Will information and communication technology disrupt the health system and deliver on its promise?

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ABSTRACT

- Investment in information and communication technology (ICT) in the health sector can bring important benefits. To date, the focus has been on automating clinical work practices such as ordering tests and prescriptions, which significantly improves efficiency and safety.
- Uptake of ICT has been slow and the results less favourable than anticipated for various reasons, including poor integration of systems into complex clinical work processes, limited training, and the intermittent nature of ICT funding. As a result, many health care organisations have been operating hybrid paper and computer systems that introduce new patient risks, staff frustration, and outcomes below expectation.
- The focus must shift from automation of clinical work to innovation; from evolutionary application of ICT to revolutionary uses. Health professionals must embrace ICT as a "disruptive technology" that will produce significant changes in their roles and responsibilities and lead to real health reform with new, innovative models of health care delivery. As other industries have shown, substitution and role changes are areas in which ICT can lead to the greatest gains.

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Hand a rifle to an expert archer and she will probably miss the mark, despite having superior technology in her hands. What happens, then, when you arm the health sector with an array of new information and communication technologies (ICTs) that promise to revolutionise the delivery of care? The evidence is that ICTs have fallen short of the target.

The global expansion of ICT is now consuming more than $US3.5 trillion a year. It is a paradise for those selling technology. The chief consumers among health sectors are those in the United Kingdom, the United States, Canada, Australia and other developed countries. Having seen ICT boost productivity and improve service outcomes in other industries, health sectors are keen to reap the benefits for themselves and so have been rapidly increasing investment in the new technologies.[1-3] The rhetoric of vendors and governments espouses the financial benefits and improved quality of care that will result. But those on the front-line of hospitals and clinics tell a different story. The existence of entrenched, non-standardised work practices tailored to specific patient populations or organisational systems or cultures means that ICT can fail to meet health professionals' specific needs, and high levels of autonomy among staff, and their unique requirements, mean they often remain unconvinced of the potential gains from ICT. Indeed, they are frequently in a position to resist the latest technology on these grounds alone.

When technology does not integrate into everyday work practices, things can go wrong.[4,5] An Australian survey of 10 000 nurses in 2007[6] revealed that only 40% felt ICT was making their working lives easier. As one participant observed, the installation of a new electronic reporting system at her workplace did not replace the four paper-based systems already in use; it just added to them, largely due to a failure to integrate systems: "After 20 years of technology growth, I now spend more time filling out paper work and far less time face to face with patients." This is a cry echoed around the world.

Much of this frustration is related to intermittent bursts of funding for, and the constant changing and updating of, ICT systems. Nearly one in five participants surveyed at an annual electronic medical record (EMR) trade fair in the US in 2007 had been or was in the process of uninstalling an EMR system.[7] Not only is this time-consuming in itself, but it inevitably requires retraining of users in the next upgrade, and can increase scepticism. Risk of errors and inefficiencies increases when organisations are forced to run paper and computer systems in parallel.[8,9] Workarounds abound, the potential streamlining of work processes is hard to realise, and staff put great effort into maintaining multiple systems. These factors all contribute to suboptimal outcomes.

Stable investments are required that allow organisation-wide, flexible systems to be implemented in a relatively short time, with a focus on training and on integrating systems into the realities of the complexity of clinical work. But this is not sufficient to gain the transformative benefits that the health system needs from ICT.

Given that $462 million was allocated to individual e-health records alone in the 2010–11 federal Budget, clarity about what is desired and expected from e-health is becoming an urgent problem.[10] The key lies in how ICT in health care is viewed and what people want it to do. At present, the focus is on creating efficiency and safety gains by using computers to automate existing manual processes. For example, computerised ordering systems largely substitute paper orders with electronic orders. This has produced demonstrable and sustained improvements in the speed with which test results are available to clinicians.[11,12] Substantially reduced rates of medication errors following automation of the prescribing process are further promising evidence of the benefits of ICT.[13,14]

While vitally important, these substitutional and evolutionary uses of ICT largely undervalue its revolutionary potential. ICT has the capacity to transform work practices and processes by creating opportunities for health professionals to take on new roles and to provide care in different and innovative ways. Decision support within computerised ordering systems and telemedicine are only two examples. Such systems create opportunities for health professionals other than doctors to order certain tests and to make treatment decisions when experts may not be at hand. Available evidence suggests outcomes do not suffer. For instance, nurses' performance in answering clinical questions unaided generally falls below that of doctors, but when supported by online evidence systems, their performance matches that of their medical colleagues.[15,16] As other industries have shown, substitution and role changes are areas in which ICT can lead to the greatest gains.[17]

In its transformative capacity, ICT is disruptive.[18] A "disruptive technology" is a technological innovation that eventually overturns existing practices and transforms the landscape of a particlular industry. Disruptive technologies can change traditional patterns of work and enable less highly paid professionals to do progressively

more sophisticated things in less expensive ways.[19] Much of the discomfort felt by health professionals about ICT is a response to this potential for disruption. As ICT markedly alters people's roles and shifts responsibilities,[20] it challenges the status quo, and this is seen by many as a threat to the established routines that enable organisations to function, as well as to other valuable practices. Small wonder that ICT is viewed by some health professionals as a danger to the things they cherish.

New technologies do not automatically lead to improvements in accompanying work practices, organisational structures and models of care. As the metaphor of the archer illustrates, new technologies have to be matched by new skills and behaviours.[21] But making this happen is fraught with difficulty and expense. Most efforts to reform clinical work practices as part of health ICT implementation projects have adopted traditional business process re-engineering[22] methods, which use workflow models that are comparatively simple, top-down and linear.[23] But this is the wrong fit for the complex, collaborative nature of medical work and for the unique organisational and workforce characteristics of the health sector, in which the various professional groups have high levels of self-sufficiency and are distinctly tribal[24] in their behaviour. As a result, potentially significant changes to work practices are rarely explored, and a disconcertingly large number of major health ICT projects have been floundering or failing to deliver the much-touted benefits.[25-27] We need fresh approaches that look at how work is conducted in real-world clinical settings — not as specified in linear policy and procedure manuals — and assess how ICT can create opportunities for supporting new care delivery models rather than replicating existing practices. This includes patients having an active role in the process.

The time has come to apply ICT to the health system in a way that creates real reform, making quantum gains in the information that clinicians and managers have at their fingertips to help them make better decisions. If used to its full potential, ICT can enhance professional roles and workflows, leading to streamlined systems and improved quality of care. It is time to see ICT in this new light, as a genuine enabler of these outcomes. It is not just a technical fix, requiring more elegant machines and software, according to the technophiles' arguments. Nor is it mostly a behavioural problem, needing "change management" or professional consulting firms to manage it, as policymakers and managers think. It is both, and clinicians at the coalface need to be integrally involved in design, application and adaptation of their practices and behaviours to make things work in new ways. Until we heed this lesson, we will continue to see ICT as a mere tool for automating existing activities — further entrenching existing problems — rather than as an opportunity for truly reforming health care delivery.

Competing interests

None identified.

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