Editorial

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Biographical notes: John Puentes holds an Electronics Engineering Degree, an MSc in Image Processing and Artificial Intelligence, and a PhD in Signal Processing and Telecommunications. He worked as Engineer, Consultant and Project Manager for biomedical and telecommunications companies before moving to the Image and Information Processing department at TELECOM Bretagne, where he is Associate Professor and associate researcher of the French Institute of Health and Medical Research (INSERM). He is an invited associate editor and reviewer for several international journals, conferences and organisations. His primary research interests are medical practice support systems, image indexing, and telemedicine.

Enabling medical practice through the application of telecommunication and information technologies, as a way to overcome geographical separation has been a long-sought vision. However, despite the current proliferation of those technologies, this concept materialisation at a practical level strives to realise its expected potential (Hersh et al., 2001; Roine et al., 2001). A juxtaposition of abundant and refined but incompatible technologies, and deficient service models, characterise the present landscape (Tulu et al., 2005). Whether it is medical specialist (telemedicine) or patient (e-health) driven, such a distant healthcare practice has multiple implications, mainly at professional (Lehoux et al., 2002), economic (Hakansson and Gavelin 2000), and social (Jennett et al., 2003; Menachemi et al., 2004) levels. New trends like mobile patients, computer-supported collaborative medical sessions, ambulatory monitoring with intelligent alarm processing, patient-centred information systems, diagnosis expertise subcontracting across national borders, and knowledge extraction from large repositories of specialised patient records, among others, are irreversibly transforming our understanding of the telemedicine and e-health scopes. On the other hand, along with the identified status and present tendencies, it seems plausible to consider that distant healthcare programs development is most likely to be promoted by private instead of public medical practice. This will not have, as initially imagined, a significant impact on the population disparities access to healthcare, reinforcing distant urban healthcare to the detriment of its rural counterpart (Puentes et al., 2007). Improvements in distant healthcare quality and delivery should be envisioned beyond rapid retrieval and exchange of multimedia patient data, addressing issues that concern end-user ergonomics, ubiquity,

standardisation, detailed process workflow analysis, and security, besides medical practice support.

Within this challenging and intriguing context, the idea of the *International Journal of Biomedical Engineering and Technology* special issue, materialised as an initiative to address questions related to the growing interdisciplinary diversity that surrounds telemedicine and e-health delivery. Accordingly, selected papers represent proposals to solve problems related to distant healthcare practice, without focussing exclusively on the traditional medical specialist/patient consultation model. The addressed subjects include complementary wireless cardiac activity monitoring, remote rehabilitation of memory impaired patients, disaster relief support and economic analysis. This diversity also reflects varied interdisciplinary connections involved in the implementation and execution of telemedicine and e-health projects: patients who take an active and interactive role in their treatment and follow-up, medical emergency critical resources administration based on geo-referential knowledge, and profitability outside of a mass market model.

What are the current approaches to carry out wireless cardiac activity monitoring and how do they interface with available short- and long-range transmission technologies? In the first paper, Faribozi and Moghavvemmi attempt to answer this ambitious question, by making a critical review of sensors that monitor cardiac activity, complementing ECG recording and transmission, which has been already extensively studied. Eight approaches are initially described: skin contact electrodes, bio-impedance measurement, photo-plethysmography sensors, phonocardiography, textile-based sensors, capacitive sensors, thermal imaging, Doppler radar sensors; and their wireless monitoring capabilities analysed considering raw signals conditioning and transmission alternatives, before stating possible trends.

Can remote rehabilitation be applied to help memory-impaired patients who need to relearn basic living skills? In the second paper, Fok reports on an engineering work in progress, aimed at using and validating a virtual reality framework for cognitive rehabilitation, intended to offer for patients treated at home, caregivers distant therapy assistance. The system provides a basic infrastructure consisting of a patient database, therapy configuration tools, dynamic three-dimensional object representations, patient interaction and performance follow-up, combined with adapted telephone prosthesis. The training steps to learn again the skill of using a telephone are described and illustrated. A preliminary usability test done with healthy volunteers illustrate how this approach could be applied.

How mobile telemedicine units' displacement under threat could be optimised in an urban disaster scenario, when a crucial insufficiency of resources happens? In the third paper, Puentes et al. describe a geographic aware system that provides decision support to optimise mobile telemedicine units' displacements in dynamic environments. The system manages multiple information sources – terrain graph representation, traffic, weather, treats, and other events – to adjust in a timely manner the trajectory of a mobile telemedicine unit operating in an unstable environment involving threats, fixed and dynamic obstacles. Depending on the impact of actual and predicted threats, as well as the tolerance and emergency levels, the vehicle trajectory is corrected. Four simulated scenarios illustrate the system anticipation capacity.

Once there is a technologically sound telemedicine solution working, how do we know if it is efficiently and profitably exploited? In the fourth paper, Nassiri et al. calculate the financial break-even point of remote consultation for three

pathologies – parasitology, dermatology and cardiology – based on a portable teleconsultation station and satellite communications, installed at three geographically isolated villages and the French Guiana capital. Taking as reference air medical evacuation costs and assuming an initial investment lifespan of six years, reduced afterwards to three years to make the sensitivity analysis, the amount of avoided air evacuations necessary to properly exploit the system is obtained at both aggregate and disaggregate levels. The analysis is completed by the impact of organisational factors.

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I hope that the papers presented in this special issue will contribute to enhance telemedicine and e-health value understanding, while expanding and demonstrating the effective exploitation of their potential.

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