Rachelle Kaye
is the Director of the Maccabi Institute for Health Services Research and the Deputy Director of the Division of Planning and Finance in Maccabi Healthcare Services, Israel.

Ehud Kokia
is the Director General of Maccabi Healthcare Services and Professor at the School of Public Health Sackler Medical Faculty, Tel Aviv University.

Varda Shalev
is a practicing family physician and the Director of the Medical Informatics Department, Maccabi Healthcare Services.

Dalia Idar
heads the Clinical Computerisation Department in the Division of Health Information Technology at Maccabi Healthcare Services, Israel.

David P. Chinitz
is Associate Professor of Health Policy and Management at the Hebrew University-Hadassah School of Public Health in Jerusalem, Israel.

Rachelle Kaye
Maccabi Institute for Health Services Research
Israel

E-mail: Kaye_r@mac.org.il

Barriers and success factors in health information technology: A practitioner's perspective

Rachelle Kaye, Ehud Kokia, Varda Shalev, Dalia Idar and David Chinitz

Abstract

Healthcare information technology is a key factor in improving quality and reducing cost in healthcare, and yet, the successful implementation of health IT varies greatly among healthcare systems. A review of the health IT literature supplemented by an analysis of the experience of successful IT implementation in Maccabi Healthcare Services, reveals that, despite differences among countries, common barriers to implementation of health IT and common critical success factors can be identified. Barriers include lack of clear benefits, sufficient incentives and adequate support for clinicians as well as payer–provider relationships, marketplace competition and privacy legislation. Critical success factors are innovative leadership, integrated management and collaboration with the doctors based on concrete needs, benefits, incentives and support. Dilemmas for managers include proof of return on investment for health IT versus leadership and tough management decisions; the optimal balance in the tradeoff between market dynamics, competition and choice, and the value of an integrated system that can generate significant benefit to clinicians, patients and payers; and the appropriate balance between privacy and improved quality of care, including the reduction of clinical error.

Introduction

E-health and healthcare information technology (health IT) have become a key preoccupation of healthcare systems worldwide. A review of the literature reveals that there is significant consensus that the implementation of electronic health records (EHRs) and health IT systems is considered among the highest priorities of modern healthcare systems.[1] Governments are committing massive amounts of resources to promote them, the most recent being the USA's commitment of $19bn to health IT as part of the American Recovery and Reinvestment Act 2009. Examples of this consensus are reflected in the following excerpts:

> 'The value of healthcare information technology has never been more important. Identified as a key component of healthcare transformation to reduce costs and improve quality, deriving maximal value from . . .

investment remains difficult. Despite … increasing evidence on the value of information technology, adoption of healthcare information technology proceeds at a snail's pace.'[2]

'Governments across the world are in various stages of planning initiatives designed to leverage advances in health IT for the health of their citizens. The hazards of not having an EHR have become too apparent to ignore'.[3]

A concomitant preoccupation is the necessity for building a business case for the widespread implementation of health IT. There is already a considerable amount of 'evidence' from multiple studies that have attempted to evaluate the effect of health IT.[4] However, the evidence and the conclusions are not totally clear-cut.

This purpose of this paper is to add clarity to this picture. In the following section we review critically two prominent pieces of research on the role of e-health and health IT, as well as some of the main themes emerging from the literature on the subject regarding enabling factors and barriers in the diffusion of these technologies. Subsequently, the paper reports on actual e-health and health IT policies and their implementation in the setting of the Maccabi Health Fund, a large managed care organisation in Israel. In the discussion section, we consider the lessons added by the Maccabi experience to the growing literature on the use of these technologies in healthcare services.

Two major studies and lessons from the literature
The US Agency for Healthcare Research and Quality report

The US Agency for Healthcare Research and Quality (AHRQ) commissioned an evidence report/technology assessment of the costs and benefits of health IT from the Southern California Evidence Based Practice Center. The purpose of the study was to assess the evidence base regarding the benefits and costs of health IT systems, that is, the value of discrete health IT functions and systems in various healthcare settings

The researchers screened 855 studies, of which 256 were included in the final analysis. The results of the studies analysed were variable. A number of studies supported a role for health IT in improving the quality of paediatric care. The ability of EHRs to improve the quality of care in ambulatory care settings was demonstrated in a several studies. These studies demonstrated improvements in provider performance when clinical information management and decision support tools were made available within an EHR system. However, there were insufficient data on the cost-effectiveness of these systems and it was not possible to determine the extent to which the demonstrated benefits were generalisable. Nonetheless, the researchers concluded that health IT 'has the potential to enable a dramatic transformation in the delivery of healthcare, making it safer, more effective, and more efficient and that some organisations have already realised major gains through the implementation of multifunctional, interoperable health IT systems built around an EHR'.[5]

The European eHealth Impact study

This study was one of the first European attempts to assess the real impact of e-health applications. It evaluated ten individual e-health sites in different European countries, including Germany, Sweden, Romania, France, Czech Republic, Belgium, Denmark and the UK, using methods developed by the European Commission funded eHealth Impact project.

The study showed that effective e-health investment does indeed result in better quality and improved productivity, which in turn, free up capacity and enable greater access. Once development and implementation stages have been successfully realised, the value of these benefits rises each year and exceeds the costs, usually very significantly.

The study also identified a number of success factors. These include the focus of the e-health application on solving particular problems, the use of multidisciplinary teams, and a process of organisational change needed to realise the benefits of e-health.

The conclusion of the researchers was:

'Electronically enhanced healthcare [when properly implemented] promises to reduce costs, improve quality and efficiency and treat more patients with the same resources ... The eHealth Impact project conclusively demonstrated that there is over a 2:1 ratio between economic benefits and costs.'[6]

As managers, we rely on evidence as an important component in the decisions we make, but ultimately, there is never enough evidence and we are compelled to make our decisions in light of the available evidence, based on experience, intuition, common sense and our willingness to embrace innovation and change. Thus, we find that despite the lack of clear and unequivocal evidence, some countries are already well advanced in the implementation of electronic medical records and national network infrastructures, particularly the Scandinavian countries of Denmark, Finland, Norway and Sweden. But most are not. Nonetheless, governments in France, Canada, Australia, England, New Zealand and the USA, for example, have now committed to deliver national electronic networks and medical record systems to support healthcare delivery for their populations, typically by the end of the current decade. In Asia, countries such as Hong Kong, Singapore, South Korea, Thailand and Taiwan are developing and implementing e-health policies.[7]

The drivers of this process internationally are the goals of efficiency, quality of care and reducing medical error, along with new opportunities presented by the technologies themselves, such as telemedicine and internet-based chronic disease management. However, there has been very little dialogue internationally about what works and what does not, despite the fact that many governments and international agencies have placed this key priority on their agendas. This is beginning to change as the nature of these technologies lends itself particularly to working cooperatively in order to share best practice.[8]

Barriers and enablers in the implementation of e-health and health IT

Barriers

There is considerable consensus in the literature with regard to the major barriers to the adoption and effective use of IT in healthcare. Shortliffe,[9] Hersh[10] and Middleton *et al.*[11] identify similar challenges. While all of these analyses focus predominantly on the US situation, many of the same barriers exist in Europe and were also encountered by Maccabi. The following typology of barriers is based on the authors' attempt to synthesise the barriers outlined by the above authors as well as others.

Financial and business barriers

The specific types of barriers most frequently encountered by countries and organisations in this category include absence of solid evidence of the economic impact of health IT; lack of clarity regarding the specific cost-benefit to each of the stakeholders (payers, physicians, patients) resulting in 'conflict' with regard to which of the stakeholders should foot the bill; absence of financial rewards (particularly for the physicians, but in some countries, also for the payers) for improved clinical information exchange; the perception of IT as a cost centre rather than a strategic enabler, and a problematic market with multiple vendors and significant disparities in purchasing power among the different types of purchasers (clinicians, payers, governments).

Structural barriers

Structural barriers are predominantly a function of the structure of the healthcare system and, therefore, the specific barriers vary significantly from country to country. For example, the healthcare system in the USA, with the exception of pockets of highly integrated managed care systems such as Kaiser, Geisinger and others, is a very fragmented system with multiple payers and diverse groups of private providers who are reimbursed directly or indirectly by these multiple payers. On the health IT side, there are multiple systems and multiple vendors. This constitutes a significant barrier to EHR adoption and particularly to the connectivity with other systems that adds significant benefit for the physician. A similar problem exists in some European countries. For example, in both France and Belgium, doctors are independent practitioners who are paid by the patient who is then reimbursed by the health insurers. The fact that there is no direct contract and payment relationship between the health insurer and the doctor constitutes an interesting challenge for implementation of EHRs and interconnectivity. On the other hand, in the Scandinavian countries, physicians are paid by the government (be it local, regional or federal) and hence, the decision to computerise the physicians' clinics with EHRs, to create incentives and to create data exchange networks is more straightforward. Another structural barrier is the lack of standardisation and certification for EHR and health IT systems, resulting in the lack of system and data interoperability. A contributing factor to the delayed standard adoption is the lack of incentive for data exchange between and among providers as well

as between providers and payers. Regulations relating to healthcare data, privacy and confidentiality are also often barriers to health IT as they tend to restrict the sharing of patient data among providers.

Cultural barriers

The cultural barriers are perhaps the most significant. From the perspective of the doctor, the most frequently mentioned include that clinicians view health IT (particularly EHR) as time-consuming and they are too busy to deal with it; they do not perceive what is in it for them; they fear that it will depersonalise healthcare and more specifically, will interfere with their rapport with their patient; they perceive it as a threat to patient privacy and confidentiality and as a potential tool for 'Big Brother' interference in their practice. The issue of privacy also constitutes an obstacle from the perspective of the patient and politicians.

Technical and professional barriers

The major problems encountered in this category include a lack of synchronisation between the system and clinical workflow; purchasers (doctors) who are poorly prepared to make appropriate decisions about what to purchase; clinicians acting as consultants to system developers who are really not qualified due to their lack of training in biomedical informatics; the lack of a professional workforce in medical informatics capable of leading the implementation; and the lack of a strategic organisational process to develop the commitment of all of the stakeholders.

Critical enabling factors

There are significant differences in the history, structure, regulations and culture of different health systems that have a substantial influence on the most successful processes and factors for introducing and implementing health IT. However, two common success factors are so basic that they can be considered axiomatic: innovative leadership and collaboration with clinicians.

Innovative and committed leadership is clearly demonstrated in every system that has successfully implemented a health IT system, be it political leadership as in the Scandinavian countries, or organisational leadership as in integrated healthcare systems in the USA such as Kaiser. This was certainly the case in Maccabi, and it included not only vision and commitment, but also hands-on involvement of top management, willingness to step in to solve problems and, of course, willingness to invest and commit organisational resources to the process. This success factor is comprised of several sub-factors that appear to be crucial to the successful implementation of health IT:

- *The decision to invest in health IT:* Making *and implementing* the decision to invest in health IT is essential, even if there is a lack of sufficient empirical and quantitative evidence regarding return on investment, particularly in the area of cost containment.

- *Integrated responsibility:* The designation of an active integrating organisation responsible for developing and managing the system is a key success factor. In Protti *et al.*'s studies comparing the adoption of health IT in primary care in Denmark, New Zealand, Andalusia (Spain) and Alberta (Canada), this appeared to be a common success factor.[12] In Denmark, the health system integrator is Medcom, in New Zealand it is HealthLink, in Andalusia there is a central medical record managed by the Andalusian Health Service, while in Alberta, the successful implementation of EMRs in physician clinics was driven by the Physician Office System Program.
- *Clear identification of concrete needs and the goals to be achieved:* The National IT Strategy for the Danish Health Care Service 2003–2007 made it clear that IT was a means to an end, not an end unto itself. The goals that were defined were, in fact, health system goals that the IT system would make possible, namely: high professional quality of healthcare, shorter waiting time, a high level of user satisfaction, better information about service and quality, efficient use of resources and freedom of choice.[13] Likewise, the European eHealth Impact study concluded that in order to be successful: 'The e-health applications must focus on solving particular problems, or have an impact on a particular clinical or operational process'.[14] In Maccabi's case, the goals shifted at different stages of the process but were always based on the concrete needs of the doctors and/or of the organisation. The initial goals were very modest: improved and standardised documentation of diagnoses, medications and referrals, documentation of all physician visits, eligibility verification, and more efficient claims adjudication. These immediate objectives related to two higher-level goals: better care based on better documentation and better management of resources based on better data. Over time, these goals were expanded and transformed into goals such as improved quality and integration of care.
- *Clear strategy and organisational process:* This entails a clearly defined and agreed upon strategy for achieving the goals and an organisational process enabling leadership to monitor the process to assure that everything is proceeding according to plan and goals are being met.

Partnership and collaboration with clinicians and other stakeholders have also been demonstrated to be a critical factor in the successful implementation of health IT. Most of the major barriers to EHR uptake and health IT implementation relate to the difficulties clinicians face and their consequent reluctance to enter into the process. Miller and Sim identified seven major doctor-related barriers: high initial financial costs and uncertain financial benefits, high initial physician time costs, difficulties with technology, difficult complementary changes and inadequate support, lack of adequate electronic data exchange between the EHR and other clinical data systems, lack of incentives and physician attitudes.[15] On the other hand, in summarising the critical success factors

identified by the eHealth Impact project, Stroetmann *et al.* noted that 'a critical success factor is the multi-disciplinary nature of the teams involved in the planning, development, and implementation of e-health applications'.[16]

Experience from the field: The Maccabi Health Fund in Israel

Another country that is very advanced in the implementation of multifunctional, interoperable health IT systems built around electronic medical records is the state of Israel. While all Israeli health plans currently operate integrated health IT systems, Maccabi Healthcare Services was the first of Israel's four national health plans to develop and implement a comprehensive health IT system, and can be considered among the early pioneers in this field, having initiated the development of its system in the early 1980s. The Maccabi system can be viewed as an example of what works and does not work in the process of developing and implementing health IT.

Maccabi Healthcare Services is the second largest health fund in Israel, providing comprehensive medical coverage to more than 1.8 million people. It was established in 1941 as an independent, mutual, not-for-profit health insurance fund. It underwent a change in status in 1995 following the passage of the Israeli National Health Insurance Law, which transformed the fund from an insurer of healthcare to an insurance subcontractor and provider of healthcare. Insurance premiums (in effect a health tax), are collected by the government's National Insurance Institute, and the sums collected are allocated among the health funds by an age-weighted capitation formula.

In Israel, all of the health funds are statewide organisations. As such, each one is, to a very large degree, a total healthcare system unto itself. Maccabi Healthcare Services is organised into five districts, encompassing 140 branches, which provide both administrative and healthcare services throughout the country. Most of the services are provided by independent contracted providers, at the core of which are 4,000 independent physicians including primary care physicians and specialists. The care they provide is supplemented by 300 senior consultants, who are hospital department heads, 250 diagnostic institutes, 600 private pharmacies and public as well as private hospitals. These contracted services are complemented by over 600 salaried physicians and Maccabi owned services including a centralised laboratory system, a tele-radiology system, telemedicine services (both diagnostic and home monitoring) in cardiology, specialty clinics, a chain of 50 pharmacies and a private hospital network.

In 1983, the leadership of Maccabi Healthcare Services concluded that the healthcare system of the future would require sophisticated information and communication technology for efficient management of the healthcare system, as well as effective and innovative healthcare services delivery. Maccabi embarked upon the development of its health management information system in 1984. In 1986, the Maccabi Independent Physicians

organisation agreed to be a full partner in the implementation of a computerised medical record in all physician clinics. In 1988, Maccabi issued a magnetic membership card to all its members, to be presented at every point of service, thereby enabling the system to capture all of the members' transactions with the healthcare delivery system.

Today, Maccabi has a comprehensive, fully integrated health information and communication system with a comprehensive database that includes more than 18 years of data on almost 2 million members. The entire system rests upon a foundation comprised of an organisational and technological infrastructure in which all healthcare providers use electronic health records and all providers and health services are electronically interconnected online and with continuous clinical data exchange taking place in real time. This system, with all of its components, was developed over a period of 20 years, but the creation of the basic infrastructure took only five years, at a time (1989–94) when computer and communication technology was much less sophisticated than today.

Many of the same barriers mentioned above were encountered by Maccabi as it made key decisions in the process of developing its system. These were surmounted in the following way:

- *Integrated responsibility:* In Maccabi, the Director of Organisation and Information Systems was designated as the person responsible for developing and implementing the Maccabi health IT system. He worked with a small dynamic team, including a senior director of the Medical Department, with the complete backing of the CEO and his direct involvement when key decisions needed to be made, such as the decision to use the national identity number as the patient and provider identifier in the Maccabi system, setting stringent standards that all IT vendors had to meet to assure compatibility for purposes of connectivity to enable clinical data exchange, and similar decisions requiring the strong backing of authority. After an initial planning and evaluation process by professional staff, Maccabi raised the idea of computerising Maccabi-affiliated independent physicians with the Independent Physicians Organisation and it was agreed to set up a multidisciplinary committee comprised of representatives of the independent doctors and senior staff from the Maccabi Medical Department and IT Department. The committee examined the needs of the organisation and the doctors which could be addressed by the system, as well as the barriers and the challenges. The decision to enter into the development of the system was a joint decision of the organisation and the doctors.
- *Financial incentives for the clinicians:* Financial incentives are critical, at least at the beginning of the process. At a very minimum, introducing an EHR based system into a doctor's clinic should not constitute a financial burden. One of the reasons that there was such rapid uptake among the doctors was that Maccabi offered a financial incentive and simultaneously reduced the financial burden of computerisation. Incentives included a 2 per cent increase in quarterly capitation fees, negotiating significant group discounts on the purchase of hardware, providing interest-free loans for purchasing

hardware with convenient repayment conditions, and providing the software at no charge to the physician.

- *A collaborative process:* The strategy for achieving the goals of the project was comprised of the following components and steps:

  1. Joint physician/Maccabi medical and IT staff committees were established for every medical specialty to develop the functional specification needed for each specialty, to oversee the adaptation of the core medical record and to provide ongoing feedback during implementation.

  2. A minimum data set was agreed upon, with the gradual addition of new fields and tools over time.

  3. It was agreed at a very early stage what the doctor would see first when he opened the EHR — a summary page with the most relevant patient data.

  4. In the case of each additional field or tool, the rationale was presented, and the benefits to the doctor, patient and/or organisation were clearly delineated.

  5. New networking capabilities were systematically developed and each brought with it relevant changes to the EHR for example, with the computerisation of the lab came electronic referral to the lab and the ability to electronically transmit lab results directly to the doctor's EHR.

  6. The uptake of the EHR was also gradual, beginning with doctors who volunteered to pilot the system. After a successful pilot stage, it was agreed that using the EHR would be voluntary for doctors currently under contract but mandatory for new doctors. This continued until the majority of doctors were in the system, at which point it became a condition of 'doing business' in Maccabi.

  7. Incentives were offered to help persuade existing doctors to start using the EHR. For example, the use of the EHR was linked to more rapid processing of claims and earlier payment to doctors.

- *Making sure that the benefits to the doctors were clear and visible:* The studies reviewed in the AHRQ study demonstrated improvements in provider performance:

  'when clinical information management and decision support tools were made available within an EHR system, particularly when the EHRs had the capacity to store data with high fidelity, to make those data readily accessible, and to help translate them into context-specific information that can empower providers in their work'.[17]

  In order to put up with the initial difficulties of learning new skills and making the necessary changes in clinical workflow, doctors need to see rapid, tangible benefit. In Maccabi, the physician was able to perceive four benefits within a very short time after implementation:

  – the insertion of the magnetic membership card into the physician's computer automatically populated the screen with the patient's demographic information, saving the physician time in writing or entering the information;

  – the insertion of the membership card generated an online connection to the Maccabi database for verification of the patient's eligibility to receive services, guaranteeing that the doctor would be paid for the visit;

  – the initial screen presented the doctor with a summary of the medical information on the patient, including major problems, diagnoses, allergies and medications;

  – once the doctor entered a diagnosis for the visit, the information was transmitted and the claims adjudication process was initiated, saving additional entry and paperwork for billing.

As the system has become more sophisticated, more benefits have been realised. For example, electronic prescriptions can be automatically screened online in real time by a drug utilisation review program, thus helping the doctor avoid adverse drug events; electronic referrals for diagnostic tests ensure that the results are automatically transmitted back to the doctor's computer, etc.

- *Physician support:* The provision of support to the clinician in implementing and operating the EHR and other aspects of the system in his clinic is of paramount importance. At the outset, the physicians did not have to make purchasing decisions on their own and they had a clearly responsible body to turn to in the event of a problem. In addition, in all cases, there was a major investment on the part of the Health System Integrator organisation in training, assisting doctors in developing new skills and making the most of the new technology at their disposal.

Discussion

The analysis of the Maccabi Healthcare Services experience in developing and implementing an EHR-based health information system identified ten critical success factors. Five critical success factors fall under the heading of 'innovative leadership':

- vision and making the decision;
- clear commitment and involvement of leadership throughout the process;
- appointment of an authorised health system integrator;
- addressing tangible, practical needs;
- establishing an organisational process for implementation and monitoring achievement of objectives.

The second set of critical success factors are grouped together under the heading of 'partnership and collaboration with clinicians and other end users' and include:

- establishing a multidisciplinary working group consisting of managers, clinicians and IT people at the outset to create a joint vision of the health IT system upon which the decision to enter into the process is based;
- financial incentives for clinicians;
- establishing an ongoing collaborative process;

- making sure that benefits for clinicians are clear and visible;
- providing training and ongoing support to clinicians.

Can the Maccabi case study be generalised to other settings? It would be easy to make the case that Maccabi developed its health IT system under a unique set of conditions: a small country with an integrated health delivery system; a representative physician organisation; a single EHR vendor; and the advantages of being an early adopter, including the ability to 'start small' and evolve over time. However, there have been similar successes under very different circumstances in Denmark, Andalusia, Alberta, and a variety of organisations in the USA. The key success factors in these other cases are not identical, but there is a surprising amount of similarity. Together, these raise a number of issues for consideration:

- A great deal of effort and energy is being invested in building 'business cases' and 'return on investment' studies under the assumption that these will convince leadership to make the commitment and the necessary investment. Perhaps we have gone overboard and are dedicating too many resources to this process; resources that might be better spent in actually getting the process underway. While it is important to assess the tangible benefits of health IT, it is equally important to make sure that the quest for evidence does not become an excuse for the lack of leadership and a justification for avoiding tough management decisions.
- While the EHR is a vital and necessary component of the system, the added value of being electronically connected to other providers such as the laboratory, imaging services, consultants and others, is one of the more visible benefits that clinicians seek from such a system. This means standardisation and requirements that all vendors and suppliers must meet. The tradeoff between market dynamics, competition and choice need to be weighed against the value of an integrated system that can generate significant benefit to clinicians, patients and payers. The price of untrammelled freedom may be chaos, while the price of total authoritarianism is suppression of innovation. The appropriate balance needs to be met.
- Connectivity and investment in the communication infrastructure for clinical data exchange is a must for a system that will be sustainable over time, in terms of benefit to doctors, patients and the healthcare system. The issue of privacy and confidentiality has been a significant barrier to integrated health IT systems in many countries. Here too, the tradeoff between privacy and improved quality of care, including the reduction of medical error, must be carefully weighed.
- The single most critical success factor is probably securing the 'buy-in' and collaboration of clinicians. This is the 'make or break' factor in EHR and health IT system implementation. The earlier in the process that this partnership is developed, the greater the likelihood of success. This means incentives as well as compromises on priorities between health system managers and clinicians. This means sensitivity to the realities of doctors' clinics and their clinical workflows. This means not expecting doctors to make decisions they

are not equipped to make about both hardware and software. This means providing massive training and support to help doctors learn to use the new technology and enjoy its benefits. This means hotlines, backup systems and help when the doctor needs it and not when it is convenient for technical staff to provide it.

- When health IT was in its early stages, we needed doctors who had a knack for computers to help the IT people build 'doctor-friendly' systems. Today, we have a growing cadre of doctors who have made medical informatics their profession. These professionals are an important bridge between the practising physician who is not equipped to explain to the technician what he really needs; the manager, with his concerns and system objectives; and the technological people with their ever-expanding bag of IT goodies. We need to encourage increased professional leadership in this area to help systems make intelligent decisions about continued innovation.

While there is no 'cut and paste' solution in health IT that can be transferred directly from one system to another, there is much commonality and therefore much that can be learned and, in some sense, generalised from one system to another.

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