Editorial

Geriatricians and Technology

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Modern geriatricians must face the challenges arising from the clash of 2 paradigms. They can be proud of their education, culture, skills, and clinical practice; this is the Hippocratic paradigm. However, currently, they need to be familiar with, accept, and use technology to sustain daily functioning and enhance the quality of care and quality of life of their aging and aged patients (the functional paradigm). They need to be more engaged in “gerontechnology,” which is defined as an interdisciplinary academic and professional field combining “gerontology” and “technology,” a concept referring to the fusion of the sciences of aging and engineering. Gerontechnology is a fast-developing field based on innovations including user- and usage-centered concepts. As the field of technology is growing faster than the field of aging, it is increasingly difficult to understand the various meanings of the different terms and tools hidden behind the label “gerontechnology.” Moreover, geriatricians need to be aware of the practical applications of these tools, from individuals aging “in place” to nursing home residents.

Use of Smart Objects to Maintain Health and Functional Capacity Among Aging/Aged Individuals

There is a consumer-driven health care revolution out there, where individuals can have access in real time to all of their vital signs and relevant health data on their smartphone. The quantified-self has become possible by wearing smart objects as everyday objects equipped with sensors, memory, communication capabilities, and a power source. Smart objects capture information from the environment and interact rapidly with the users. One application of these stand-alone and self-contained smart objects is the Personal Health Record. It is a universally accessible, lay-person comprehensible, and lifelong tool for managing relevant health information, promoting health maintenance (healthy diet, physical activity, and optimum brain functioning), and favoring early risk detection (overweight, hypertension). However, the scarce scientific results published to date have not been convincing, except for smoking cessation at midlife. A recent study reported that older adult participants found the concept of self-monitoring unfamiliar, leading to narrowed interest in the use of wellness self-monitoring tools. Indeed, the aged population is not sufficiently well informed about such tools, or sufficiently adept at using them, to enable their widespread uptake. These new technologies need to be adapted for aged adults, who need to be scientifically convinced of the value and usefulness of such self-monitoring tools before they will use them systematically.

Use of Technology to Prevent and Manage Disease

A variety of smart objects can collect and transmit different wireless information to a health-connected platform, including vital signs, weight, blood pressure, heart rate, sleep pattern, and hydration status, but also the patient’s location in case of wandering (GPS), skin wetness/images, and so forth. Flexible software integrating multiple smart objects fitted into a wearable shoe insole can be used to evaluate gait. Sensor units embedded in clothing, footwear, eyewear, or smart belts all can be used to monitor balance in older individuals by detecting deviations from normal movement behavior, thus identifying risk of falls. Optimizing medication and analyzing compliance is easy and helpful. A variety of different adherence measurement systems (AMS) exist and have been proven to be valid, although no single AMS is considered as the gold standard. Some AMS make it possible to initiate corrective interventions, mainly in the form of alert and reminder systems, thanks to interactions between the patient and his or her physician or pharmacist. When applied to patients suffering from multiple morbidities and disabilities, e-patient communication still remains a challenge.

On the other hand, aged patients now benefit considerably from the application of new technology, such as percutaneous treatment of aortic stenosis, as well as computer-assisted minimally invasive surgery (eg, natural orifice transluminal endoscopic surgery and laparo-endoscopic single-site surgery). Robotic exoskeletons can be used to study and treat patients with different types of neurological impairments. Indeed, they allow task-specific training in 3 dimensions and reduce motor impairment more effectively than conventional therapy.

Electronic medical records (EMRs) are now widely used to centrally store all personalized patient information and EMRs can be used by health care practitioners to document, monitor, and manage health care delivery within a single care-delivery organization.
shown to be beneficial for improving long-term health outcomes in
the most commonly observed frailty-related diseases in aging po-

culations, including chronic obstructive pulmonary disease, chronic
heart failure, hypertension, and diabetes.2,21 Today, there is growing
use of telecardiology, teleradiology, and telemedicine services, even
for peritoneal dialysis at home. More and more such technology is
also being used to enhance quality of care and reduce the burden and
stress of carers. Comprehensive neuropsychological assessment by
video teleconference is proving to be an excellent resource for the
establishment of cognitive and psychiatric diagnoses, and for inte-
grating individual strengths, weaknesses, and preferences into
treatment and care plans used by health care providers, patients, and
caregivers.22 Health care professionals using computer-assisted data-
collection tools, such as touchpads, can directly collect information on
mood, disturbing behavior, agitation, and affect, which greatly facil-
itates the management of hospitalized or institutionalized patients,23
promoting nonpharmacological interventions instead of antipsy-
chotic drugs24 and increasing quality of care.25

Electronic health records26 are the integration of all patient infor-
cation collected longitudinally with the patient’s demographic data,
past medical history, immunizations, vital signs, daily problems,
laboratory data progress notes, and medications. Other information
also can be gathered; for example, portable ultrasound images,27
results of whole-body imaging technology,27 or video capsule endoscopy.28

Health Information Technology (HIT) encompasses a broad array
of technologies involved in managing and sharing patient informa-
tion electronically. HIT performs information processing using both
computer hardware and software for the entry, storage, retrieval, and
sharing of health care information between MDs and health care
professionals working in different settings (eg, community, hospital,
nursing homes). This communication is useful for promoting the use
of guidelines for the care of older patients with comorbid conditions
(true old patients), drug prescriptions (identification of inappropriate
prescriptions, drug/food interactions, delivery errors, and choice of
the required drug at the best price), and, indeed, for facilitating
interdisciplinary team work. Moreover, HIT can easily support carers,
families, and care organizations, providing them with educational
resources.28

Technologies for Increasing Home Safety, Coping With
Disabilities of Daily Living, and Supporting Care Givers in
Different Care Settings

A “smart home” is a residence equipped with technology that
facilitates greater safety; monitors activities, independence, and well-
being; and provides proactive services to prevent emergencies.29–31
Smart homes include “assistive technology,” defined by the World
Health Organization in 2004 as “an umbrella term for any device or
system that allows individuals to perform tasks they would otherwise
be unable to do or increases the ease and safety with which tasks can
be performed.”21 Therefore, assistive technology includes barrier-free
building modifications, as well as equipment ranging from a simple
grab rail and kitchen,32 toileting,33 bathing, and showering aids34 to
accessible hearing aids,35 transport, and electronic fall detectors.31
Smart homes and smart nursing homes will increasingly use device
control based on a variety of smart objects, such as home views,
both on integrated cameras, and smart technology to detect any
abnormal behavior.6,30 The application of in-place gerontechnology
is particularly attractive for patients with Alzheimer disease (AD)
and their caregivers. This technology offers several useful aids, such as
routine daily reminders (eg, drugs, tasks and appointments, meals);
activation of residual cognitive resources by computerized cognitive
stimulation intervention; reduction of stress, anxiety, and depressive
symptoms in patients through visual contact with families and pro-
fessionals (Web conference); contribution to patient safety by
detecting falls and wandering; and help for families caring for pa-
tients with AD through computerized information and counseling
interventions.37 However, more evidence of the medical, social, and
economic benefits of such technology for elderly people with cogni-
tive impairment and their caregivers needs to be obtained through
randomized controlled studies.

Another Promising Idea in Health Care is the Use of Robots

- Assistive robots (ARs) give personal aid in the activities of daily
living and support to a human user. Research into ARs includes
rehabilitation robots, wheelchair robots, and other mobility
aids, companion robots, manipulator arms for the physically
disabled, and educational robots.30

- Socially interactive robots (SIRs) support behavior. The goal of
SIRs is to develop close and effective interactions with a human
for the sake of interaction itself.

- At the intersection of AR and SIR, socially assistive robots
(SARs) are not designed to help the human being perform work
tasks or save time in routine activities, but rather to give
assistance through social interaction to achieve progress in
convalescence, rehabilitation, and learning, for example.30

The Field of Robotics Is Developing Apace, and the Outlook Is
Very Promising

The biggest obstacle to be overcome to achieve wider use of all
these technologies is the refusal of technology by older adults.
Numerous factors directly affect their acceptance of technology,
namely age, gender, level of education, the usefulness and ease of use
of technology, anxiety, and health and ability characteristics.38
However, change is afoot with the new generations of aging popu-
lations, who have had wider exposure to modern technology and are
thus less averse to using technology themselves. Ethical issues also
need to be considered in the context of wider development and
acceptance of gerontechnology. How are the privacy and autonomy
of users protected? The suppression of any human contact by ger-
ontechnology is another great fear, and the cost of the devices also
may be prohibitive.39

All in all, it is clear that gerontechnology offers tremendous ad-

dvantages for the identification, monitoring, care, and follow-up of
patients in the field of geriatric medicine. Progress in the field of
gerontechnology is advancing rapidly, and these new technologies
are likely to touch our lives more and more over the coming years. It
goes without saying that gerontechnology comes in support of, and
not in place of, traditional education and clinical care. However,
geriatricians need to be more educated about, and competent in,
these new techniques for management and communication.

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