EXECUTIVE SUMMARY

Today the range of possible applications of information and communication technologies (ICT) in the health sector is enormous. The technology has progressed significantly and many estimate that ICT implementation can result in care that is both higher in quality, safer, and more responsive to patients' needs and, at the same time, more efficient (appropriate, available, and less wasteful). Advocates, in particular, point to the potential reduction in medication errors as a critical advantage.

In the past few years, however, there has been a significant and growing debate internationally about whether or not these much touted benefits and savings can be gained or, indeed, even measured. Despite the promise they hold out, implementing ICTs in clinical care has proven to be a difficult undertaking. More than a decade of efforts provide a picture of significant public investments, notable successes and some highly publicised costly delays and failures. This is accompanied by a failure to achieve widespread understanding of the benefits of electronic record keeping and information exchange.

With consistent cross-country information on these issues largely absent, the OECD has used lessons learned from case studies in six OECD countries (Australia, Canada, the Netherlands, Spain, Sweden, and the United States) to identify the opportunities offered by ICTs and to analyse under what conditions these technologies are most likely to result in efficiency and quality-of-care improvements.

The analysis takes account of the distinctive features of the participating countries' health care systems and other relevant documentation and contextual information. This information is necessary to understand the similarities and differences in the approaches employed, and helps to establish the potential benefits and drawbacks of policies and frameworks affecting the structure, design, implementation and outcomes of the different programmes and projects. The working documents developed as part of this project provide greater details on many of these issues.

Findings illustrate the potential benefits that can result from ICT implementation according to four broad, inter-related categories of objectives:

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

Increasing quality of care and efficiency

A widely recognised source of inefficiencies in health care systems is the fragmentation of the care delivery process and the poor transfer of information. The efficient sharing of health information is, however, indispensable for the effective delivery of care. This is particularly important for elderly people and those with chronic conditions, who often have several physicians, and are shuttled to and from multiple care settings. The centrality of information in health systems and the diversity of uses to which it can be put, means that ICTs that ensure the timely and accurate collection and exchange of health data are likely to foster better care co-ordination, and the more efficient use of resources.

ICTs can also make important fundamental contributions toward improving aspects of patient safety. Critical elements for providing safe care to patients include ready availability of individual patient medical information, online access to clinical guidelines or drug databases, monitoring the effects of disease and therapies on the patient over time, and detecting and preventing medication errors that could harm the patients.

Although no formal evaluations are available, it is clear from the case studies in this report that these tools are perceived as substantially increasing the safety of medical care by "generating a culture of safety", improving clinical staff actions and workflows, by facilitating tasks such as medication reconciliation, and by bringing evidence-based, patient-centred decision support to the point of care. To maximise the safety benefits from the use of ICTs, most countries have also established special programmes and initiatives to increase provider awareness, including through the promotion of adverse event reporting.

Chronic disease is the biggest obstacle to the sustainability of many public health-care systems. The use of ICTs to increase compliance with guideline- or protocol-based care, particularly for the management of highly prevalent chronic diseases such as diabetes or heart failure, which are strongly

associated with preventable hospitalisations, provides, therefore, an opportunity for significant "quick wins". This was the case in Canada, where through the combined implementation of new approaches to care delivery, guidelines and the use of a web-based chronic disease management "toolkit", the province of British Columbia achieved significant improvements in diabetes care at a nominal cost and in a very short time. Between 2002 and 2005, *i.e.* within the first three years of the programme, the proportion of people with diabetes who were receiving care that complied with the Canadian Diabetes Association guidelines had more than doubled, while the annual cost of diabetes care dropped over the same period from an average of CAD 4 400 (Canadian dollars) to CAD 3 966 per patient.

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, and by reducing multiple handling of documents. Experience in other sectors shows that these functional improvements can have a positive effect on staff productivity. The evidence in the health sector is, however, generally mixed depending on the context and the technology used.

In the six case studies presented in this report, GPs reported improved access to patients' medical records, guidelines and medication lists, but generally felt ambivalent about the effects on workload as a result of using electronic medical records (EMRs) or electronic health records (EHRs). Only Swedish physicians mentioned savings of approximately 30 minutes a day as a result of using e-prescription, which indicates that specific components or functionalities of EHRs are likely to have more positive effects than others and depending on context. The findings also indicate that integration of these electronic patient management tools into clinical workflows is not always easy and the need for support and training must be taken into consideration in the early phases of implementation in order to optimise provider adoption.

There was less ambivalence about Picture Archiving and Communication Systems (PACS), which are considered an indispensable part of the drive towards a fully functional EHR and for the delivery of high-standard remote care through telemedicine. PACS are recognised as providing a useful way to improve the processing time (or overall "throughput") of medical images and a cost-effective electronic alternative to conventional methods of storing images. Increasing throughput means that turnaround time is shorter, and that there is less waiting around for both tests and results, which also means that there is less delay before treatment can be started. Data from 22 sites in British Columbia show that report

turnaround time was reduced by 41% following the implementation of PACS. This may lead to increased capacity, more effective healthcare, and more satisfied consumers.

Reducing administrative costs

Administrative processes associated with health care such as billing represent a prime opportunity for savings. Among the case studies reviewed here, experts in Massachusetts (United States) reported huge administrative cost savings as a result of introducing electronic claim processing through the New England Healthcare Electronic Data Interchange Network (NEHEN), a consortium of providers and payers established in 1997.

After the introduction of NEHEN, insurance claims that previously would cost on average USD 5.00 per paper transaction were processed electronically at 25 cents per transaction. By 2006, the network was processing more than 4.5 million claims submissions 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 a reduction in costs, 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), have 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.

Although the level of savings observed in the United States may not be a good predictor of the gains to be expected in other OECD countries, particularly in single payers health care systems, streamlining claims and payment processing through ITs is today widely recognised as a cost-effective way to realise considerable administrative efficiencies and reduce the time and risks associated with manual claims processing.

In Australia, for example, 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.

Enabling entirely new modes of care

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). 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. The case studies in this report provide good evidence that governments have significantly leveraged this potential while pursuing three broad health reform agendas:

1. *Primary care renewal*: 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: improving chronic care, encouraging broad-based general practice or multipurpose service delivery and better care co-ordination. These objectives are not necessarily mutually exclusive, and are indeed closely linked. In rural Western Australia, remoteness has increased the need to develop more integrated and comprehensive primary health services, and electronic messaging and telemedicine can facilitate this. In the Netherlands, electronic access to patient summary care records (which are a subset of the full patient medical record) constitute the basis of efficient and safe delivery of care in after-hours primary care centres.

2. *Improved access to care*: ICTs, specifically telemedicine combined with PACS, are also used to great effect in areas with large rural or remote populations to reduce the impact of the shortage of physicians and improve access to care. This was the case in Australia, Canada, Spain and Sweden. In Spain, the Balearic health authority established a telestroke programme in 2006 to deliver specialised care and life-saving treatments to remote areas in the region. Results on outcomes show that efficacy and safety of telestroke is comparable with those achieved with face-to-face care.

3. *Improved quality of care measurement and performance monitoring*: all six countries are aiming to use ICTs also to enhance their health information systems. Electronic data collection and processing can provide data in an accessible form that facilitates reporting on different quality metrics, benchmarking and

identification of quality improvement opportunities. In the United States, the Massachusetts e-Health Collaborative (MAeHC) improved the electronic capture of laboratory, pharmacy and other subset of data necessary for quality reporting and expanded the measurement of outcomes at GP practice level.

What prevents countries from achieving efficiency improvements through ICTs?

The evidence to date suggests that successful implementation and widespread adoption are closely linked to the ability to address three main issues:

1. *Alignment of incentives and fair allocation of benefits and costs:* with a payment system that very often does not reward providers for improving quality of care or support them in making investments in ICT systems, limited resources can deter from pursuing these systems. In particular since the costs and benefits associated with adopting new technologies are not shared equitably among stakeholders, investments which are cost-effective from the point of view of the system as a whole are not automatically going to be undertaken.
2. *Lack of commonly defined and consistently implemented standards:* health care providers struggle with inconsistent medical terminology, clinical records and data storage, as well as a multiplicity of schemes introduced to facilitate interconnection and communication between specific ICT systems. Because of fragmentation in the market and the rapidly evolving nature of technological solutions, in the absence of agreed industry-wide standards and compliance with existing rules, providers investing in technological infrastructure face high risks of failure and poor returns. The ability to share information (interoperability) is also entirely dependent on the adoption of common standards and compliance with them.
3. *Concerns about privacy and confidentiality:* because of the sensitivity of health information, and the generalised uncertainty on how existing legal frameworks apply to health ICT systems, privacy concerns constitute one of the most difficult barriers to overcome if widespread implementation of ICTs is to be achieved.

Case studies indicate that there are a number of actions that governments can take to address these issues. Governments can provide motivation for high-performing projects through targeted incentives. In the case studies, government-funded initiatives were generally aimed at

unambiguous public health priorities with clear benefits and that would not have been achievable without ICTs. This ensured that projects that could have otherwise drifted and become "technology for the sake of technology" in fact had a discernable health focus. Implementation of ICTs to improve chronic care in British Columbia was clearly a motivating factor and an essential component in the successful rate of adoption of EMRs by primary care physicians in the region.

Governments also occupied a central position as initiator, funding provider, project facilitator, and neutral convener. Governments, therefore, may be the only source of leadership to enable the effective use of ICTs to implement new directions for health system change and redesign. Governments can also engage vendors and encourage them to comply with standards to reach a common goal.

Aligning incentives with health system priorities and the fair allocation of benefits and costs

A range of incentives were critical in promoting the implementation and effective use of ICTs. Given the upfront cost entailed in the purchase of EHRs (which may range from USD 15 000 to USD 40 000 depending on the technology, the level of system functionalities, and how prices have been negotiated with vendors), physicians, particularly those whose levels of income are mainly based on their own individual productivity, such as in a fee-for-service (FFS) payment system, may find it difficult to afford to adopt EHRs.

Reducing the financial barriers, shifting or sharing the financial risk, and providing much more robust evidence on the advantages of health ICT can, therefore, be expected to accelerate its adoption. Not surprisingly, in all six case studies, we found that government is intervening to promote the adoption of ICTs either through direct regulation, economic instruments (mainly direct financial incentives) or persuasive measures (including support measures such as providing education and training for change management). OECD governments are evidently using their leverage as purchasers and payers to drive ICT adoption, which reflects the growing consensus about the vital "public good" to be expected from improved health information exchange.

Grants and subsidies are the most common form of financial incentives. Bonuses or add-on payments that reward providers for adopting and diffusing ICTs are also often used, particularly in countries where physicians are remunerated on the basis of fee-for-service.

Case studies indicate that subsidies are best suited to a situation where there is a clearly identifiable capital or fixed assets investment. In the Balearic Islands (Spain), local government subsidies were used, for example, to support the entire cost of developing the ICT infrastructure in the region, including broadband development. This form of financial support is very flexible, and usually does not require complex institutional arrangements. Grants, on the other hand, are rarely assigned unconditionally. There are usually many requirements that have to be met before a grant will be awarded, and this can turn into an onerous and time-consuming process which may limit take-up.

OECD findings tend to suggest that one-off subsidies or grants, while essential to start-up initiatives, may do little to support ongoing ICT use and will not have a lasting impact unless other potentially conflicting incentives (*e.g.* through payment schemes such as FFS) are modified or removed, and the business case for the initiative is clearly defined. However, for many ICT projects, the most significant challenge is precisely the development of a sustainable business model. In other words, once the initial investment has been made, what steps need to be taken to ensure that the ongoing costs of maintaining the system will be met? For example, who will compensate general practitioners for the costs of maintaining electronic health records, when many of the economic benefits are going to be felt by payors and purchasers of health services? These long-term sustainability and financing issues appear to be the most challenging and, in most cases, unknown aspects of the ICT initiatives reviewed in this report.

In the case studies reviewed in this report, policy approaches that link financial incentives (*e.g.* bonus payments) to the adoption and use of ICTs for specific tasks or conditions where the public health benefit is recognised from the very start have proven particularly successful. The evidence collected in Australia, British Columbia, the United Kingdom and the United States indicates that payers' willingness to differentially reward improved quality of care through the use of ICTs is key not only to future sustainability but central to shared reaping of benefits from the investments made. The financial incentive packages in these countries are designed to "insulate" physicians from potential productivity and upfront financial losses from adoption of ICTs. At the same time, they operate to maximise social benefit and act as catalyst of change by requiring (or promoting) electronic data collection and reporting on quality improvement activities. There is a growing body of practical experience across OECD countries that could be further analysed in a more systematic way and modelled to indicate/demonstrate which practices work best to enhance the efficiency and effectiveness of future programmes and reduce the likelihood of mistakes in their design and implementation.

Achieving commonly defined and consistently implemented standards

While health care organisations have access to an ever-increasing number of information technology products, "linkages" remain a serious problem. EHR systems must be interoperable, clinical information must still be meaningful and easy to decipher once transferred, whether between systems or between versions of the same software. It must also be gathered consistently if it is to permit effective secondary analysis of health data. Electronic capture of data through EHRs can facilitate clinical research, as well as improve evidence-based care delivery.

The development of standards to enable interoperability continues to be a political and logistical challenge and a barrier to seamless exchange of information. The problem of lack of interoperability is, however, not one that will be easily solved by the natural operation of market forces. Nor can it be solved by the intervention of health authorities alone: joint industry and government commitment is necessary.

To move the interoperability agenda forward, many governments have set up specific bodies or agencies to co-ordinate standard-setting and have developed strategies at the national level. Under pressure, vendors and users, as well as international standards organisations, have also started to collaborate more openly in the development and progression of standards. This collaboration has resulted in some level of success. However, even when standards are available, they are often applied in different ways by different institutions. Additional mechanisms are needed to promote their consistent implementation in a manner that achieves interoperability. Besides technological specifications, appropriate incentives, consensus-building and other enabling policies all have to be in place.

Four of the case study countries (Netherlands, Spain, Sweden, and the United States) have, therefore, established formal health care ICT product certification processes. In several of these countries, health care payers, ranging from governments to the private sector, are now also offering, or setting out to offer, financial incentives for the adoption of certified EHRs.

A variant to this approach, implemented at present only in Canada in a few provinces, has been to establish a certification process that targets vendors' products and services, and includes a number of "usability" requirements such as service levels, technical support responsiveness, financial viability, etc. This process is a targeted effort, within the context of a specific incentive programme to promote EMR/EHR adoption, rather than a broad product certification scheme, as envisaged in the other countries.

Although these initiatives all appear very promising, there is still limited evidence that they have significantly improved interoperability.

Enabling robust and reliable privacy and security frameworks

Health information can be extremely sensitive and professional ethics in health care demands a strict adherence to confidentiality. A view held by many physicians in nearly all the case studies was that sharing identifiable patient data among different providers in a network raises the question of who should be allowed access to the file and how such access is to be regulated and by whom. There appears to be a generalised need for clear and enforceable rules on these sensitive issues.

Patient consent was also often identified as the main "road block" to creating a co-ordinated information system for patient care. Some of the case study countries require that patients be informed at the time of data collection of all the purposes for which their data may be used. Others, operate on the basis of an implied consent model for disclosure of health information for treatment purposes, coupled with the individual's right to object to disclosure (opt out).

The implementation of privacy and security requirements is proving particularly challenging in the case of EHRs and constitutes a main barrier to system-wide exchange of information in many countries.

In Sweden, which enjoys virtually countrywide e-prescribing, GPs are currently unable to access the full list of medications that their patients have been prescribed due to legal restrictions. As a result, though the technology is available, privacy regulations act as barriers to fully harnessing the health benefits from the e-prescription system.

In Canada, well-intentioned privacy laws have created barriers to data access. In British Columbia, an unintended consequence of this commitment to privacy protection is that privacy is often cited as the reason that government cannot access critical health data and carry out the necessary associative studies to improve services for citizens.

In addition, in most of the case study countries, compliance is complicated by multiple layers of regulations from central to local. This is a particularly difficult problem in Australia, Canada, and the United States where rules for the protection of personal information have been established at both the national and local (state or province) levels. This made it especially difficult, for example, to implement a locally developed web-based electronic messaging and patient management system in Western Australia which cut across several jurisdictions. This is largely because rules for the protection of personal information have been established at both federal as well as state and territory levels in Australia. All regimes are similar but not identical. There are

separate regimes for public sector and private sector organisations and specific legislation applicable to entities which hold health records.

The case studies clearly indicate that appropriate privacy protection must be incorporated into the design of new health ICT systems and policies from the outset, because it is often difficult or impossible to introduce effective privacy protections retroactively. There are a variety of technical solutions already available to protect patients, but if privacy policies are unclear, technology will be of little help. Lack of clarity in the purpose and scope of privacy protection may also have unintended perverse consequences. Although health care organisations have a strong interest in maintaining privacy and security, they also have to balance this interest against the need to ensure that information can be retrieved easily when required for care, particularly in an emergency.

Restoring public trust that has been significantly undermined is much more difficult than building it from the outset. Many OECD countries are in the early stages of health ICT adoption, and this provides a critical window to address privacy and security issues.

Conclusions

The findings discussed in this report point to a number of practices or approaches that could usefully be employed in efforts to improve and accelerate the adoption and use of health ICTs. As these typically imply trade-offs with competing goals, policy makers must determine whether the expected benefits from these practices are likely to outweigh the costs in a particular situation. This study, however, highlights an absence, in general, of independent, robust monitoring and evaluation of programmes and projects. While most of the case studies had included some sort of formal evaluation to justify initial budgets, few had conducted a formal post-implementation evaluation to determine the actual payoff from the adoption and use of ICTs.

Measuring the impacts of ICTs is difficult for a number of reasons. ICT implementation may have effects that are multidimensional and often uncertain in their reach and scope, and difficult to control. In addition, the realisation of benefits from ICT implementation 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 necessary organisational transformations will reduce both uptake and impact. Coupled with this, are inherent difficulties in defining what constitutes health ICTs, the extent of its use and adoption, and the fact

that in many cases health institutions may use both ICT and more traditional practices simultaneously. Benefits of new ICT systems may, therefore, only become apparent after working practices have changed or adapted to take advantage of the new resource and this process could take several months or years, presenting a particular problem for those looking to evaluate projects.

The challenges described above place health ICT investments in a space that is quite different from other capital investments in the health sector, for example a hospital building or medical equipment. But health ICT projects are still often evaluated using traditional appraisal techniques, limiting evaluation to the objectives of sound financial management. However, providing decision makers with direct cost-analysis cash-flow projections, financial figures etc., is not enough, since the ultimate strategic objective is to improve the efficiency and quality of clinical care through health ICTs.

These methodological difficulties are further exacerbated by data limitations, definitional problems and the lack of appropriate sets of indicators on adoption and use of ICTs which can be compared over time, within and across countries. For many of the hypothesized modes by which ICTs might effect efficiency in health care systems, there is little or no available data which would allow measurement. Despite a plethora of anecdotal information, the hard evidence available today on the impact of health ICTs is, therefore, inconsistent, which makes it difficult to synthesise and interpret.

The scale of most ICT projects and the huge sums of taxpayers' money that have been and are being spent on them, make it crucial for governments to address the issues of benchmarking and of accountability so that lessons can be learned. Failure to collect the data necessary to evaluate the impact of ICTs is one of the core challenges to achieving widespread adoption of high-performing ICT initiatives.

Notwithstanding the difficulties entailed, the case studies cast no doubt on the potential ability of countries to make major progress toward key policy goals such as improving access to care in remote areas or better care co-ordination for chronic diseases through implementing ICTs. In particular, they prove that cost-effective solutions for remote and rural areas are possible. The Northern Health Authority in British Columbia was able, for example, to provide a secure, high-speed wireless communications network for over 97% of the region's rural private physician's offices through a CAD 1.2 million (~USD 1.14 million) grant from the federal Primary Health Care Transition Fund. In Australia, the Great Southern "Managed Health Network" developed a secure web-based electronic messaging system that is being now rolled out in the most remote areas of the region with start-up funding of AUD 1.8 million (~USD 1.3 million) from the government's Managed Health Network Grant programme.

One shared characteristic of the programmes reviewed here is that they were all embedded in wider reform projects, and required the support of all stakeholders to achieve their goals. Successful adoption and use generally depended on the simultaneous implementation of new service delivery models, organisational partnerships, changes in GP compensation, clear and dedicated leadership. Notable facilitators included dedicated managers and physician leaders who envisioned the specific changes needed, and were able to overcome organisational barriers and unforeseen technical challenges at implementation. All initiatives had dedicated funding, including for support and training of health professionals, which was widely recognised as a key factor in winning user acceptance.

Although there are limits to the generalisation of results, the case studies covered here illustrate the interdependence between various policy dimensions, which are difficult to disentangle, but must be addressed if countries are to achieve the intended efficiency gains from ICT implementation. The following points summarise the main findings:

- *Establish robust and coherent privacy protection*: a robust and balanced approach to privacy and security is essential to establish the high degree of public confidence and trust needed to encourage widespread adoption of health ICTs and particularly EHRs. Government action is needed to help establish reliable and coherent privacy and security frameworks and accountability mechanisms that both encourage and respond to innovation.

- *Align incentives with health system priorities*: to achieve the intended benefits from ICT technology, governments and payers need to set targets associated with unambiguous public health gains such as improved management of highly prevalent chronic diseases which are strongly associated with preventable hospitalisations, and better align resources, processes, and physician compensation formulae to match the nature of the gains to be achieved. To do this it is necessary to address the fixed costs associated with setting up the system. More important, and more difficult, it is also necessary to ensure that health ICTs are used effectively to deliver evidence-based care leading to better outcomes. This requires what has been termed, for want of a better phrase, a "sustainable business model" which either adapts, or takes into account, the payment systems in place for health care services more generally.

- *Accelerate and steer interoperability efforts*: agreement on and implementation of standardised EHRs remains a challenge, one that must be solved if the improvements in patient safety and integrated shared care are to occur. The effective and consistent collection of

data from the patient's primary care record can facilitate greater efficiency and safety as well as contribute to future research. Resolving interoperability issues will require government leadership and the collaboration of the relevant stakeholders to establish standards and develop innovative solutions.

- *Strengthen monitoring and evaluation*: high-quality evidence represents a fundamental source for the decision-making processes. It is a vital tool for assessing where countries stand and where they want to go. Governments have, therefore, much to gain in supporting the development of reliable and internationally comparable indicators to benchmark ICT adoption and ensuring that systems for monitoring ICTs are sufficient to assist in meeting the improvement goals. Risk, delay and cost can be minimised by learning from good international practices.

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