Medicine, 2001) reported that improving patient safety requires an information system that can prevent errors from occurring in the first place, and which makes it easy for health care professionals to acquire and share information related to quality improvement.

Tools that include alerts on a patient's potentially serious health condition or risk, and facilitate communication between providers have been cited as providing substantial benefits in health outcomes (Bates *et al.*, 2001; Bates *et al.*, 2003). Communication between patients and providers is also vitally important for safety, especially at the hospital/primary care interface.

In all the case studies referred to in this report, patient safety elements were built into the various ICT systems being deployed, including greater availability of medical information such as online access to clinical guidelines or drug databases and clinical decision support tools. These features were key requirements in the secure electronic messaging and patient management solutions developed by the Great Southern Managed Health Network in Western Australia (Box 1.1). It is clear from interviews that they can substantially improve the safety of medical care by improving clinical staff actions/workflows and bringing evidence-based, patient-centred decision support to the point of care.

A related major effect of health ICT on patient safety and the overall quality of the care delivered is its role in increasing compliance with guideline- or protocol-based care (Chaudhry *et al*., 2006), particularly in the management of chronic diseases such as asthma, diabetes or heart failure.

These conditions require regular monitoring of patients to track trends in clinical parameters and rapidly identify any deviations; this task can be dramatically facilitated by ICT. Disease management tools can also play a key role (Balas *et al.*, 2000).

Box 1.1. Integrated medication management solutions

The secure electronic messaging and patient management solution developed by the Great Southern Managed Health Network (GSMHN) in Western Australia includes not only the basic information usually stored in paper records, but also additional safety features such as allergy lists and automatic alerts to warn doctors of potentially harmful drug interactions. These features can also facilitate medication reconciliation, *i.e.* auditing the medications currently being prescribed to a patient before admission with what is continued after admission to hospital. This ensures that any discrepancies are brought to the attention of the prescriber and changes can be made where appropriate.

Key features for improving medication management include:

- Pre-populated online forms and access to, and use of, approved abbreviations.
- Access to, and use of online medicines databases (e-MIMS).
- Access to online treatment guidelines.
- Easily accessible information for reconciling the medications prescribed to a patient.
- Automatic high-risk drug and allergy lists and alerts.

Through the use of a chronic disease management (CDM) toolkit and associated decision support tools, such as flow sheets, the province of British Columbia (Canada) has achieved significant improvements in chronic care guideline compliance at a nominal cost. Findings indicate that, compared with baseline data, the proportion of people with diabetes who had HbA1c, blood pressure and lipid tests complying with guidelines from the Canadian Diabetes Association, improved between 2001/02 and 2004/05 from 21.8% to 48.6% (Box 1.2). Through the combined implementation of new approaches to care delivery, guidelines and the use of the CDM toolkit, over the same period, the cost of diabetes care in the province dropped from an average of CAD 4 400 (Canadian dollars) to CAD 3 966 per patient. In Canada, a relatively modest investment in IT has led to a major rapid change in diabetes care, yielding significant payoffs.

Box 1.2. Improving compliance with clinical guidelines in British Columbia

In 2002, chronic disease research identified a problem of low adherence to recommended clinical guidelines for diabetes, with only 39% of people with diagnosed diabetes in the province receiving two or more haemoglobin (Hb) A1c tests, and only 34% undergoing a microalbumin test. Driven by the need to improve compliance, in 2002 health officials in British Columbia established yearly targets and financial incentives to improve diabetes care, which included two or more HbA1c tests annually.

In addition, British Columbia established patient registers for diabetes and congestive heart failure to encourage health professionals to be proactive in scheduling tests and reporting information. In 2003, as part of a three-year project with funding from the Primary Health Care Transition Fund (PHCTF), British Columbia also implemented an expanded chronic care model. Implementation involved the development of an interim, web-based information system for three chronic conditions: diabetes, congestive heart failure and major depressive disorder. The interim system was later developed to provide the chronic disease management (CDM) toolkit.

The CDM toolkit incorporates clinical practice guidelines in flowsheets, and includes other features that health professionals can use to monitor and evaluate the impact of the care provided on their diabetes patients. The indicators collected for diabetes by the CDM Toolkit improved the management of diabetes by increasing the percentage of diabetic patients who undergo the recommended best practice of at least two haemoglobin A1C tests per year.

The redesign of the delivery system encouraged and expanded the scope of activity of medical office assistants (MOAs), and led to the introduction of a small number of nurses and dieticians into physicians' offices to trial multidisciplinary care, and experiment with Community Collaborative projects and Group Visits. Decision support tools, such as flow sheets, were developed to guide daily work, and substantial efforts were made to foster self-management.

The most frequently cited effect of ICTs on efficiency is related to reduced utilisation of health care services

On efficiency**,** or value for money, the most frequently cited positive effect is attributed to reduced utilisation of health care services. More effective information sharing, such as rapid electronic delivery of hospital discharge reports or the use of Computerised Physician Order Entry (CPOE) that delivers decision support at the point of care, can reduce the uptake of laboratory and radiology tests (Bates, Leape *et al.*, 1998, 1999; Harpole *et al.*, 1997; Rothschild *et al.*, 2000) – according to Chaudhry *et al.* (2006), sometimes by as much as 24%. In most cases, clinical decision support features can also influence prescribing behaviour, and save money by

informing physicians about "comparative effectiveness" of alternative medical treatments. This could offer a basis for ensuring that existing costly services are used only in cases in which they confer clinical benefits that are superior to those of other, cheaper services. These benefits on utilisation of health services increase as more of the available decision support features are used, and as the time horizon is lengthened (Government Accountability Office, 2003).

Case studies show that the use of Picture Archiving and Communication Systems (PACS) which allows the digital capture, viewing, storage and transmission of medical images was viewed positively by both referring physicians and radiologists. Physicians generally reported that they were able to reduce the number of repeat tests, and make decisions about clinical care more quickly. Efficiency gains included the ability to see more patients and interpret the results of diagnostic tests more quickly – a process sometimes referred to as "throughput". This means that turnaround time is shorter, and there is less waiting around for both tests and results, which also means that there is less delay before treatment can be started. This leads to increased capacity, more effective healthcare and more satisfied consumers (Box 1.3).

Box 1.3. Benefits of investments in picture archiving and communication systems

PACS is a computer system that replaces conventional x-ray film, and greatly improves access to patient information by making it possible for referring clinicians to review their patient's images on PCs from their own offices. Hitherto, in rural areas information such as lab test results and discharge summaries has sometimes taken days or weeks to retrieve and access. PACS also benefits radiologists who also have improved access to patient data and no longer have to forward information to other health care facilities.

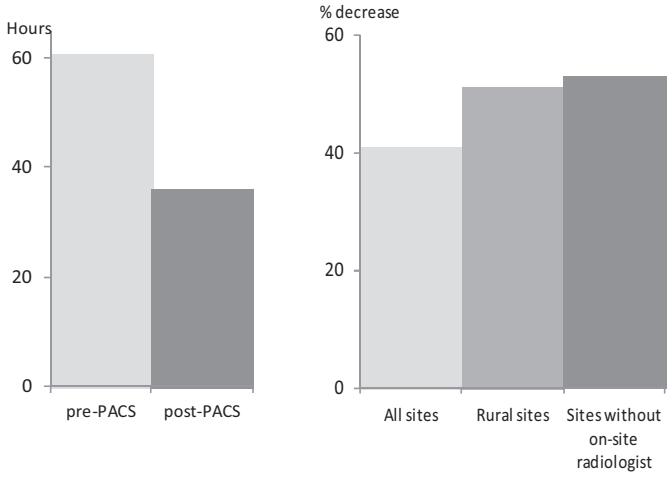
British Columbia has employed both quantitative and qualitative approaches to measuring the benefits of investments in PACS. A PACS Opinion Survey was devised to record end users' opinions about the impact of PACS on such areas as provider efficiency, patient care, report turnaround time and communication. The survey was conducted in three provinces (Ontario, Nova Scotia and British Columbia), and administered to radiologists and referring physicians deemed to be high users of the system. The survey was completed by 78 radiologists (43.1% response rate) and 181 referring physicians (17.6% response rate). The vast majority of radiologists and referring physicians indicated that PACS had improved their efficiency, with 87.2% of radiologists reporting that PACS had improved their reporting and consultation efficiency, and 93.6% indicating that it had reduced the time they had to spend locating exams for review.

According to referring physicians, PACS had also a positive impact on patient care, with two-thirds of respondents indicating that PACS had improved their ability to make decisions

regarding patient care, 80% reporting that PACS has reduced the time they had to wait to review an exam (images), 58% indicating that PACS had reduced the number of exams reordered because the results were not available (*e.g.* lost or located elsewhere) when they needed them, and 43% reporting that PACS has reduced the number of patient transfers between facilities due to the new ability to share images and consult remotely.

A separate analysis of report turnaround time, defined as the time from patient registration in diagnostic imaging to when a draft report is available to the referring physician on the system, was conducted on data extracted for 22 sites in British Columbia. The analysis showed that report turnaround time decreased following the implementation of PACS by 41% (mean turnaround time decreased from 60.8 hours pre-PACS to 35.9 hours post-PACS).

Figure 1.1. Decrease in report turnaround time following PACS implementation



Source: Northern Health Authority (British Columbia).

1.2. Reducing operating costs of clinical services

ICTs can contribute to the reduction of operating costs of clinical services through improvement in the way tasks are performed, by saving time with data processing, reduction in multiple handling of documents etc.

Experience in other sectors shows that this can have a positive effect on staff productivity. The evidence in the health sector is, however, generally mixed. ICTs can reduce some of the work involved in collecting patient information and getting it to where it is needed. Effects on physician's time, however, vary significantly and depend on the technology, the level and

type of decision support tool adopted, and individual's experience (Garg *et al.*, 2005). In the six case studies presented in this report, GPs rarely reported a reduced workload as a result of using electronic medical records, with only Swedish physicians mentioning savings of approximately 30 minutes a day as a result of using e-prescription.

On the other hand, allied health professionals in Western Australia consistently reported that using electronic messaging saved them time in a range of activities. They related this gain to easier access to patient data, faster communication, and the availability of higher quality and more complete data. Similarly, pharmacists in Sweden reported that processing prescriptions had become quicker and easier through the use of e-prescriptions and that they needed to make fewer phone calls to physicians. E-prescribing had reduced dispensing-related costs, since labour typically represents the lion's share of dispensing costs in community pharmacies. This could improve customer satisfaction, while also allowing staff to provide new services that could help diversify the pharmacy's revenue base.

1.3. Reports on cost-savings tend to be anecdotal in nature

In the countries covered by the case studies, the evidence on cost-savings was generally limited. This was due to a lack of systematic project evaluation, and the absence of baseline values and of robust measurement. There are also evaluative challenges in assessing ICTs which include isolating its impact from other, perhaps concurrent, technological improvements and organisational initiatives. The realisation of benefits from ICT implementation also strongly depends on contextual conditions. For example, moving to an EHR in its fullest form is not just a technical innovation; it is a cultural transformation. Change management is vital for successful uptake, and failure to build in processes for effecting the transformation will reduce both uptake and impact. There is also ample evidence to show that many ICT projects fail due to social and cultural issues or the absence of the necessary supporting policy frameworks. Successful adoption and use of the chronic disease management toolkit in British Columbia depended on the simultaneous implementation of new service delivery models, organisational partnerships, changes in GP compensation, and clear and dedicated leadership.

It is also necessary to recognise that there may be lags between ICT investments and benefit realisation (Devaraj and Kohli, 2000). Recent studies, for example, suggest that the financial benefits are not realised until a level of functionality is reached that allows systems to truly serve the needs of clinicians and system planners (Pricewaterhouse Coopers, 2007; Stroetmann *et al.,* 2006).

The upshot is that while most of the case studies in this report had included some sort of formal evaluation to justify initial budgets, few were mature enough or had conducted a formal post-implementation evaluation to determine the actual payoff of the projects or programmes.

There have also been very few studies that have attempted to forecast the economic impact of ICT on the health system as a whole – which is unsurprising given the difficulties in measuring output in this sector. A recent study by the United States Congressional Budget Office states, "no aspect of health ICT entails as much uncertainty as the magnitude of its potential benefits" (Congressional Budget Office, 2008; see Box 1.4).

There is a clear need for a more organised approach to systematic research in this area to assist OECD governments to determine which investment strategies are most likely to achieve savings.

Box 1.4. Report on the costs and benefits of health information technologies in the United States (US Congressional Budget Office)

The CBO report, published in 2008, provides an overview of the current challenges in estimating the value of health information technologies (ITs). The questions of primary concern to the CBO were: If the federal government took steps to stimulate the adoption of health ITs, what would be the likely impact? Would such steps ultimately reduce healthcare costs and, if so, by how much? The report analysed the cost saving estimates from two major studies performed by the RAND Corporation and the Center for Information Technology Leadership (CITL).*

The RAND study, a modelling exercise based on a broad literature survey of evidence of health IT effects, estimated that potential IT-enabled efficiency savings for inpatient and outpatient care could average more than USD 77 billion per year. Additionally, the study noted the potential for significant patient safety benefits from electronic record systems, especially those that can reduce the 200 000 inpatient adverse drug events, some of which are due to poor information transfer, possibly saving about USD 1 billion per year. Avoiding two-thirds of the medication errors and adverse drug events that occur in an ambulatory care setting could result in annual national savings of USD 3.5 billion. RAND also noted the potential for improvements in short-term preventive care through reminders to patients and clinicians about compliance with preventive care guidelines. Although e-increased use of preventive services leads to higher, not lower, medical spending overall, RAND concluded that the additional costs are not large and the health benefits are significant. Widespread adoption of advanced electronic health record systems also creates a platform for significant improvements in chronic disease prevention and disease management. RAND estimated that the potential combined savings of reducing the incidence of chronic disease attributable to long-term prevention and reduced acute care due to disease management would be USD 147 billion per year.

As is the case with any modelling project and prospective estimates, both this study and that of the CITL were subject to numerous assumptions and judgments. The CBO report notes that "both studies appear to significantly overstate the savings for the health care system as a whole – and by extension, for the federal budget – that would accrue from legislative proposals to bring about widespread adoption of health ITs. It concludes that Health ITs appear to be necessary but not sufficient to generate cost savings; that is, health IT can be an essential component of an effort to reduce cost (and improve quality), but by itself it typically does not produce a reduction in costs".

* CITL examined technologies for the electronic flow of information among healthcare organisations focusing on the value of health information exchange and interoperability (HIE&I). Results of the CITL-HIE&I analyses are reported in: Pan (2004) and Walker *et al.* (2005).

Source: Hillestad *et al.* (2005); Linder *et al.* (2007); Walker (2005).

1.4. Health care organisations can reap non-financial gains from ICTs

Despite the difficulty of measuring the cost-benefits associated with investments in ICTs, increasing numbers of health care organisations are reaping "non-financial", intangible gains from these technologies. This means that to appreciate fully the benefits that can accrue from ICT implementation, it is often necessary to look beyond financial results to more qualitative impacts, including patient and provider perceptions. In Western Australia, together with confidentiality, speed of communication was the most commonly perceived intangible benefit (*e.g.* the prompt receipt of discharge summaries from hospitals – previously often arriving after the patient had been seen by the GP following surgery). For some GPs and allied professionals an additional intangible benefit is the possibility to access patient information at multiple locations (*e.g.* their private practice, a residential aged care facility or hospital). GPs in Western Australia and Canada were pleased that they did not need to return to their practices to consult patient data or clinical notes. These time gains may lead to improved quality of life, decision making, and higher quality of care including more patient satisfaction.

1.5. Administrative processes such as billing represent in most countries a prime opportunity for savings

Administrative processes such as billing represent in most countries a prime opportunity for savings. Duplicative requirements and idiosyncratic systems can drive up the cost of care, with insurers and providers sharing the greatest burden of the administrative processes.

Among the case studies, experts in Massachusetts reported staggering administrative cost savings as a result of introducing electronic claims processing through the New England Healthcare Electronic Data Interchange Network (NEHEN), a consortium of providers and payers established in 1997. Claims that cost USD 5.00 to submit in labour costs per

paper transaction, after the introduction of NEHEN, were processed electronically at 25 cents per transaction (Halamka, 2000). By 2006, the network was processing more than 4.5 million transactions every month, representing 80% of all transactions in the State of Massachusetts. Through this intensive use, NEHEN has been able to significantly reduce the cumulative annual administrative costs for its members. For example, the health care provider Baystate Health was able to save more than USD 1.5 million through lowered transaction fees in less than three years, between September 2006 and April 2009. Savings are driven in large part by achieving administrative simplification and by slashing the time taken to process billing and claims-related information manually.

Despite the evidence of cost reductions, by 2009, an estimated 35% to 40% of US physicians still relied on paper claims submissions. Neither of the two major technologies used in electronic payment, electronic data interchange (EDI) and electronic funds transfer (EFT), had been widely implemented in other states. Barriers ranging from lack of nationwide standards, to infrastructure cost and inconsistencies in requirements from the different payers have hindered widespread adoption of these technologies.

In Australia, electronic claiming over the internet has been available since 2002 when Medicare Online was introduced. Similarly to the United States, uptake by physicians has been slow. In order to accelerate adoption and use by physicians, in 2007 the Australian Government introduced a range of incentives. In May and June 2009, Medicare Australia also ran a targeted communication campaign to promote Medicare electronic claiming to the Australian public. Although data was limited, in Western Australia, physicians reported faster communication, fewer telephone calls, and savings in mail handling, stamps, and paper.

1.6. Achieving "transformation" through ICTs

ICTs can also generate value by enabling innovation and a wide range of changes in the process of care delivery, which may (or may not) improve cost efficiency (*i.e.* reduce net expenditures) (Coye *et al.*, 2009). As evidence for these effects has accumulated over the past decade, ICTs have also been defined as technologies with a transformative potential, in that they can open up the possibility of entirely new ways of delivering care. Health ICTs can achieve "transformation" by effectively providing means to implement changes that are otherwise impossible to envisage without these technologies (*e.g.* establishing new models of care delivery/access to care in remote and rural areas).

The case studies reviewed here provide good examples of how governments have significantly leveraged this transformative potential while

pursuing health care reform agendas. In general, there are three broad goals and change agendas that governments have successfully pursued with ICT implementation.

Primary care renewal

In many countries, primary care represents the main entry point into the health care system for all the individual's health-care needs and problems. It provides ongoing person-focused care, and co-ordinates or integrates care provided elsewhere or by others. Starfield's (1994) description of primary care as "first-contact, continuous, comprehensive, and co-ordinated care provided to populations undifferentiated by gender, disease or organ system" encapsulates the main attributes of primary care. Countries with health systems that are more oriented towards primary care achieve better care co-ordination and health outcomes, greater life expectancy, better patient satisfaction and lower overall health care costs (Renders *et al.*, 2001; Davis *et al.*, 1999; Starfield *et al.*, 2002, 2005) The primary health care system also serves essential public health interests by providing an infrastructure for detecting unusual health events, and a vehicle for rapidly disseminating information and care during a national health emergency.

Not surprisingly, in the six countries covered by the case studies considered here, ICTs are central to efforts to renew primary care, generally by targeting three areas of considerable need: improvement of chronic care, multipurpose service delivery and better care co-ordination. These objectives are not necessarily mutually exclusive, and are indeed closely linked. Choosing these targets has ensured that projects that could have otherwise drifted and become "technology for the sake of technology" in fact had a discernable health focus.

As we will discuss later, the implementation of ICTs to achieve change in primary care was without exception combined with the realignment of incentives as well as a strong business case intended to motivate the adoption of ICTs by the many diverse stakeholders. Health ICT adoption was also tightly coupled with a reassessment of the clinical care model as well as directly involving clinicians from start to finish.

Improved access to care

The fragmented approach towards health care delivery, combined with inequities in access to care that reflect geographic, socioeconomic, and cultural disparities can create a care gap for citizens. A range of ICTs can help to bridge this gap by providing a cost effective means to deliver quality care to remote or under-served populations. A number of studies have shown, for example, that telemedicine can be used in many situations to overcome and redress workforce shortage and the often skewed distribution

of physicians, and particularly of specialists, between rural and urban settings (Jackson *et al*., 2005; Balamurugan *et al.*, 2009; Shea *et al.*, 2006; Izquierdo *et al.*, 2003; Bashshur *et al.*, 2009).

In all six case study countries, telemedicine services are being used to great effect in areas with large rural or remote populations. In the Balearic Islands, for instance; telemedicine is now providing emergency stroke care to patients who previously had no access to this (Box 1.5).

The introduction of telemedicine in British Columbia has allowed patients in rural areas to be assessed closer to where they live. Figure 1.2 shows how the number of patients who were seen following thoracic surgery increased significantly after telemedicine was introduced in December 2003. It also shows how in 2004, just one year post implementation, telemedicine gradually became the preferred mode of service delivery.

Similarly, in Australia, telemedicine is a critical component of the Western Australia Country Health Service's strategic plan for delivering care to the indigenous population.

Box 1.5. Improving access to emergency stroke care in the Balearic islands through telemedicine

Tissue plasminogen activator (tPA), a powerful clot-busting drug used in stroke treatment, is effective in improving outcomes in patients if used within three hours of stroke onset. Despite the evidence, prior to the introduction of the telestroke programme the number of patients actually receiving tPA in the Balearic Islands was limited. Two of the limiting factors were the shortage of available acute stroke expertise in emergency departments and limited access to a hospital stroke unit. Neurologists often cover several hospitals, making it difficult for them to evaluate acute stroke patients on site when needed. In addition, emergency room physicians typically do not have the requisite experience to make decisions about thrombolytic therapy without the backup of a vascular neurologist.

The regional health authority's (Ib-Salut) drive to modernise health care IT began in 2004, and physicians recognised an opportunity to extend stroke care services to the more scattered parts of the region. To do so, they exploited the new regional patient electronic health records to make critical patient data available not only at the point of care, but to all essential care providers. For stroke care, this has meant that physicians can now share a patient record instantly across the region with stroke team neurologists at Hospital Son Dureta. This has eliminated fragmentation, and provided a continuity of care that did not exist before.

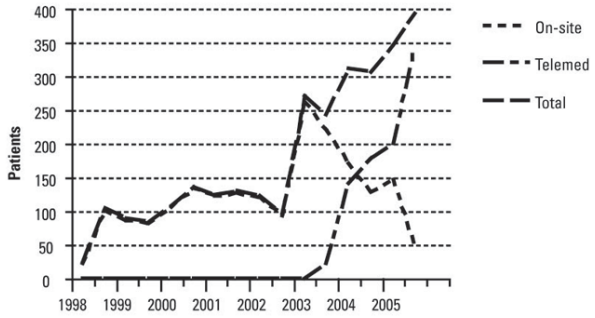
A Picture Archiving and Communication System is used to allow the rapid sharing of essential radiological imagery to make the confirmatory diagnosis of the stroke and its category by neurologists at Son Dureta.

The Balearic network merges audio, video, and data transmission to enable Son Dureta neurologists to be "virtually" present at the bedside of a stroke patient anywhere in the region.

Furthermore, the Balearic telestroke programme has turned out to be much more than just a technology project; it has brought about a fundamental change in the attitude to and understanding of stroke within the community. Through the use of community education and awareness campaigns, Ib-Salut has created a community awareness that was virtually non-existent before. In addition, Ib-Salut has provided stroke management training to over 500 primary care physicians in the region, as well as training physicians and nurses in emergency response teams,. Care providers are now not only better able to recognise and evaluate strokes, they also now realise that treatment is possible and that time is critical. Ib-Salut officials noted that the attitudes of physicians and nurses seeing stroke patients have gone from being "nothing can be done" to "every second counts because there is so much we can do". As a result, the programme has been the catalyst for community building and organisation centred on improving stroke outcomes.

Telestroke care, like telehealth in general, transcends distance and geographic boundaries. Patients outside the Palma area now have an equal chance of receiving timely stroke treatment. Twenty-six patients were treated between July 2006 and November 2008. Results on outcomes show that the efficacy and safety of telestroke care is comparable to those of direct care, with three months post-stroke cure rates of 59% for patients receiving face-to-face care versus 55% for those receiving telestroke care.

Figure 1.2. Thoracic surgery patients seen at outreach clinics per six-month period, 1998-2005



Source: Humer *et al*. (2006).

Improved quality of care measurement and performance monitoring

The delivery of quality health care is a fundamental goal of all health systems. Increasingly, both hospitals and other medical practices are being judged by systematic measurement and reporting of their performance. However, across most OECD countries, measuring the quality of the health care is a labour-intensive and time-consuming process and generally occurs retroactively.

Case studies show that automated data collection and processing can provide richer data in an accessible form that facilitates benchmarking and identification of quality improvement opportunities. It can also enhance

documented adherence to quality assurance criteria and the efficiency of surveillance, population and outcomes research (Kukafka *et al.*, 2007).

In the United States, the Massachusetts e-Health Collaborative (MAeHC) has enhanced the information-gathering capabilities of physicians, and improved the electronic capture of laboratory, pharmacy and other data sources necessary to expand measurement of outcomes. The MAeHC's effort to extract health care quality data from the community level database, which is an agreed-upon subset of data stored in physicians' EHRs, offers an opportunity to engage providers effectively and increase alignment between incentives programmes (Box 1.6).

Health authorities and payers can now have a more timely view of how the health system is performing, enabling them to make more relevant decisions about which areas call for clinical improvement, how best to allocate finance, training, and other resources.

Box 1.6. Real-time tracking of the quality of clinical care delivery

Clinical audit has an increasingly important role in the quality of care being offered to patients. Only good quality data can enable valid conclusions to be drawn, which in turn enable changes to be made for the better. In the United States, the development of health ICTs such as EHRs, and collection and analysis of quality of care data have traditionally followed divergent paths. Although more and more patient data are held on computer systems, traditionally, quality data is collected and analysed retrospectively on the basis of insurance claims. Structured electronic data sources can, however, provide useful, and in principle, more accurate and granular complementary information. Improving quality of care measurement has, been a key goal of the Massachusetts e-Health Collaborative (MAeHC) since its inception. Consequently, in implementing EHRs and health information exchanges (HIE) the Collaborative has been attempting to bring these divergent paths back together. The MAeHC has worked with quality and performance experts to develop standardised and nationally-recognised metrics that can be used to monitor impacts on quality and cost of care. Most of the data today is sent directly to a central quality data warehouse, from HIEs via EHRs deployed in physician's practices, together with data from their billing system.

The shorter-term end product has been the production and distribution of EHR clinical performance feedback reports to participating providers, which help them to monitor their own performance and identify clinical areas calling for improvement. These efforts to extract health care quality data directly from HIEs has opened a live window on the performance of the local health system and provided a shorter feedback loop for clinicians who can adjust their working practice as appropriate. It also offers an opportunity to engage providers effectively and increase alignment between incentives programmes, as service delivery data can now be captured in real-time.

References

Balamurugan, A. *et al.* (2009), "A Pilot Study of Diabetes Education via Telemedicine in a Rural Underserved Community – Opportunities and Challenges", *Diabetes Educator,* Vol. 35, pp. 147-154.

Balas, E.A. *et al.* (2000), "Improving Preventive Care by Prompting Physicians", *Archives of Internal Medicine*, Vol. 160, pp. 301-308.

Bashshur, R.L. *et al.* (2009), "National Telemedicine Initiatives: Essential to Healthcare Reform", *Telemedicine and e-Health*, Vol. 15, pp. 1-11.

Bates, D.W., D.L. Boyle *et al.* (1998), "What Proportion of Common Diagnostic Tests Appear Redundant?", *American Journal of Medicine*, Vol. 104, pp. 361-368.

Bates, D.W., G.J. Kuperman *et al.* (1999), "A Randomized Trial of a Computer-Based Intervention to Reduce Utilization of Redundant Laboratory Tests", *American Journal of Medicine*, Vol. 106, pp. 144-150.

Bates D.W., L.L. Leape *et al.* (1998), "Effect of Computerized Physician Order Entry and a Team Intervention on Prevention of Serious Medication Errors", *Journal of the American Medical Association*, Vol. 280, No. 15, pp. 1311-1316.

Bates, D. *et al.* (2001), "Reducing the Frequency of Errors in Medicine Using Information Technology", *Journal of the American Medical Informatics Association*, Vol. 8, pp. 299-308.

Bates, D. *et al.* (2003), "Patient Safety: Improving Safety with Information Technology", *The New England Journal of Medicine,* Vol. 348, pp. 2526-2534.

Chaudhry, B. *et al.* (2006), "Systematic Review: Impact of Health Information Technology on Quality, Efficiency and Costs of Medical Care", *Annals of Internal Medicine*, Vol. 144, pp. E-12-E-22.

Congressional Budget Office (CBO) (2008), "Evidence on the Costs and Benefits of Health Information Technology", Congressional Budget Office, Washington, D.C.

Coye, M., J. Ateret Haselkorn and S. DeMello (2009), "Remote Patient Management: Technology-Enabled Innovation And Evolving Business Models For Chronic Disease Care", *Health Affairs*, Vol. 28, No. 1, pp. 126-135.

Davis, R.M., E.H. Wagner and T. Groves (1999), "Managing Chronic Disease", *BMJ*, Vol. 318, pp. 1090-1091.

Devaraj, S. and R. Kohli (2000), "Information Technology Payoff in the Healthcare Industry: A Longitudinal Study", *Journal of Management Information Systems*, Vol. 16, No. 4, pp. 41-67.

Garg A.X. *et al.* (2005), "Effects of Computerized Clinical Decision Support Systems on Practitioner Performance and Patient Outcomes: A Systematic Review", *Journal of the American Medical Association,* Vol. 293, No. 10, pp. 1223-1238.

Government Accountability Office (GAO) (2003), "Information Technology: Benefits Realized for Selected Health Care Functions", *GAO-04-224*, GAO, Washington, D.C.

Halamka, J.D. (2000), "New England Healthcare EDI Network, The New England Approach to HIPAA", *www.ehcca.com/presentations/HIPAA2/106.PDF*.

Harpole, L.H., R. Khorasani *et al.* (1997), "Automated Evidence-based Critiquing of Orders for Abdominal Radiographs: Impact on Utilization and Appropriateness", *Journal of the American Medical Informatics Association*, Vol. 4, pp. 511-521.

Hillestad, R., J. Bigelow *et al.* (2005), "Can Electronic Medical Record Systems Transform Medical Care? Potential Health Benefits, Savings and Costs", *Health Affairs*, Vol. 24, No. 5, pp. 1103-1118.

Humer, M., A. Luoma and B. Nelems (2006), "Distant Thoracic Surgical Patient Assessment in Rural British Columbia 1985-2005", *British Columbia Medical Journal*, Vol. 48, No. 6, pp. 279-284.

Institute of Medicine (2001), *Crossing the Quality Chasm: A New Health System for the 21st Century*, National Academy Press, Washington, D.C.

Izquierdo, R. *et al.* (2003), "A Comparison of Diabetes Education Administered through Telemedicine versus in Person", *Diabetes Care*, Vol. 26, pp. 1002-1007.

Jackson, J. *et al.* (2005), "A National Study of Obesity Prevalence and Trends by Type of Rural County", *Journal of Rural Health*, Vol. 21, pp. 140-148.

Kukafka, R. *et al.* (2007), "Redesigning Electronic Health Record Systems to Support Public Health", *Journal of Biomedical Informatics*, Vol. 40, pp. 398-409.

Linder, J.A. *et al.* (2007), "Electronic Health Record Use and the Quality of Ambulatory Care in the United States", *Archives of Internal Medicine*, Vol. 167, No. 13, pp. 1400-1405.

Pan, E. (2004), "The Value of Healthcare Information Exchange and Interoperability", Center for Information Technology Leadership (HIMSS), Washington, D.C.

Pricewaterhouse Coopers (2007), *The Economics of IT and Hospital Performance*.

Renders, C.M., G.D. Valk *et al.* (2001), "Interventions to Improve the Management of Diabetes in Primary Care, Outpatient and Community Settings: A Systematic Review", *Diabetes Care*, Vol. 24, pp. 1821-1833.

Rothschild, J.M., R. Khorasani and D.W. Bates (2000), "Guidelines and Decision Support Help Improve Image Utilization", *Diagnostic Imaging*, Vol. 22, No. 11, pp. 95-97, 99,101.

Scott, J.T., T.G. Rundall *et al.* (2005), "Kaiser Permanente's Experience of Implementing an Electronic Medical Record: A Qualitative Study", *BMJ*, doi: 10.1136/bmj.38638.497477.68.

Shea, S. *et al.* (2006), "A Randomized Trial Comparing Telemedicine Case Management with Usual Care in Older, Ethnically Diverse, Medically Underserved Patients with Diabetes Mellitus", *Journal of the American Medical Informatics Association,* Vol. 13, pp. 40-51.

Shekelle, P. and C.L. Goldzweig (2009), "Costs and Benefits of Health Information Technology: An Updated Systematic Review", The Health Foundation, London.

Starfield, B. (1994), "Is Primary Care Essential?", *The Lancet*, Vol. 344, pp. 1129-1133.

Starfield, B. and L. Shi (2002), "Policy Relevant Determinants of Health: An International Perspective", *Health Policy,* Vol. 60, pp. 201-218.

Starfield, B., L. Shi *et al*. (2005), "The Effects Of Specialist Supply On Populations' Health: Assessing The Evidence", *Health Affairs*, Supplement Web Exclusives, pp. W5-97-107.

Stroetmann, K.A., T. Jones, A. Dobrev and V.N. Stroetmann (2006), "E-Health Is Worth It: The Economic Benefits of Implemented e-Health

Solutions at Ten European Sites", DGINFSO, European Commission, Brussels.

Walker, J.M. (2005), "Electronic Medical Records and Health Care Transformation", *Health Affairs*, Vol. 24, No. 5, September/October, pp. 1118-1120.

Walker, J. *et al.* (2005), "The Value of Health Care Information Exchange and Interoperability", *Health Affairs,* Supplement Web Exclusives, pp. W5-10-18.