



Available online at
ScienceDirect
 www.sciencedirect.com

Elsevier Masson France
EM|consulte
 www.em-consulte.com/en



Editorial

Gerontechnology: Don't miss the train, but which is the right carriage?



ARTICLE INFO

Keywords:

Aging
 Gerontechnology
 Ageism
 Ethic deals
 Wellness

1. Background

In the very near future, technological and digital progress will certainly occupy an increasingly important place in new cost effective models of care and everyday clinical practice. Geriatricians must face the challenges related to their education, culture, skills, and clinical practice. However, they also need to sustain daily functioning and enhance the quality of care and quality of life of their aged patients [1]. Indeed, the main purpose of geriatric medicine, in addition to the diagnosis and treatment of acute and chronic diseases, is to maintain cognitive and physical function. With this in mind, technological innovations could be helpful. Gerontechnology is as a multidisciplinary model that uses technology to innovate in the geriatric field [2,3]. The International Society of Gerontechnology (ISG) considers that “[gerontechnology] creates solutions to extend the working phase in society by maximizing the vital and productive years in the life span, consequently reducing costs in later life”. Indeed, while ageing is one of the main issues of this century, we are lucky to enjoy long life, and many countries are looking to Europe to see how it is coping with the huge increase in its oldest population. Digital and technical revolutions offer a great opportunity to propose new models of care and create new multidisciplinary jobs. The recognized expertise of Europeans in gerontechnology could confer significant and appreciable value on us in a competitive and globalized economy, as emerging countries will have to face the same demographic “problems” in the near future. Nevertheless, although a recent report [4] demonstrates that in older adults, use of technology is on the rise, some older adults remain isolated from digital life altogether. Therefore, while the development of technology is moving forward very quickly, a lot of questions are left without response, particularly regarding today's oldest populations.

2. What kind of technology do we need, for whom, and in which specific context?

Technological devices must be used at different times of aging, e.g. in healthy aging to prevent functional decline, and in frailty

and disability to help patients and caregivers. Accordingly, technological devices and applications (apps) may have different goals, such as screening, diagnosis, prevention, assistance, rehabilitation, facilitating therapeutic adherence, promoting healthy aging or predicting negative health outcomes. Wellness is also an important aspect of healthy aging. In a brief communication in 2011, Thompson et al. [5] cited Halbert Dunn, who originally defined wellness as “an integrated method for functioning”, which focuses on maximizing the potential of which the individual is capable. It requires that the individual maintain a continuum of balance and purposeful direction within the environment in which he/she is functioning. Physical wellbeing, fitness, mental and cognitive health, as well as social and spiritual wellbeing are the principal issues central to maintaining autonomy.

Moreover, for each of these issues, technologies are sorted according to the functions they target, i.e. cognitive, motor, sensorial and emotional, social engagement. Given this diversity, a major difficulty remains, namely how to classify these technological needs in order to better account for the adaptation of these tools to specific needs and clinical contexts. The different categories need to be precisely defined and regularly revisited. It is very important to ensure compatibility with the characteristics of the users within their particular context of life. Moreover, the proposed devices need to be easy-to-use and should promote social integration. “Use of gerontechnology seems a synthesis of person, technology, and environment” [6]. This means that gerontechnology must be involved in the full spectrum of human activities, encompassing health and behavior, activities of daily living and accommodation, communication and autonomy, mobility and transport, job and leisure (think of age-friendly cities and hospitals).

3. How to develop and evaluate relevant innovative “technologies for aging”?

A lot of medical disciplines, such as medical imaging, seem to fit more comfortably with current technological progress than “technologies for the aged”. Numerous studies have been conducted with innovative devices (e.g. ambient sensors, intelligent clothes and software, associated or not with telehealth), but their methodology and results are questionable [7–11]. The incorporation of new technologies into the fields of health care is a worldwide phenomenon, but evidence to support this practice is needed. Indeed most studies have focused on patient satisfaction and feasibility rather than efficacy and cost-effectiveness, and geriatricians must be aware of the implications for their practice [12].

However many methods propose to tackle the global, multidimensional evaluation of health technologies. Nevertheless, they do not address the early development and evaluation processes, a

field in which innovation is warranted for these health technologies [13]. The participation of end-users, as well as new business models are also key issues to ensure future implementation in real life. Medical stakeholders and end-users need to support engineers in the very early phases of innovation to develop relevant new devices and ensure they will really be useful and correctly assessed. Discussions with technicians, engineers, and developers of new devices are essential to better define what is really needed and to avoid “technological gadgets” and “techno push”.

A recent report by Aaron Smith for the Pew Research Center [4] shows that older people, whose propensity to use technology is increasing, are often isolated from digital life. Many old persons consider that face physical challenges to using new digital devices and need assistance; while many elders who are not Internet users consider that they are not missing out on much. This reaction will probably disappear in the future, when today's young generation living in a digital society starts to age. However, barriers will still remain between young and old persons concerning the ability to adapt to novelties in technology.

4. What is the right time and the best way to introduce innovative technologies into a person's life?

The integration of technological devices has to be done early in life, when persons are still robust enough to be comfortable with the use of new technologies, and when medical interventions have the best chance of success. This is the reason why the terminology “technologies for aging” can be discussed. Those who are not using new technology will be excluded from the digital revolution, while older adults are a group at risk of exclusion. It is important to understand what works well, and to focus on the strengths of potential users rather than their weaknesses [14]. Persons should be able to participate in the development of the equipment that will accompany them over their whole life course. The practice of medicine is progressing from a curative and passive attitude, towards proactive and preventive personalised care. Technological devices, as a supportive part of a larger whole, need to move toward this goal. In a recent study from Hong Kong [15] concerning attitudes of gerontechnology users, positive attitudes were most frequently related to enhanced convenience and advanced features, while negative attitudes were associated with health risks and social problems arising from using technology. The acceptance of the device is also very important and not sufficiently well taken into consideration. In a review of adults' perceptions of fall technologies, Hawley-Hague and co-workers [16] demonstrated that the technology needs to be clearly described in research and older peoples' attitudes towards different sorts of techniques must be clarified. Indeed, for example, the positive message about the benefit of falls technology is critical, as is ensuring that it is simple, and above all, tailored to individual needs. In an exploratory study, the authors show that although a lot of devices (portable computers, robotics, games consoles...) were used, the results showed that one of the barriers to successful use was the lack of adoption and adherence to their use. These two factors are linked to understanding the potential benefits such as independence, increased safety, convenience, and increased social opportunities and confidence.

Another barrier is also present and largely underestimated, namely ageism, defined as age discrimination prejudice by one age group toward others. Ageism influences adherence to the digital divide [17]. Cartoons, publicity, television, and Internet all quite often depict old adults in a negative manner, generating negative stereotypes. Through this negative message, ageism may affect the use of new technology; indeed, the propensity to

use new technology involves dimensions, namely optimism, innovativeness, discomfort, and insecurity, all of which are influenced by the stereotypes. Physical and cognitive limitations may also have a negative impact on the uptake of new technologies.

5. Does it raise ethical issues?

Ethical values are another important field. In gerontechnology, we work on the assumption that the effects of our professional actions should be beneficial to old persons directly or indirectly. As mentioned by Bouma, “ethics deals with intended and foreseeable effects of human actions onto others” [18]. Direct effects on one or more persons can be traced one-to-one to earlier actions of one or more actors. Often, indirect effects may be traced back to a number of earlier actions and situations. We may also speak of foreseeable changes in the likelihood of certain effects. The basic issue is to consider what effects and side-effects (risks, misuse) might result from our actions and in which circumstances [18].

If technology is connected to the way older people live, then they will participate; but if technology can negatively alter people's forms of life, then this will not be the case [19]. On the other hand, in order to give consent, it is generally understood that a person should have the information required to be able to make a decision, and that they should understand the implications of that decision [20]. However, the question is not quite so clear cut in chronic diseases, and especially in frail persons with cognitive disorders. Quite often, the caregivers could benefit from the progress of technologies to enable them to live at home in a secure environment. In these situations, the principle of beneficence (doing good for others) needs to be considered together with the principle of justice, in terms of progress, security and dignity [21].

6. Our project

The European Geriatric Medicine Society (EuGMS), representing more than 10,000 specialists in geriatric medicine in Europe, was founded to further best practice in healthcare for older people. The promotion of quality of care in old persons, while also maintaining good health, and best quality of life at home in a cost effective model are the major issues. Therefore, it is a duty for the EuGMS to reflect on innovations in the organization of care. As mentioned above, in view of the number of new technologies and the complexity of their integration into the life of elders, many questions need to be considered. According the review by Piau et al. [22], the two key research questions in this regard are: (1) What is the evidence demonstrating that gerontechnologies are effective in enabling independent living; and (2) what are the devices designed specifically for frail old persons?

There is a compelling need to obtain a consensus on the definition of these technologies, to discuss working strategies and to develop innovative business models, because in fact, very often, the technologies precede the real needs and can lead to inappropriate applications of their use in our rapidly progressive world.

A strategic interest group (SIG) has recently been created by the EuGMS to be a hub for participation and communication, and to strengthen the reflection on the integration of technical devices into clinical practice, to make it relevant for old persons. Geriatricians, students and caregivers must know that new techniques will be part of their professional life in the future, and will probably be of help to them. Teaching and training have to be proposed in the core curriculum of geriatric medicine, but also for nurses and all geriatric caregivers. Numerous centers of

excellence are currently being created in the digital industry with some topics on aging, but very often without collaboration with potential users or geriatric experts. The SIG of the EuGMS wants to be partner at a European level to enhance and contribute to such projects. This will provide geriatric expertise in the framework of a concrete, fruitful and open partnership. Geriatrics will not avoid the digital revolution and must take advantage of it. Of course, we cannot miss the train of technology, but we need to define what is the best way to improve it, for the right service(s), at the right time, for the right old person in the future, according to acceptable ethical values.

The priority areas, which make up our action plan are the following:

- gain increased knowledge of technology acceptability and determinants of use in real life, taking into account the heterogeneity of existing technologies and the fast pace of development;
- investigate the impact of stigmatization (ageism) and the emotional patterns in the use and development of technology in old persons;
- from healthy aging to disability, build a flexible and progressive classification of technological needs, in order to better account for the adaptation of these tools to particular needs and clinical contexts
- develop early development and evaluation methods of innovative technologies for aging with strong participation of end-users;
- break away from the narrow definition of “technologies for aging” and develop partnerships with other medical specialities that are confronted with the same problems, from paediatrics to rehabilitation medicine;
- develop partnerships between geriatricians, patients and caregiver associations, engineers, companies and economy researchers to build innovative business models;
- improve our knowledge of ethical issues and the societal consequences of technological innovation.

Disclosure of interest

The authors declare that they have no competing interest.

References

- [1] Michel JP, Franco A. Geriatricians and technology. *J Am Med Dir Assoc* 2014;15:860–2.
- [2] Sheets DJ, La Buda D, Liebig PS. Gerontechnology. The aging of rehabilitation. *Rehab Manag* 1997;10:100–2.
- [3] Graafmans J, Taipale V. Gerontechnology. A sustainable investment in the future. *Stud Health Technol Inform* 1998;48:3–6.
- [4] Smith A. **Pew Research Center. Older adults and technology use; 2014** [Available at: <http://www.pewinternet.org/2014/04/03/older-adults-and-technology-use/> (Access date: 11 June 2017)].
- [5] Thompson HJ, Demiris G, Rue T, et al. A Holistic approach to assess older adults' wellness using e-health technologies. *Telemed J E Health* 2011;17:794–800.
- [6] Lam JCY, Lee MKO. Digital inclusiveness – longitudinal study of internet adoption by older adults. *J Manage Info Syst* 2006;22:177–206.
- [7] Bjerling H, Curry J, Maeder A. Gerontechnology: the importance of user participation in ICT development for older adults. *Stud Health Technol Inform* 2014;204:7–12.
- [8] Dhillon JS, Wunsche B, Lutteroth C. Designing and evaluating a patient-centred health management system for seniors. *J Telemed Telecare* 2016;22:96–104.
- [9] Wu YH, Damnee S, Kerherve H, et al. Bridging the digital divide in older adults: a study from an initiative to inform older adults about new technologies. *Clin Interv Aging* 2015;10:193–200.
- [10] Maertens F, Gillain D, Menozzi C, et al. Geron-techno-prophylaxis? Study on the potential contribution of actigraphy in improving the quality of care and sleep care for patients in the geriatric department at CHU Liège. *Gerontechnology* 2016;15:155–60.
- [11] Hentschel MA, Haaksma ML, van de Belt TH. Wearable technology for the elderly: underutilized solutions. *Eur Geriatr Med* 2016;7:399–401.
- [12] Stowe S, Harding S. Telecare, telehealth and telemedicine. *Eur Geriatr Med* 2010;1:193–7.
- [13] Michel JP. The future of geriatric medicine. *Eur Geriatr Med* 2012;3:233–7.
- [14] Hanson VL. Influencing technology adoption by older adults. *Interact Comput* 2010;22:502–9.
- [15] Chen K, Chan AH. Use or non-use of gerontechnology – a qualitative study. *Int J Environ Res Public Health* 2013;10:4645–66.
- [16] Hawley-Hague H, Boulton E, Hall A, et al. Older adults' perceptions of technologies aimed at falls prevention, detection or monitoring: a systematic review. *Int J Med Inform* 2014;83:416–26.
- [17] McDonough CC. The effect of ageism on the digital divide among older adults. *HSOA J Gerontol Geriatr Med* 2016;2:008.
- [18] Bouma H. Professional ethics in gerontechnology: a pragmatic approach. *Gerontechnology* 2010;9:429–32.
- [19] Bowen WR. Engineering ethics: outline of an aspirational approach. London: Springer Verlag; 2009.
- [20] van Berlo A. Ethics in domotics. *Gerontechnology* 2005;3:170–80.
- [21] Cornet G. Alzheimer's disease wandering behaviour: gerontechnology and ethics in three French Speaking countries. *Gerontechnology* 2012;11:266–70.
- [22] Piau A, Campo E, Rumeau P, et al. Aging society and gerontechnology: a solution for an independent living? *J Nutr Health Aging* 2014;18:97–112.

J. Petermans*

University Hospital Liège, Chenee, Belgium

A. Piau

University Hospital Toulouse, 31059 Toulouse, France

*Corresponding author at: Geriatric department, CHU Liège, site NDB, rue de Gaillarmont 600 à 4032, Chenee, Belgium
E-mail address: jean.petermans@chu.ulg.ac.be (J. Petermans)

Received 20 June 2017

Accepted 26 June 2017

Available online 24 July 2017