

Guest Editorial

Telehealth Systems and Applications

In the 21st century, the convergence of healthcare and information and communications technologies (ICT) offers an opportunity to give patients greater liberty from their health problems. Telehealth systems and applications, supported by advances in ICT, are fostering a diversity of cost-effective and efficient healthcare solutions. These solutions are becoming embedded in all aspects of clinical care and are enhancing the quality, equality and accessibility of care while playing a pivotal role in decreasing the rising costs from the growth in aging population. The emergence of affordable health sensors and accessible mobile computing devices, such as smartphones, wearables and tablets, offers opportunities for Telehealth systems and applications to revolutionize existing healthcare solutions.

Telehealth has become an integral part of healthcare at a global context with research being conducted all around the world to address Nation-specific challenges. For example, in the vast country of Australia, due to the many rural towns and regional cities, equality and accessibility of care is a major ongoing healthcare problem. In 2011, NSW state governments has made a large investment in Telehealth and established Nepean telehealth technology centre (NTTC) in the western Sydney area with the aim to foster and pilot clinician-sponsored Telehealth models of care, for the purposes of providing health services to patients who live in regional and rural areas in NSW. This has led to the development of new technologies and models of care delivery, as well as to produce a culture that allows for the adoption of new Telehealth technologies.

More than the 40 years of research has produced a wealth of technological developments in Telehealth. IEEE Xplore digital library includes more than 5000 published works related to Telehealth or Telemedicine. The same keywords in PubMed – a bibliographic database of medical research maintained by the National Library of Medicine returns more than 18,000 citations of published works. In both of these databases, there is a common trend of yearly rise in the number of publications which is consistent with the continuous development of new Telehealth technologies. This special issue comprises eight selected state-of-the-art research papers worldwide in Telehealth systems and applications, covering a wide range of cutting-edge developments including remote monitoring, tele-rehabilitation, remote detection, and chronic disease management. These studies offer innovative solutions for clinical applications such as for vital signs monitoring, mental health, and obesity. As a whole, they represent the current global activities and also depict the future trends and directions that Telehealth research is aspiring towards.

The manuscript by Cellar *et al.* discusses the technical challenges of acquiring high quality vital signs during home monitoring and the use of these vital signs for automated risk stratification of patients; the discussion is based upon the lessons learnt from a clinical trial in Australia. Grünerbl *et al.* focus on the use of smartphone technologies for monitoring mental health. They propose a system that uses smartphone sensing to recognize the manic and depressive states in patients suffering from bipolar disorder. Lanata *et al.* describe a personalized wearable monitoring system that can characterize the mood and mental state of patients to improve the diagnosis and management of psychiatric disorders. The manuscript by Garripoli *et al.* presents an embedded Telehealth device that uses radar sensors and a base-station for the automatic, real-time, continuous, remote detection of fall emergencies. Solana *et al.* describe a Tele-rehabilitation platform that combines remote monitoring together with a decision support system (DSS) to offer new personalized strategies for cognitive rehabilitation for patients with brain injuries. Thelen *et al.* present the use of off-the-shelf medical devices and web technologies to realize a real-time patient monitoring solution. Sukor *et al.* assessed the performance of algorithms for eliminating noise artifacts in pulse oximetry and blood pressure signals to improve the quality of self-measurements by patients. Barnett *et al.* describes a complete weight loss and management system deployed via smartphone and a personal computer. The novelty of the proposed system is its ability to facilitate communication and extend the relationship between patients and their dieticians.

As guest editors, we hope that the manuscripts in this special section will be of value for all readers and will act as inspiration for further advancements in the important and exciting Telehealth research area. We are grateful to the authors for submitting their contributions to this special section, and to the numerous reviewers whose help was instrumental in refining the quality of the manuscripts.

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