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Title	Technology adoption in health care: International barriers and opportunities to telemedicine
Type	Article
URL	<a href="https://clock.uclan.ac.uk/12350/">https://clock.uclan.ac.uk/12350/</a>
DOI	<a href="https://doi.org/10.1177/1367493514561844">https://doi.org/10.1177/1367493514561844</a>
Date	2014
Citation	Carter, Bernie (2014) Technology adoption in health care: International barriers and opportunities to telemedicine. <i>Journal of Child Health Care</i> , 18 (4). pp. 299-301. ISSN 1367-4935
Creators	Carter, Bernie

It is advisable to refer to the publisher's version if you intend to cite from the work.  
<https://doi.org/10.1177/1367493514561844>

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# Technology adoption in health care: International barriers and opportunities to telemedicine

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Although telemedicine and telehealth are seen as discrete entities by some authors, both The Cochrane Library (2010) and the WHO (2009) acknowledge that definitions overlap. The broad and encompassing definition underpinning the WHO (2009) report states that telemedicine is:

The delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities

The Cochrane Library (2010) categorizes telemedicine under three main headings, namely, store and forward (the transmission of medical data between a patient and his/her doctor where the data will be assessed at a later time point), remote monitoring (the use of devices to monitor patients in a non-medical setting) and interactive telemedicine (through the use of telephones, videoconference, etc. for remote but real-time communication). Regardless of the type of telemedicine, the following four elements are seen to be fundamental: (1) its purpose is to provide clinical support, (2) it is intended to overcome geographical barriers, connecting users who are not in the same physical location, (3) it involves the use of various types of information and communication technology, and (4) its goal is to improve health outcomes (WHO, 2009).

New clinical technologies such as telemedicine offer potentially enormous benefits to improving the health outcomes of patients as well as offering benefits to their families, clinicians and all those working within health care. Yet, despite this potential, a recent report from the United Kingdom identified barriers to the adoption and implementation of new clinical technologies, even where there was evidence of effectiveness or proven advantages for patient safety (Llewellyn et al., 2014). Among other factors, Llewellyn et al. (2014) found generic policy and organizational barriers and issues stood in the way of successful adoption and implementation. These barriers included the lack of a central push from the Department of Health, the requirement for new ways of working and new skills, lack of leadership, infrastructure issues, lack of project managers/management and poor diffusion of knowledge beyond the very local level. Another barrier was concerns over costs, such as the lack of a tariff for the new technologies, which created a potential loss of income to the hospital/department (Llewellyn et al., 2014).

Indeed, globally the 'most frequently cited barrier to the implementation of telemedicine solutions ... is the perception that the cost of telemedicine is too high' (WHO, 2009: 9). However, work by Dharmar et al. (2013) in the United States noted that telemedicine resulted in increased hospital revenue as well as increased professional billing revenue, increase of market share and an increase in the number of patient transfers following the deployment of telemedicine. Jennett et al.'s systematic review identifies evidence of some socioeconomic impact in a variety of different paediatric settings.

The literature on telemedicine is expanding, and telemedicine is being used effectively in settings as wide ranging as critical care, rural health care and emergency care. For example, Otero et al. (2014) note the usefulness of telemedicine in paediatric critical care both for improving patient outcomes and in terms of education. McGrath Davis et al. (2011) report on the feasibility and acceptability of telemedicine to clinicians and families in the treatment of paediatric obesity. An impressive use of telemedicine is the use of 'real-time' audio visual communication between clinicians practising in conflict-torn Somalia and a paediatrician in Nairobi. The introduction of telemedicine reduced adverse ward outcomes (death and loss to follow up) by 30% and progressively improved the capacity of the clinicians. Among many positive outcomes from this study was the way in which telemedicine brought the doctors working in some of the most 'deprived and insecure circumstances in the world ... a sense of proximity and solidarity with senior colleagues elsewhere' (Zachariah, 2012: 1161).

Advances are evident and some of the potential of telemedicine is being achieved. However, whilst telemedicine is a rapidly developing field, it is still in its infancy, and the WHO (2009: 7) recognizes the importance of evaluation to 'ensure maximization of benefit ... [and improvement of] health outcomes'. Also, it is clear that as technological possibilities expand, we should not become so focused on the technology that we lose sight of the children and families. Patient-centred care needs to be at the heart of transformational telehealth practices (Anon, 2014).

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