International exchange

Harnessing information technology to innovate in primary care

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ABSTRACT

Background The health sector's capacity to meet the changing needs of patients is being questioned. This has significant implications for patients, carers, health services and those who hold the public purse. It is therefore important to bolster its capacity to serve a greater proportion of people in need of health care, opportunities for which might be facilitated by information technology (IT).

Aim To identify strategies to bolster the capacity of the primary care sector to deploy and innovate with IT.

Methods Three discussion groups comprising clinicians, regulatory agents, innovators and academics from each Australian state. Themes discussed included: (1) health problems that can be readily solved by IT, (2) clinician engagement with IT, (3) experiences with IT implementation, (4) engagement with hard-to-reach groups, and (5) social media use.

Results Although participants were aware of the issues surrounding the use of IT, including limited evidence and reduced data integrity, they were equally aware of the opportunities afforded by IT. With appropriate support, they indicated that IT could help to innovate and reinvigorate the primary care sector. This could be demonstrated via research, initiatives that improve governance arrangements (within and beyond the primary care sector), programmes that enhance care delivery and consumer empowerment initiatives.

Conclusion Clinicians are rarely included as part of teams developing innovations, and technology is not always tailored for clinical practice or tested on clinical outcomes. Technical and access issues continue to hamper dissemination of innovation. The need for leadership in developing IT healthcare solutions remains paramount, with the organisation best able to negotiate with the key stakeholders at the helm.

Keywords: complex interventions, health innovation, knowledge, primary care, social media, translation

How this fits in with quality in primary care

What do we know?
There is an urgent need to increase the capacity of the primary care sector to serve patients with chronic, complex and life-limiting illness. Information technology (IT) will play a pivotal role in this process.

What does this paper add?
IT offers the opportunity to innovate primary care for population health in the relative safety of a simulated environment. However, effective IT innovations require end-user involvement from the outset, rather than simply as customers.

Background

Most countries are experiencing a growing demand for health care and experts agree that demand will continue to rise.[1–3] The population is ageing, the birth rate is falling, people are living longer and medical technology is offering more scope for successful treatment.[4] Additionally, sedentary lifestyles and the consumption of high-calorific foods are virtually the norm so that between 1980 and 2008, the mean body mass index (BMI) worldwide increased by 0.4 kg/m^2 per decade.[5] It is expected that 75% of Australians will be obese or overweight by 2020; this represents both a health and an economic phenomenon.[6] Although demography will have an important impact on healthcare costs, the magnitude of these costs will be dwarfed by the increasing cost of medical treatment. For example, the demand for more expensive but less invasive procedures will increase much more than the cheaper options now in vogue.[4,7] Such trends have significant implications, as the incidence of multiple chronic diseases including dementia, cancer, diabetes and atheromatous vascular disease, is likely to rise to unprecedented levels.[8] These illnesses will require multidisciplinary teamwork from a health sector often characterised by siloed working practices.[9,10] If primary care is to respond to these (and other) challenges effectively and efficiently, novel approaches to service design and delivery are required and new technologies appear to offer such opportunities.

Information technology (IT) has changed the way individuals interact with services, service providers and each other.[11] Information is now freely and readily available, partly due to the increasing accessibility and affordability of technology.[12] For instance, most Australians have access to a home computer and 46% own a Smartphone.[13,14] The increase in exposure to electronic and social media reflects the rising prominence of cyber-consumerism,[15] as evidenced by online banking, online takeaway ordering, self-service supermarkets and self-service travel bookings. A recent report indicates that 53% of Australians aged over 15 years shop online[16] – online retail is now the norm, rather an activity undertaken by a select few. Many consumers are no longer willing to queue for service – they want (near) instant attention and a failure to deliver risks a loss in clientele. This has implications for healthcare services as these trends also shape patient expectations.[17]

In this epoch of instant gratification,[18] the healthcare sector includes 'a swell of new players', many of whom are now considering the commercial opportunities that technology affords.[19,20] For instance, following its interviews with 32 chief executive officers of private or public healthcare organisations across 18 nations, PricewaterhouseCoopers found three key forces were transforming the healthcare market – namely, the revolution in care, regulatory reform and the march of science.[21] This suggests that there is much opportunity to enable primary care clinicians to fulfil their broad role in prevention, early intervention and connected care.[22] The challenge is to harness these opportunities to foster innovation in primary care. This was the focus of a recent workshop hosted at the 2012 Health Informatics Society of Australia (HISA) annual conference. A team of innovators from the Curtin Health Innovation Research Institute at Curtin University and a representative from the Industry and Innovation Studies Research Group at the University of Western Sydney facilitated a discussion with approximately 50 delegates, findings from which are reported here.

Methods

Delegates represented the government, not-for-profit and private sectors, and held various appointments. They included (but were not limited to) clinicians, regulatory agencies, innovators and academics. The authors delivered brief presentations on examples of innovations in primary care. This included (for instance) the use of video and internet technology to deliver continuing professional development to general practitioners in the form of simulated patient care; this example demonstrated a way to enhance

clinician capacity to provide aftercare to patients, following major surgery. Following these brief presentations, delegates were invited to form three groups, co-facilitated by two authors per group.

The evidence pipeline model, devised by Glasziou and Haynes,[23] formed the framework for discussions. This framework proposes seven critical points at which the translation from research evidence to practice is at most risk – these include the points of: clinician awareness, clinician acceptance, clinician application, clinician ability, clinician recall *in situ*, patient agreement and patient adherence. Reflecting on this framework, delegates were invited to consider and discuss the following key questions:

- Which health problems can we solve now or facilitate management of with IT?
- What experiences have delegates had with the implementation of IT?
- How can IT be used to engage clinicians?
- How can IT help to access hard-to-reach groups?
- What are the considerations and implications of social media for health service providers?

With consent from those present, discussions were documented and/or digitally recorded. Notes were then prepared by the facilitators and analysed in conjunction with the digital recordings. Delegates were not offered recompense for their contribution to this project.

Using an iterative process,[24] each facilitator independently analysed and interpreted the field notes and audio-recording associated with the discussion that they co-facilitated. Guided by the aforesaid key questions, this involved repeated exposure to the research material[25] to generate, develop and revise categories.[26] The authors then compared and contrasted constructed themes and synthesised interpretations.

Through the analytic phase of the project, the data were found to cluster around a number of core themes, as the delegates described their perceptions and constructed their own meanings of situations during the discussion. Using a reflective, iterative process, theme content was then interrogated to explore relationships between and within the themes. The process enabled the authors to engage in a systematic method of analysis using an eclectic process, whilst remaining open to alternative explanations for the findings.[24]

The final task of the team was to compare the changes in stakeholder perceptions from this workshop with one conducted a number of years ago to ascertain any similarities and differences that may have occurred over time.[27]

Results

Solvable or manageable health problems

The need to improve clinical outcomes and reduce the economic burden of ill health was identified as the greatest impetus to the deployment of innovation. It was noted, for example, that outcomes in some of the commonest chronic conditions including mental illness, diabetes and atheromatous vascular disease were unsatisfactory. The reasons for poor outcomes are complex and not exclusively related to a failure to implement so-called 'evidence-based guidelines'. However, there is little doubt that much of the research evidence is not readily applied and a user-friendly, 'normalised' innovation may assist. In some areas of practice, technology is already deployed, albeit there is still a need to innovate for wider deployment. For example, the introduction of computerised appointment schedules has streamlined processes within busy surgeries. Specifically designed templates and tailored programs are also now available for clinical practice with patients now able (in some cases) to make their own appointments online. Other IT innovations that have assisted in the better management of health problems include: consultations with doctors via the internet, sharing of patient information between paradigmatically different services, empowerment of consumers to take control of their chronic and complex conditions, bolstering of health promotion efforts to target and tailor messages about healthy lifestyle choices accordingly, as well as monitoring of at-risk and frail patients in their own homes.

There is robust evidence for the efficacy of online treatments for chronic conditions, such as mental illness. However, there is concern that contextual variations limit the value of these innovations for consumers; for instance, they may be ineffective for particular patients at particular time-points. Furthermore, mobile technologies are not necessarily more accessible; for example, some patients prefer to access technology in the privacy of their own home and on full computer screens, rather than while on the move on relatively small devices.

A major stumbling block to the development of effective technology in health care is the recruitment and retention of participants to test innovations. Where funding is available to provide support to practitioners or incentives to clients, recruitment during a trial or pilot period is relatively successful. However, where funded time for involvement in research is not provided or is limited during a trial period, recruitment and retention were particularly difficult. Furthermore, workshop participants found that changes

in behaviour and/or practice observed throughout a trial usually ceased when supporting funds ceased. Use of 'champions' to promote and support change were found to be very effective and led to prolonged changes in practice if positive outcomes of value to service providers and consumers were demonstrated.

Harnessing technology – implementation experiences

The delegates acknowledged that not everyone had access to technology or was in broadband range. Even where IT was relatively well-established, many delegates noted the limited availability of current, accurate and streamlined patient data, a problem that is exacerbated by a complex health system with many entry and exit points across the public and private sectors. Innovations to promote information sharing were constrained by the interoperability of software systems, privacy legislation, patient preference, confidentiality issues and limited clinician willingness (or ability) to enter data at each patient encounter. It is therefore unlikely that a shared patient record system implemented within current protocols, would comprehensively catalogue patient experiences of the healthcare system. According to some delegates, empowering patients to be the primary custodians of their own health records may also introduce bias and, in turn, reduce the comprehensiveness of current health record databases.

For clinicians in primary care depending on a fee-for-service, funding is the key impetus for the adoption of innovation. A monetary incentive was suggested to be essential, particularly when end-user effort is required. Conversely, as was demonstrated by the team in their preamble, IT use in research is helping to reduce the burden on participants and hence the cost. As such, clinicians may be more inclined to embrace innovation. Researchers are using video and web-based technologies to efficiently test hypotheses with standardised or simulated patients or to deliver education in the virtual clinic environment. This will assist in the investigation of research questions where it is difficult to recruit *bona fide* patients (e.g. patients with rare or embarrassing conditions) or test clinical decision making without risk of harm to 'real' patients.

In general, IT has been deployed piecemeal and largely for commercial interests; therefore it has often not delivered on promise. Examples of successful deployments in primary care are still relatively uncommon. There is little evidence that software tools have delivered significant or sustained and measureable clinical improvements. Although data extraction tools help to understand the public health landscape, these data do not necessarily lead to the necessary action to enact and sustain change. Into this vacuum come burgeoning businesses offering technological interventions that have not been empirically tested or evaluated prior to market release. A key factor is a failure to enlist the end-user as an advisor to the development team. There is therefore a risk that many innovations will be obsolete because they 'leak' at every point through Glasziou and Haynes' pipeline.[23] New innovation also requires pump prime funding of ideas that may have limited (if any) commercial value, yet add to current understandings of, and efficiencies in health care. Such projects do not readily fit into government research funding schemes, nor are they necessarily appropriate for private ventures. Nevertheless, without this investment, progress will continue to be disappointing.

Although the introduction of innovation is important, so too is continued monitoring of its impact. Only then can the return on investment, be it economical or social, be determined. This might be facilitated by the post-marketing surveillance of new tools. Delegates stressed the need for leadership in Australia from medical practitioners with experience in coordinating research projects within practices and across the nation. They also noted that there must be a willingness to change based on evidence.

Engaging clinicians and hard-to-reach groups

It was generally acknowledged that IT has not been readily adopted by all clinicians or at least not to its full potential. In primary care, technology may be used to schedule appointments, print prescriptions or for patient billing; yet, it is not typically used to maintain medical records, communicate with colleagues, inform clinical practice or consult patients online. Clinician engagement with IT was said to reflect change management theories, which recognise the importance of early adopters.[28] Working with local champions and professional bodies to promote uptake was strongly emphasised, as was the need to promote the benefits of technological innovation specifically in reducing workload; this again reflects change management theory.[29] These themes reflect ideas from a similar workshop at this conference as reported in this journal in 2011. The authors of that paper concluded, 'The greatest areas of disagreement or misunderstanding were ... the return on investment for commercial partners; the timelines for academic outputs; and the potential for disruption of clinical practice routines'.[27]

According to some delegates, particular consumer groups are excluded from reaping the benefits associated with healthcare innovation. These include indigenous people, people from culturally and linguistically diverse backgrounds, people from a low socio-

economic background, high-risk youth and people who are homeless, or at risk of becoming so. Although older people are often added to this list, some delegates reported exceptions where many seniors were now 'IT savvy'. Reasons for limited IT engagement among some consumer groups include geographical remoteness, limited means and a preference to opt out of innovative interventions. It was therefore suggested that innovators be mindful of these (and other) barriers and tailor their wares accordingly to ensure all consumers can benefit. A failure to do so is likely to exacerbate current public health inequity and in turn further inflate healthcare costs.[30]

Social media – considerations and implications for service providers

Social media is fast becoming a significant part of the landscape in which individuals seek health information and engage in services. The delegates discussed the use of social media to promote health literacy and foster patient empowerment, while also considering limitations and potential dangers. The global reach of social networks, and the speed at which they can disseminate information, are seen as key advantages. For example, computational analysts at the University of Rochester have developed systems to track geotagged tweets (posts on the social media service Twitter) that relate to occurrences of a range of infectious diseases, including flu. Their systems produce highly accurate heat maps showing outbreaks as they emerge, and their models have clear implications for disease management, and for developing our understanding of the spread of infectious diseases.[31]

Of course, this speed of dissemination can also be a negative factor, particularly if the information is incorrect or lacks credibility. Researchers report that some individuals find it increasingly difficult to differentiate between credible, evidence-based information from expert sources, and that which has no basis other than general folksonomies and 'crowd-think'.[32] Indeed, many individuals may not understand, or even care about, the distinction.

Issues of privacy and confidentiality were raised. As service providers increasingly look to engage with users of electronic media, including social media, the risk of data and privacy compromise becomes correspondingly greater. In cases where third party social media sites such as Facebook are used, the service provider may have limited control over confidentiality policies and considerations. These sites regularly update their policies and adjust their default settings; subsequent changes may result in the unforeseen exposure of information.

Delegates agreed on the importance of thorough empirical testing of IT initiatives before en masse deployment to understand their impact on behaviour and the end-user experience. One systematic review of social media interventions in the area of sexual health identified 178 activities that met their inclusion criteria, with only one reported in published scientific literature.[33] The authors concluded that much more work is needed to evaluate and understand the impact of these activities – a conclusion that was endorsed by the delegates.

Also important to the delegates was the subsequent delivery of end-user training. It was also noted that innovators needed to be aware of, and be able to discern 'the wisdom of the crowd' from the 'voices of the most vocal'.

Delegates indicated possible ways to use social media to benefit health including using private interest to drive innovation and employing a coordinator to oversee integration of social media innovations into practice. This again reflected the thoughts from a previous workshop, which concluded that the most effective lead organisation in driving innovation is the one that is best-positioned to negotiate the needs of each stakeholder group.[27]

Conclusions

Within the context of Glasziou and Haynes' framework,[23] innovators are challenged on several fronts. Clinicians are not necessarily aware of the potential offered by IT; they are rarely part of teams that develop innovations, thus limiting the relevance of innovations to clinical practice; the limited interoperability of IT systems diminishes information exchange; furthermore, technology is not routinely evaluated before market release, or re-evaluated thereafter.

Consumers could also be better engaged in the development and use of IT for primary care. There is still patchy access to the necessary technology and to broadband. Concerns about privacy continue to be a major stumbling block as do cultural issues and failures to adapt the technology to the end-user.

Despite these challenges, delegates largely agreed on two key points. First, IT has much to offer the primary care sector and has the potential to bolster its capacity to meet patient demand. Second, to realise this potential, leadership in developing IT innovations remains paramount, with the organisation best able to negotiate with the key stakeholders at the helm. Given that delegates represented the government, not-for-profit and private sectors, and offered perspectives from each Australian state and territory, these findings make a significant contribution to current understandings of IT use in primary care.

However, four limitations moderate the conclusions that can be drawn. First, the participants were self-selecting and this diminishes generalisability. Second, reliance on self-reports means that participant perceptions could not be verified. Third, while this paper reflects notes taken in each discussion group, it may still not encapsulate the perceptions voiced by all the participants. Fourth, the participants provided a snapshot of their views, which might alter over time.

Findings from this research suggest that the health of the primary care sector may be bolstered by an injection of IT innovation. However, to optimise relevance to clinical care and patients, this will require end-user involvement from the outset as well as the stewardship of an organisation that can lead and orchestrate innovation across the government, not-for-profit and private sectors.

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