Telemedicine normalisation: a new version of an old problem?

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Abstract
The progress of e-health has raised hopes and expectations that challenges faced by healthcare systems in the 21st Century (e.g. ageing populations, equality in access and budget restraints) can be overcome through its application. Although the development of telemedicine began early in the 20th Century, its incorporation into healthcare remains problematic and controversial. Despite the fact that many proposed projects show potential for good clinical assessments and outcomes, most do not continue beyond the feasibility phase. While managers and clinicians wait for definitive evidence to support the implementation of telemedicine, findings from research conducted during the 1990s incorporating information and communication technologies (ICTs) into the business world suggest that a different approach could facilitate understanding of how telemedicine could be extensively implemented in healthcare systems.

Keywords (MeSH): Telemedicine; Biomedical Technology; Medical Informatics; Health Care Economics and Organizations

Information, communication technologies and the promise of e-health
The World Health Organization’s (WHO) ‘eHealth Resolution’ recognised the contribution of information and communication technologies (ICTs) to the delivery of healthcare for the first time (WHO 2005). e-Health was defined as a cost-effective and secure use of ICTs to support health and health-related fields, including healthcare services, health surveillance, health literature, and health education, knowledge and research. Member states were urged to establish long-term strategic plans to develop and implement e-health and to build appropriate legal frameworks and infrastructure involving the public and private sectors. This document provided a global strategy for e-health at the highest level, requiring its General Director to promote international multi-sectorial collaboration in offering technological support to member states and facilitating e-health integration in healthcare systems. WHO’s interest in promoting and encouraging the incorporation of ICTs in healthcare was shared by other organisations. The European Union (EU) established the ‘EU e-Health Action Plan 2004-2010’ to create the European e-Health Area (European Union 2004), which responds to major challenges confronting the health sector, and affirms that e-health improves access to healthcare, boosts quality and effectiveness of services, and provides an assurance that, when combined with organisational change and the development of new skills, e-health can help to deliver better healthcare at lower cost within citizen-centred healthcare delivery systems. Priorities are: (a) to address common challenges and create the right framework to support e-health; (b) to pilot actions to encourage the delivery of e-health; and (c) to share best practices and systems for measuring progress.

Six years later, the Conference Declaration about European Co-operation on e-Health (European Union 2010) is still seeking standardisation and evaluation of e-health with respect to health outcomes, benefits and cost-effectiveness, including patient safety, accessibility to health care and quality of health care. Political will to promote and expand the use of ICTs in e-health implementation has been fuelled by common problems experienced by health systems in developed countries: rising demand for healthcare and social services; an ageing population; increasing mobility; management of huge amounts of information; global competition; and the need to provide the best possible healthcare within limited budgets (European Union 2004).

Telemedicine and its normalisation
Telemedicine has pioneered ICT incorporation in the health domain since the middle 20th Century when distance data-transmission technologies were in use (Bashshur, Reardon & Shannon 2000). Since then, there has been a progressive increase in the number of
Assessments using traditional models of health technologies, has not proved useful in ICT implementations. It be a useful determinant in certain health interventions and include different activities; at times undertaking measurements that take into account the peculiarities of technology beyond traditional health interventions and this would not be enough to ensure that telemedicine applications achieve good outcomes. The essential factors in the application and success of telemedicine are strongly related to the conditions under which they are developed, as well as the correlation between positive results from a clinical trial and their application in the routine clinical practice, aspects not usually considered in traditional assessments. Some authors have proposed alternative models for assessing and evaluating complex interventions in health care, the goal being to better understand how new clinical techniques, technologies and other complex interventions become normalised in practice (May 2006; May & Finch 2009).

This situation highlights inherent difficulties in assessing effects and results of ICT incorporation into a specific activity. In healthcare, a sector with a solid tradition of evaluation, relevance of these kinds of assessments is so important that many governments create agencies to conduct specific research and provide reports, and although not binding, these reports are extensively used for decision-making. It is difficult to find adequate methodological models to undertake measurements that take into account the peculiarities of technology beyond traditional health interventions and include different activities; at times with few characteristics in common.

A new version of an old problem
Is this so new and strange? Not really. In the business world, in the late 1980s/early 1990s, investment in telemedicine projects, scientific activity and research. The Telemedicine Research Centre (Grisby 2004) identified 145 telemedicine-active programs, where 10 years earlier there had been only 10. Moser et al. (2004) highlighted a consistent increase in telemedicine publications from a handful in 1990, to 100 in 1994, and over 800 in 1998. This number has been more or less constant since then, totalling 5,911 assessments in 2003.

Despite increased activity in telemedicine and an apparent determination to incorporate ICTs into health systems, it continues to have only symbolic presence. Many pilot projects and feasibility studies are started but few telemedicine applications are incorporated into healthcare delivery systems (Broens et al. 2007). The general consensus is that implementation is slow and difficult because of lack of scientific evidence to support its effectiveness to provide either clinical or cost benefits (Grisby, Brega & Devore 2005). Health Technology Assessment suggests that success of telemedicine programs will be determined by clinical results, although these are difficult to assess. Bashshur, Shannon and Sapi (2005) concluded that with few exceptions, research in this field has yet to produce adequate empirical data to provide evidence for clinical efficiency of telemedicine. Grigsby, Brega and Devore (2005) pointed out that without rigorous, high quality research to produce this evidence, telemedicine will not be supported by professionals and decision makers. Projects started and assessed are mainly short-term or designed only for a pilot phase. Whetton (2005) found that nearly two thirds of all communications presented to the 2004 International Conference on Successes and Failures in Telehealth organised by the International Society for Telemedicine and e-Health were short-term projects. Such projects produced only provisional results about feasibility of technological applications and did not offer information about how they would work when they reached a mature state. Therefore, we are facing a conundrum: we hope that results from assessments will offer clear advice about convenience and utility to definitively facilitate implementation of health interventions, while actual projects and assessments provide data based on short-term projects and interventions only, which change over time. This type of assessment, which can be a useful determinant in certain health interventions, has not proved useful in ICT implementations. Whetton (2005) pointed out that attempting to make assessments using traditional models of health technologies assessment presents recurring difficulties. Studies may be too descriptive, insufficiently rigorous (e.g. too small a sample size, no control group), or data may be inadequate to support research objectives (e.g. short-term projects with limited capacity for analysis). Some authors have suggested that telemedicine assessment should learn from randomised clinical trials methodology, the 'gold standard' in interventional studies in health technologies assessment, and apply the same rigour in trial design, execution and publication of results. Because of difficulties involved in randomly assigning patients to control and interventional groups, obtaining sample sizes that are large enough, and difficulties associated with implementing double-blind studies (all fundamental features in clinical trials), alternative methodologies have been proposed, with quasi-experimental designs and the use of administrative databases (Grisby & Bennet 2006). Conversely, other authors have argued that there are inherent problems with ICT assessment that do not permit transference of traditional methodologies (Ammonwerth et al. 2003); that clinical trials are devoted to objectively measuring effects of therapeutic interventions and this would not be enough to ensure that telemedicine applications achieve good outcomes. The essential factors in the application and success of telemedicine are strongly related to the conditions under which they are developed, as well as the correlation between positive results from a clinical trial and their application in the routine clinical practice, aspects not usually considered in traditional assessments. Some authors have proposed alternative models for assessing and evaluating complex interventions in health care, the goal being to better understand how new clinical techniques, technologies and other complex interventions become normalised in practice (May 2006; May & Finch 2009).

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1 Health Technology Assessment is a multi-disciplinary field of policy analysis that examines the medical, economic, social and ethical implications of the incremental value, diffusion and use of a medical technology in healthcare (see: http://inahta.episerverhotell.net/HTA/)
ICT was widely assumed to have enormous potential to reduce costs and improve competition. However, research did not show a relationship between ICT investment and increased productivity. This was referred to as the ‘technological paradox’, and it generated alarm and discussion between researchers and top managers (Brynjolfsson & Hitt 1996). The technological paradox had its empirical origin in the US in the 1970s, when it was observed that an incremental investment in ICT did not translate into a proportionate increase in productivity, especially in the services sector. In fact, there was an unexplained residual decrease in productivity when compared with the first half of the post-war period, not only at company level but also at the global economic level. Moreover, this decrease coincided with the rapid increase in ICT use. That reality brought prestigious economists such as Nobel Prize winner Robert Solow to affirm: ‘We see computers everywhere except in productivity statistics’ (Solow 1987: 36). The idea of a technological paradox was further reinforced by studies in 1990s, which aimed to show a correlation between ICT spending and productivity, but found no positive correlation between these variables or that their benefits outweighed costs (Yorukoglu 1998).

Most studies showed that ICT investment did not create a significant increase in productivity or they actually reduced it (Oz 2005); that residual return of investment in ICT was lower than the residual return of more conventional investments (Yorukoglu 1998). It appeared that productivity vanishes in one of the fastest and most comprehensive technological revolutions of human history (Castells 2000). Research highlighted three key facts that lead to an understanding of what was happening (Brynjolfsson & Hitt 1996, 2000; Brynjolfsson 1998):

1. Methodological deficiencies and difficulties in accessing the right data led to output not being measured in the right manner. Traditional ways of evaluating the relationship between inputs and outputs failed to take into account non-traditional sources of value.

2. There was a considerable time lag before it was possible to observe and empirically measure increases in productivity due to ICT incorporation and diffusion in economic activities. It takes time for changes in business processes to reveal ICT benefits.

3. A significant component of ICT value was its capacity to initiate organisational transformation processes that drive change in business processes and models. Thus, incorporation of ICT would not produce an automatic increase in productivity but it would be an essential component of a broader system of organisational changes that would in turn increase productivity.

Organisational transformations, the key element

How can these key facts be applied to telemedicine implementation and normalisation? Over the last few years, a similar analytical approach has been applied to ICT introduction in healthcare organisations, with studies devoted to identifying and assessing organisational transformations brought about by these technologies (Nicolini 2006; May et al. 2003; Harrison, MacFarlane & Wallace 2002; Gagnon et al. 2004). Some of these studies address the issue from a social perspective, with the basic assumption that scientific knowledge and technologies evolve in a concrete context. Here, the technological features of the design or application and its outcomes can modify implementation and acceptance, but whether it is then used or ‘dropped’ is determined by the social context in which the technology is implemented. This approach casts doubt on the argument that the low level of telemedicine implementation is due to lack of sufficient scientific evidence. Instead, it suggests that the real results will be achieved by interaction between social, organisational and technological factors.

May et al. (2003), in a retrospective qualitative study of data from several telemedicine projects obtained from 11 different locations in the UK, concluded that the relatively poor telemedicine implementation could be a consequence of a naive development model, as far as it assumes that the incorporation of telemedicine is a linear and rational process, where high quality research will lead to a quick acceptance of innovation and to its integration to clinical practice. They proposed an alternative integral model that defines five requirements for a project in order for it to be adopted: implementation; adoption; translation; stabilisation; and normalisation, the latter being conditional on the previous four. Nicolini (2006) studied four Italian telemedicine projects that ran actively for a minimum of two years, with an aim to understand the nature of organisational innovation with the adoption of telemedicine, the characteristics of using technologies, and the effects on traditional medical practices. The author concluded that telemedicine creates significant changes in work processes, and that these changes affect the material conditions and professional relationships of clinicians in their practices. From this analytical perspective, Broens et al. (2007) proposed a layered implementation model that changes focus from initial technological aspects to organisational aspects as a project matures. From this perspective, implementation of telemedicine processes...
requires a visionary approach, going beyond the traditional indicators used for assessments.

**Conclusion**

From what we have learnt about ICT incorporation in the business world, it seems that implementation of telemedicine in healthcare organisations requires a different approach from that of traditional health technologies. Difficulties in incorporating telemedicine into clinical practice confirms that ICTs are not just an instrument to automate or improve processes already in place; they play a far more important role as facilitators of organisational changes, and these changes will be the key factors that drive the full accomplishment of what telemedicine promises in relation to equality, sustainability and quality. Therefore, a more holistic approach is needed alongside a strategy that keeps the particularities of ICT technologies in mind, which changes the focus from production of evaluative evidence to consideration of the transformational properties of ICT technologies and the organisational processes linked to them. The authors argue that the redesign of healthcare systems is not just something that needs to be done to facilitate implementation of ICT technologies and e-health; it is the critical factor that will determine whether or not ICT technologies and e-health succeed.

**References**


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