Chapter 28
User Diversity as a Challenge for the Integration of Medical Technology into Future Smart Home Environments

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ABSTRACT

Facing the growing aging population in many countries of the world, healthcare-related technologies become increasingly important, representing a possible solution to the soaring overstrained health care systems and dwindling number of caregivers. Though a user-centred and sensible integration of medical technology in home environments is highly challenging, especially when focusing on the group of old and frail users. Their specific needs and wants, their (dis)abilities and limitations have to be carefully considered, in order to reach full acceptance and a successful rollout of e-health applications in home environments. As the knowledge about acceptance in the medical sector is still limited, an elaborate research is needed in order to understand and respect aged persons' specific demands. In an empirical approach, the role of age, technology generation, technical expertise, and gender are determining for the acceptance of medical technologies. As the acceptance of medical technologies might be also biased by social norms and the way aging and age-related consequences are evaluated within a society, individual ageing concepts as well as economic and educational levels were considered for the evaluation of the perceived benefits and drawbacks of medical technologies. Outcomes show the importance of understanding users' needs and wants in order to develop user-centred medical technology concepts and to allow a successful rollout.

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INTRODUCTION

In the last few years, an increasing public awareness regarding the consequences of the demographic change can be observed in many countries, which is imposing considerable challenges on the next decades on future health care systems. Drastically demographic changes and such aspects as increased life expectancy, improved medical healthcare, reduced fertility rates, will lead to a growing number of frail older people, who will need medical treatments and long term care provided by official health care systems (Leonhardt, 2006). One of the central challenges for political and health care systems in the 21st century is therefore to master the demands of an aging society (Arning & Ziefle, 2009a; Rogers, 2009; Stronge et al., 2007).

Electronic health technologies will play an increasingly important role in the coming years, as more and more older people will require medical care and support (Leonhardt, 2006; Warren & Craft, 1999; Weeks et al., 2005; Wyeth et al., 2001). There is an increased need for intelligent medical technologies, which enable people to live independently at home (Czaja et al., 2008; Holzinger at al., 2010; Kleinberger et al., 2007; Ziefle & Röcker, 2010). Electronic healthcare technologies support the interaction between patients and health service providers, institution-to-institution transmission of data, and peer-to-peer communication between patients and health professionals (Arning & Ziefle, 2009b; Gaul & Ziefle, 2009).

Within the last years, a variety of new healthcare concepts for supporting and assisting users in technology-enhanced home environments emerged (Klack et al., 2010; Meyer & Mollenkopf, 2003; Ziefle & Röcker, 2010). These so-called Ambient Assisted Living (AAL) applications are characterized by a combined use of information and communication technologies and health monitoring devices in the home domain. Mobile technologies in combination with ambient technologies offer enormous potential to improve patients' medical care and reduce the financial pressure on health care systems alongside progress in biomedical sciences or genetics. The spectrum of emerging technical applications covers a broad variety of developments, reaching from internal technologies (implants for monitoring physiological signals) over devices integrated into clothes (wearable technologies) to healthcare robots or smart home technologies, which support older people in keeping up their independent life at home (Kasugai et al., 2010; Gaul & Ziefle, 2009; Demiris et al., 2008; Meyer & Mollenkopf, 2003; Schmitt, 2002).

Supporting older patients in keeping mobility and maintaining an independent life style at home will only be achievable by systems, which fulfill certain criteria. Such systems are supposed to monitor and control health-related information, are portable and communicable, and fit into the ecology of existing mobile devices as well as ambient assistant living (Ziefle et al., in press).

These innovative smart care technologies promise to deliver significant improvements in access to care, quality of care, and the efficiency of the health sector (Leonhardt, 2006; Meyer & Mollenkopf, 2003; Mynatt et al., 2004). Though, the development in medical technology is impressing, nevertheless, practical experience shows that the brilliance and novelty of technical solutions does not guarantee the successful diffusion of these innovations. In order to reach a high degree of user acceptance, not only the technical and engineering parts are of importance, but also the human aspects of these technologies and the way how they meet user's wants and needs regarding privacy, dignity, and their requirements for as useful perceived medical technologies (Lahlou, 2008; Necheles, 1982; Ziefle & Wilkowska, 2010; Zimmer & Chappell, 1999). Thus, the success of (future) healthcare technologies depends decisively on the extent to which technical developments meet the specific needs and demands of users, and on their willingness to use and integrate devices into their personal spaces (Gaul & Ziefle, 2009; Ziefle &