Education as ehealth infrastructure

Title

Education as ehealth infrastructure: considerations in advancing a national agenda for ehealth

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Abstract

This paper explores the role of education as infrastructure in large-scale ehealth strategies – in theory, in international practice and in one national case study. Education is often invisible in the documentation of ehealth infrastructure. Nevertheless a review of international practice shows that there is significant educational investment made in implementing national ehealth agendas.

Disparate views about the role of education are implicit in the ehealth strategy literature, while there is a shortage of evidence-based accounts of ehealth education. In the case of Australia, the benefits and challenges of a broadly collaborative approach to ehealth education are highlighted through activities of various types occurring on many levels to support the implementation of a national ehealth system. This paper concludes that although evidence-based practice is a given in other areas of healthcare, and although there are many published evaluations of ehealth usability and acceptance in the health informatics literature, there is surprisingly little evidence about what works and doesn't work with regard to the ehealth education.

Key Words

Education; Ehealth; Electronic health record; Evaluation; Evidence-based practice; Health information technology; Implementation; Strategy

Introduction

The aim of this paper is to explore the role of education in the implementation of large-scale ehealth strategies – in theory, in international practice and in one current national case, namely Australia.

Ehealth integrates the use of electronic information and communication technologies in the health sector. Ehealth includes administrative and clinical decision support systems, electronic health records, health 2.0, informatics, mobile and telehealth, smart devices, virtual care teams, and more. The implementation of ehealth in healthcare systems, for an entire nation or for jurisdictions within it, represents a major structural reform, bringing with it changes in the working environment and work practices of the workforce and in the service experiences and expectations of patients and carers (see Tan and Tan 2011, for an international overview and a study of implications for the US healthcare system).

The question of education's role in implementing ehealth is important. The vision of ehealth that has been articulated in national health reform strategies around the world in recent years has not been realised fully in many places, perhaps partly because "best practice guidelines in effective development and deployment strategies are lacking" (Black et al, 2011, p.1).

The general problems of translating any type of government strategy and policy into practice may be understood within the field of implementation research first defined by Pressman and Wildavsky (1984, p.133), who famously stated, "No suggestion for reform is more common than 'what we need is more coordination'". Implementing a national ehealth strategy requires a range of substantial, coordinated infrastructure initiatives, which are not entirely technical, as Jones (2004, p.28) observed: "In addition to the technical infrastructure required to support millions of users, a myriad of access devices, and unprecedented amounts of data, the design must incorporate an information model that supports transactional decision support throughout the life of the citizen."

This paper explores the question of how we might begin to understand education, or more precisely, national coordination of ehealth education, as one of the infrastructure initiatives required for the successful implementation of ehealth systems. When ehealth is introduced to healthcare systems on this large scale, is it necessary or even desirable to take a formal approach to educating stakeholders about this health reform and the changing context of their healthcare environment? If not, why not? If so, what works and doesn't work? This exploration is in keeping with the use of socio-technical theory to understand various other aspects of the implementation of ehealth in healthcare systems

(da Silva et al., 2010), even though this approach has not been applied to understanding the role of education in depth to date.

This paper uses a public health domain definition of health education, as distinct from training in a narrower sense and from health promotion, which uses different methods. The key features of education are a systematic, planned program of application; the use of a range of techniques and methods, which may be with individuals, groups, organisations or communities; and the aim of influencing the antecedents of behaviour (namely awareness, information, knowledge, skills, beliefs, attitudes and values) so that participants voluntarily change behaviour (Sharma and Romas, 2002)

Education is often invisible in accounts of ehealth infrastructure. It may be implied but is rarely described within strategic plans. For example, a recent detailed comparison of three nations' national electronic health record system implementations is entirely silent about education (Morrison et al., 2011). A structured review to extract ehealth policy issues and solutions from sixty articles in both peer-reviewed and grey literature from 1998 to 2008 identified the following themes: networked care, interjurisdictional practice, diffusion of ehealth / digital divide, ehealth integration with existing systems, response to new initiatives, goal-setting for ehealth policy, evaluation and research, investment, and ethics. (Khoja et al., 2012). If we assume that education is blended into or integrated throughout such themes, we take much for granted and derive little insight.

Methods for exploring the role of education as ehealth infrastructure

This paper uses three methods to build a clearer understanding of the role of education as infrastructure in large-scale ehealth strategies.

First it reviews the international peer-reviewed literature on this topic since 2007 – this five-year period was expected to flag major educational research arising from international interest in ehealth strategies that took hold during the previous five-year period. The search terms and combinations ["health information technology" OR ehealth OR e-health OR telemedicine OR "health innovation"] AND [policy OR strategy OR agenda] AND [implementation OR adoption OR "change management"] AND [education OR training OR "professional development" OR learning OR competenc*] were formulated in consultation with an academic biomedical librarian. Searches of major health, education and social science databases were conducted including ERIC, PubMed, Scopus and Web of Knowledge

Second, it analyses international report literature about education initiatives within various countries' ehealth strategies. This section reviews how selected countries use education to support the implementation of their ehealth strategies, based on the most recent World Health Organization policy documents and other report literature available in the public domain. According to Wrede (2010, p.91), "no unified, self-conscious methodological approach of conducting case study research oriented towards international comparison exists", and comparative studies must take account of the cultural, economic, historical and political differences among nations, however case comparisons can contribute to building a deeper understanding of globalized phenomena such as ehealth, as indeed the international report literature in ehealth also suggests.

Third, it presents a case study of the ehealth education rationale and approach developed around Australia's national ehealth strategy. The case study draws from documents in the public domain as well as the authors' reflections on our work experience spanning several years in the case study setting, and is a methodological fit within the diversity of case study approaches in health policy (Exworthy and Powell 2012). According to Hammersley (2012) two main strategies are required in case study research in education to be able to infer sound explanatory theories, namely process-tracing (generating ideas about relevant candidate causal processes via detailed investigation of particular cases) and comparative analysis (systematic comparison of cases where candidate causal factors, are present and absent, or occur at different levels or in different combinations). This paper undertakes only the first of these strategies and thus has limitations. Nevertheless, in what the authors believe to be a rare advance into an internationally under-researched area in health sciences education, this paper sets out to describe the case of one particular country in a way that other future case studies might follow, and also it identifies other countries where single-case descriptions and subsequent cross-case comparisons might be most illuminating.

This paper concludes by drawing together findings from these three investigations in order to distil the current state of knowledge about the role of education in large-scale ehealth strategies and to outline important directions for this area.

Literature review: strategic perspectives on ehealth education

One can find a number of idiosyncratic accounts of ehealth education; various tertiary education institutions, professional associations and private training providers offer ehealth education at least for some groups (indicative examples are Clark et al., 2009 and Edirippulige et al., 2012). However these do not offer a strategic perspective, because such education is not usually connected with large-scale ehealth implementations in a transparent or accountable way. While the decision to offer

or to pursue these kinds of ehealth education may be influenced by the status of ehealth strategy in the local healthcare context, there is no assurance that such education will have curriculum appropriately aligned to the strategy (for example, will it equip participants to work with the particular tools and standards that are used in the national system or is it more generic?), or that it will be accessible to the people who are most directly affected by implementation of new systems (for example, will it be provided for widely dispersed community and primary care providers as well as for the hospital-based workforce?) , or that it will be taken up by a critical mass of stakeholders (for example, will it reach patients and carers in sufficient numbers to make a real impact in aged care and chronic disease management?).

Similarly worth noting and setting aside are the longstanding views of the specialised health and biomedical informatics community, championing education's critical role in the success of ehealth strategy implementation. For example, in 2007, advocates for an international qualification scheme for this purpose wrote:

Though often a surprise to many, [a] picture of end-user poor compliance is well documented over a period of time, and thus should be anticipated. Health professionals have in round terms a professional lifespan of approximately forty years. In nearly every country those practicing for more than ten years will have undertaken their basic professional education and early practice in an environment based on paper-based records. In many countries of the world electronic systems will only have been brought in even more recently. Furthermore, the most senior and experienced health practitioners – usually the professional champions and leaders – will certainly have been educated ahead of the e-health revolution. It is into this workforce environment that governments, health policy makers, and health informatics system advocates are seeking to introduce radical and comprehensive electronic systems. (Rigby et al., 2007)

However such views have failed to engage the mainstream of ehealth strategists and stakeholders, and thus the educational research literature offers no substantial body of theory or evidence about when, why and how to use education as infrastructure in implementing large-scale ehealth strategies.

The authors' literature search for a strategic view of the role of ehealth education in implementing national strategies returned approximately 110 results. Close reading of these articles narrowed down to 16 the number which made substantial observations relevant to the topic. From consideration of key themes in these articles, it emerged that the prevalent concern was who should

participate in ehealth education and within this were three distinct theoretical perspectives on the role of education in implementing large-scale innovations in healthcare:

Education is not necessary: A view persists that designing health information technology innovations to be intuitive and enticing means that little or no education will be required for successful implementation (Ovretveit et al., 2007; Wen and Tan, 2005). However, based on the extant evidence, in the context of a national ehealth strategy it seems that this approach to education would be at best optimistic and at worst negligent: Healthcare workers may self-report of lack of competence in using an ehealth innovation at a surprisingly high level (Makela et al., 2010); or they may reject it as not being a priority for their work (Al-Qirim, 2005). Overlooking end users' training and support needs has been linked directly to implementation problems in some studies (Greenhalgh et al., 2010; Sheik et al., 2011).

Education is for workforce change: Another view is that the introduction of ehealth challenges the workforce to perform more or better or differently. From this perspective, an enlightened manager would frame ehealth as a learning challenge – rather than as a performance challenge – so as to encourage the workforce to be less averse to risk, to experiment more, persist longer, learn more and ultimately perform better (Nembhard et al., 2009). This view supports a functional argument for considering workforce education as an essential part of ehealth implementation, and makes it a priority to analyse scopes of practices and training demands among healthcare workers (Buntin et al., 2010). Proponents of this view suggest that workforce education needs to be sustained over time, practical, pitched at different levels, incorporated into mainstream activities, and supplemented with agreed clinical protocols and consistent reference documents (Brebner et al., 2005).

Education is for everyone: Yet another view is that understanding ehealth innovation as a whole system entails taking an inclusive and nuanced approach to the learning needs of a wide range of distinct stakeholder groups. Education target groups variously identified include the general public, patients, carers, clinicians, administrators, researchers, IT industry manufacturers and suppliers, or groupings based on geography. (Wiljer et al., 2008; May et al., 2012; Brock Martin et al., 2012; Ackerman et al., 2010). All may differ in their 'awareness', 'principles' and 'how-to' kinds of learning requirements (Kyratsis et al., 2012) This view encourages attention to ehealth system end-users beyond those in the healthcare workforce, and alignment between education for these groups and the broadest social and economic goals of ehealth strategies.

Even if one rejects the first of these three views based on the evidence against it, still there is scarce evidence to support the other two – that is, evidence about what makes for the effective design of education programs in order to achieve desired outcomes within large-scale ehealth implementations (Carlfjord et al., 2010).

One systematic review identified four broad types of educational interventions for this purpose – meetings, materials, outreach and audit – but also noted the absence of impact evaluation research (Gagnon et al., 2009).

Our own literature search yielded no papers that offered substantial evidence of the impact of education in this context, or even enough pedagogical detail to inform the educational design of a strategic program. Nor could we find any literature on other pertinent aspects of ehealth education at a nationally strategic level, such as quality assurance and resourcing.

Review of international practice

From an international perspective, education is included explicitly as infrastructure for ehealth in the World Health Organization (WHO) ehealth country survey. Education programs are categorised as one of several ‘foundation ehealth actions’. Of the 114 countries participating in the 2009 WHO survey, 23% reported that they had some types of programs in place. The role of education in implementing ehealth applications is also specified (World Health Organization, 2011).

It is evident from the WHO survey findings that there is a recognised need for significant educational investment in national ehealth agendas. The largest investors include the USA, the UK and Canada. These three countries were chosen for close review here, based on the scale of their investment and based on their influence in the case of Australia’s ehealth agenda.

Table 1 dissects the ways in which the WHO survey has categorised education, shows the education-related findings for three countries and shows the global response rate, before taking a closer look at how education is described in their ehealth strategies. Australia did not participate in the WHO survey, so the authors have extrapolated data from NEHTA and related federal government websites for comparison purposes.

[TABLE 1 GOES HERE]

Of the three countries compared with Australia, Canada was the only country which produced a supporting implementation strategy along with its national ehealth strategy. The Canadian implementation strategy included approaches to training, their influence on the ehealth

implementation strategy, and the ways these approaches could streamline workflow and standardize policies and procedures. In this, Canada clearly distinguished education from training (training being narrowly focussed on improving a particular kind of work performance or meeting a requirement to demonstrate a specific proficiency). In Canada's ehealth implementation strategy, education is used to describe a program of instruction in which knowledge or skill is developed or obtained through a learning process, where knowledge tends to be focused on longer term and deeper understanding and is a key influencer of project sustainability (Pan-Canadian Change Management Network, 2011).

Neither the UK nor the US initially included education as a key component in their ehealth strategies but subsequently both countries released implementation plans. These plans include explicit approaches to education and training, their influence on the ehealth implementation strategy, and resources allowing for different modes of delivery for different educational target groups, from university students and clinicians to IT industry and not-for-profit stakeholders in health, as detailed next.

The UK National Health Service Connecting for Health (NHS CFH) office, part of the Department of Health Informatics Directorate, is charged with maintaining and developing the NHS national IT infrastructure. Among its services and applications, NHS CFH includes Informatics Capability Development and a subsidiary Education, Training and Development function, "offering support materials, guidance and toolkits to help individuals and organisations in the NHS, the Department of Health and other healthcare-related organisations to develop their informatics capability in a changing environment"(NHS Connecting for Health, n. d.).

In the US the Office of the National Coordinator for Health Information Technology (ONCHIT) is the principal federal entity charged with coordination of nationwide efforts to implement and use the most advanced health information technology and the electronic exchange of health information. ONCHIT has a strong focus on the university and community college system, including related educational measures in a package with a range of other programs "designed to work together to provide the necessary assistance and technical support to providers, enable coordination and alignment within and among states, establish connectivity to the public health community in case of emergencies, and assure the workforce is properly trained and equipped to be meaningful users of EHRs" (Office of the National Coordinator for Health Information Technology, n. d.).

Australian case study

From a review of international practice it is clear that there are many curriculum components, educational approaches and stakeholder groups to consider in using education in support of ehealth strategy on a large scale. The next section of this paper presents a case study of how this has occurred in Australia and highlights further factors that need to be considered in using education effectively to facilitate ehealth change and adoption nationally.

Australia's ehealth agenda is based on a vision of new options for how Australians manage their own health and interact with the health system across geographic and jurisdictional boundaries. These options are meant to address recognized challenges to the current system, such as: increasing demand from an ageing population and the growing incidence of chronic disease; consumer demand for more costly and complex procedures; significant discrepancies in health outcomes of advantaged and disadvantaged groups; shortage of skilled health-sector workers; and the rate of avoidable errors occurring in healthcare.

Australia's ehealth infrastructure work up to 2012 included: a national clinical terminology service; a healthcare identifier service; a national ehealth privacy framework; a secure message delivery service; e-discharge summary, e-referral, e-diagnostics and e-medication management; a national product catalogue information system; a national authentication service for health; a compliance and conformance assessment scheme; and a new generation of ehealth interoperability based on ehealth standards; and a shareable personally controlled electronic health record (National E-Health Transition Authority 2011a, 2011b).

The role of education in ehealth was explicitly documented, however not at a level of granularity that would support development and delivery of educational programs nationally. The federal government's strategy identified four major strategic work programs that were necessary to implement the national ehealth agenda. One of these, the change and adoption work stream, was intended to play a critical role in driving take-up and support among stakeholders in ehealth.

Education was included in this work stream as one of five key areas of activity, noting the need for "substantial investment in education, training and research". The strategy went on to describe the rationale for education infrastructure, that is, to address the need to "implement changes to vocational and tertiary training programs to increase the number of skilled, nationally available ehealth practitioners required for successful adoption of ehealth to occur". The anticipated outcomes were expressed as: sufficient numbers of skilled health information technology [human] resources; building of Australia's ehealth skills capacity and capability; increased numbers specifically of trained Australian health informatics practitioners; consideration of the establishment

of nationally recognised tertiary qualifications in health informatics (National Health and Hospitals Network, 2010, p. 47-48). A separate federal government report supported the ehealth implementation agenda and documented the need for the development of a change management plan, engagement in training and awareness activities, monitoring and evaluation of those activities and associated timelines (National Health and Hospitals Reform Commission 2009).

The Australian government established a number of new agreements, organisations and tasks for existing organisations, and funded change and adoption work programs to support these tasks, so that its ehealth agenda has been advanced principally through a combination of four key agencies:

1. Commonwealth (federal) Department of Health and Ageing;
2. National E-Health Transition Authority ;
3. Health Workforce Australia agency
4. Health Departments in State and Territory jurisdictions.

The next part of this case describes in more detail the various intertwined responsibilities for ehealth education that were assumed subsequently by these agencies.

1. The Commonwealth Department of Health and Ageing was tasked with the development and implementation of a national personally controlled electronic health record (PCEHR). The related strategy and delivery plan prioritised healthcare consumer and provider stakeholder groups. Four consumer groups were identified - Aboriginals and Torres Strait Islanders, newborns and mothers, Australians 65 years old or older, and people with chronic conditions. General practice was recognised as the provider group where greatest value would be created and received. Education was expected to address consumer and general practice employee concerns, increase comfort with the system and produce demand for the PCEHR. These objectives informed the development of educational resources to support this specific ehealth initiative to be made publicly accessible online. Education was customised for consumers, healthcare professionals and software developers with the goal that this focus on the PCEHR would lead to national adoption of the broader ehealth agenda (Department of Health and Ageing, 2012).
2. One of the National E-Health Transition Authority (NEHTA) strategic initiatives was to 'foster workforce capacity and education to better utilise the priority ehealth solutions'. This led NEHTA to commission research into existing ehealth education activities across Australia, which confirmed the absence of national coordination and identified needs for greater

support. NEHTA subsequently developed an educational strategy which adopted three guiding principles for this work - avoid duplication of effort; build on existing organisations and efforts; and adopt a collaborative approach - and identified three target groups for collaboration (National E-Health Transition Authority, 2011a), namely health informaticians, health system managers and health professionals, and consumers. NEHTA's work identified interrelated needs among health informatics professionals, universities and vocational education and training providers, health professional colleges and health degree accreditation bodies, creating further requirements for national collaboration on ehealth education initiatives.

3. Health Workforce Australia (HWA) is an initiative of the Commonwealth, State and Territory governments, and is responsible to the Health Ministers of the State and Territory jurisdictions. It has engaged with the education sector nationally, in order to integrate health workforce planning, policy and reform with essential complementary reforms to the education and training system (Health Workforce Australia, 2012). Health Workforce Australia has begun a number of work programs to contextualise some of the educational outcomes required to support the national ehealth strategy within the framework of workforce change. This work embraces the specification of ehealth competencies for registered health professionals, the inclusion of interprofessional ehealth competencies in a national common health competency resource, and an analysis of the need for specialised ehealth and health information workforce development.
4. Each Australia State and Territory government jurisdiction is implementing its own ehealth strategy based on the federal strategy. While they are all supported by NEHTA, by the federal Department of Health and Ageing and by the national change and adoption consultancy partner, nevertheless these jurisdictions vary in their implementation of ehealth infrastructure and in their associated change and adoption activities. These variations in policies, governance and legislation may affect ehealth education programs and shape the constraints in which they work, as it is possible to discern four distinct types of jurisdictional approaches to education as ehealth infrastructure (ACT Health, 2010; Deloitte; 2006; NSW Health, 2007; Department of Health Victoria, 2010; Northern Territory Government, 2008; careconnect, 2008):

Ehealth education does not rate any mention in documents in the public domain.

Ehealth education is a relatively simple task in managing and delivering ehealth programs, one that will immediately increase the use of information sources and services available and deliver quick wins for the healthcare system.

Ehealth education is a subset of ehealth risk management strategies, for instance to address the challenge of a health workforce with low levels of computer access and skill, and mitigate the risk of not achieving the major attitudinal and behavioural changes needed in key stakeholders and users.

Ehealth education merits a dedicated and detailed strategy, with tailored programs for all users including consumers; ongoing programs to update users about new initiatives; integrated and collaborative learning to increase the skills of the health workforce; and standardised instruction and assessment for healthcare workers.

At the time of writing, there is observable evidence of education and workforce development activity by the four agencies. However no criteria or benchmarks are readily available to assist in assessing the long-term impacts of these activities or the strengths and weaknesses of this overall approach. The paucity of publicly available reports of educational design approaches and of evaluation findings makes it difficult to draw comparisons with experiences that have occurred earlier and elsewhere. Evaluations of smaller-scale and more localised educational activities are scarce enough (Gray et al., 2011), while evaluations of the large-scale educational infrastructure initiatives described in this paper are not available, at least in the public domain.

Conclusions, Recommendations and Future Directions

For large-scale ehealth strategies to be translated into meaningful change there must be a high-level public policy with general approval from the citizenry, endorsed and supported by the healthcare industry and implemented strategically by government agencies. But it takes more than this for ehealth change and adoption to succeed. This paper has highlighted how educational infrastructure may be positioned deliberately as part of ehealth implementation, to ensure that that the people for whom it is intended are aware of it, do not hold misconceptions about it and are able to use it meaningfully. Through examining the place of education in various national ehealth strategies, we can see that ehealth education initiatives in different countries vary widely. Education's role is acknowledged in some but not all of these strategies, a reflection on the differing political stances and traditions of each country, as well as on the level of maturity of the respective ehealth strategy.

From a review of the literature on ehealth strategy it is possible although not easy to discern some effects of education in ensuring successful change and adoption. Much learning and professional development is expected from stakeholders, but little is said about which educational design and deployment approaches are most likely achieve these outcomes, or how. Providers of entry-level and post-basic ehealth education for health professionals and for IT professionals may be frustrated in trying to make it engaging and effective, unless they are able to position this education within educational quality and competency frameworks for ehealth. Providers of ehealth education for patients, carers and consumers may succeed only in creating dissonance if professional competence falls short of public expectations.

Although evidence-based practice is a given in other areas of healthcare, and although there are many published evaluations of ehealth usability and acceptance in the health informatics literature, there is surprisingly little evidence about what works and doesn't work with regard to the ehealth education, training and professional development infrastructure that may critically influence implementation. Health systems have invested in developing a sophisticated understanding of the well-established role of education in the health workforce and in public health, so the absence of attention to the detail of ehealth education is an especially noticeable gap. How do different groups respond to different components? Can peer learning accomplish some objectives better than expert teaching? What difference does the sequence of learning make? How much education is enough? We simply don't know. Accounts from all quarters are required to build a strong shared body of knowledge and practice in the area of ehealth education; furthermore this work requires a shared view of what can be expected from such education, by various actors and stakeholders in it.

A recently published national ehealth strategy toolkit (World Health Organization and International Telecommunication Union, 2012) makes a start by suggesting that levels of educational program participation and completion can be used as ehealth education outcome measures. Experts in educational impact evaluation know that such measures are only a start, however. What matters increases in importance and in complexity of assessment as follows (Kirkpatrick and Kirkpatrick, 2006, p. 122): Participants may or may not give positive feedback about the learning opportunities that they choose to take up; may or may not learn what is intended; may or may not apply what they learn to what they do. The way participants apply their learning may or may not improve the way the system works; an alternative and possibly less intentional outcome could be "the emergence of competing knowledges, expectations and power relations and the reconfiguration of power relations between actors in healthcare" (Halford et al., 2009).

Australia, with a comparatively recent ehealth strategy and implementation plan, might have expected to benefit from the ehealth education aims and outcomes of countries that have a longer history or a larger agenda in ehealth. Instead, Australia and other nations must be encouraged to show international leadership, by evaluating and elucidating their current ehealth education practices. Only through further educational research of this kind and through comparison of ehealth education approaches in multiple jurisdictions can we develop and apply a sophisticated understanding of good practice in this underdeveloped area at the intersection of education and public policy.

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Table 1. Education-related World Health Organization ehealth survey items, data from selected countries and global response rate.

Survey category and item (*= global 'Yes' response rate)		Australia	Canada	UK	USA	*
Foundation ehealth actions: Legal and ethical frameworks for ehealth						
Internet safety: Government sponsored initiatives about Internet safety and literacy		Yes	Yes	Yes	Yes	47%
Quality assurance approaches to health-related Internet content: Education programs for consumers and professionals		No	Yes	No	Yes	23%
Foundation ehealth actions: Ehealth expenditures and their funding sources						
Skills training	Public funding	Yes	Yes	Yes	Yes	61%
	Private funding	No	No	No	Yes	26%
	Donor / non-public funding	No	No	-	Yes	43%
	Public-private partnerships	No	-	No	No	20%
Ongoing support	Public funding	Yes	Yes	Yes	Yes	61%
	Private funding	No	No	No	Yes	19%
	Donor / non-public funding	No	No	-	Yes	35%
	Public-private partnerships	No	-	Yes	Yes	18%
Scholarships	Public funding	Yes	No	Yes	Yes	28%
	Private funding	No	No	No	Yes	8%
	Donor / non-public funding	No	No	-	Yes	19%
	Public-private partnerships	No	-	No	No	4%
Foundation ehealth actions: Capacity building						
ICT education	ICT training for health sciences students at tertiary institutions	Yes	Yes	-	Yes	77%
	Institutions offer continuing professional education in ICT	Yes	Yes	Yes	Yes	75%
Professional groups offered continuing education in ICT	Medical	Yes	Yes	Yes	Yes	73%
	Nursing	Yes	Yes	Yes	Yes	62%
	Public health	No	Yes	Yes	Yes	60%
	Dentistry	No	Yes	Yes	Yes	54%
	Pharmacy	Yes	Yes	Yes	Yes	54%
Barriers to elearning	Lack of knowledge of applications	No	Yes	Yes	Yes	46%
	Lack of skilled course developers	No	Yes	No	Yes	55%