*A. BENETOS (Convener). **An overview of frailty and new technologies (IAGG symposium)**. Gerontechnology 2012;11(2):215;* doi:10.4017/gt.2012.11.02.787.00 **Participants**: *ATHANASE BENETOS* (France), *FATI NOURHASHEMI* (France), *CHRISTIAN SWINE* (Belgium), and *GUILLAUME SACCO* (France) **ISSUE** The mission of the International Association of Gerontology and Geriatrics (IAGG) is to promote the highest levels of achievement in gerontological research and training worldwide, and to interact with other international, intergovernmental and nongovernmental organizations in the promotion of gerontological interests. The Association pursues these activities with a view to enhancing the highest quality of life and wellbeing for all people as they experience aging at an individual and a societal level. Frailty is more prevalent after the age of 80 and thus its impact are increasingly felt due to the general aging of the population. A number of new technological options are now available to increase quality of life for frail persons and to diminish the burden of care for them. **CONTENT** This symposium intends to give an overview of the options and efficacy of introducing new technologies in gerontological and geriatric research and care of frailty. **STRUCTURE** First, Professor Benetos will present the geriatric syndrome of frailty, its complications and how to approach early detection of frail subjects. Second, Professor Nourashemi will introduce the audience to suitable technologies that have become available recently. Next, Professor Swine will view the subject from a biological angle. Last, Doctor Sacco will show how the use of assistive technologies could improve the objective and standardized assessment of instrumental activities of daily living (IADL). There will be an opportunity for a general discussion after each speaker. **CONCLUSION** We hope to put the spotlight on the issue of frailty and stimulate cooperation of gerontologists, geriatricians and designers and researchers in technology.

*Keywords*: frailty, gerontology, geriatrics, technology
*Affiliation*: University of Nancy, France; *E*: a.benetos@chu-nancy.fr

*A. BENETOS. **Frailty: A major challenge for the management of aging people**. Gerontechnology 2012;11(2):215;* doi:10.4017/gt.2012.11.02.788.00 **Purpose** Frailty is a clinical situation characterized by decreased physiological reserve capacities, leading to an impaired response to stress[1]. Frailty depends on co-morbidities as well as psychological, social, economic and behavioral factors. Prevalence of frailty increases in the elderly especially after the age of 80, but age itself does not explain this syndrome. Frail persons are at high risk of overall mortality, loss of functional autonomy, falls, hospitalization and admission to an institution. Identification of the mechanisms of frailty and detection of people with frailty can reduce or delay its consequences. **Method** In recent years several approaches have been proposed to detect frail persons. Among them the Fried criteria[2] : persons with three out of the following five criteria– weight loss, exhaustion, weakness, slow walking speed, diminished physical activity– are considered frail. More recently, several other criteria including psychological and social factors as well as biological parameters have been added in order to better identify the frailty syndrome[3]. **Results & Discussion** Widespread use of such criteria could contribute to the better management of frailty and its consequences.

**References**

1. Rockwood K, Mitnitski A. Frailty in relation to deficit accumulation and geriatric medicine in relation to frailty. Clinics in Geriatric Medicine 2011;27(1):17-26; doi:10.1016/j.cger.2010.08.008
2. Fried LP, Ferrucci L, Darer J, Williamson JD, Anderson G. Untangling the concepts of disability, frailty, and comorbidity: implications for improved targeting and care. Journal of Gerontology A: Biological Science and Medical Science 2004;59(3):255-263; doi:10.1093/gerona/59.3.M255
3. Bergman H, Ferrucci L, Guralnik J, Hogan DB, Hummel S, Karunananthan S, Wolfson C. Frailty: an emerging research and clinical paradigm issues and controversies. Journal of Gerontology A: Biological Science and Medical Science 2007;62(7):731-737; doi:10.1093/gerona/62.7.731

*Keywords*: frailty, autonomy, old, social factors
*Affiliation*: University of Nancy, France; *E*: a.benetos@chu-nancy.fr
*Full paper*: No

*A. PIAU, P. RUMEAU, F. NOURHASHÉMI.* ***Frailty and new technologies.*** *Gerontechnology 2012;11(2):216;* doi:10.4017/gt.2012.11.02.786.00 **Purpose** Frailty syndrome is one of the greatest gerontological challenges faced by modern societies with aging populations. Because most frail people would rather stay at home than move to an assisted-living facility, prevention of age-related disabilities is a priority. To meet this goal we need alternative ways to monitor and support frail people to live independently and safely at home. Technologies have the potential to do so. For example, telecare systems could have a role in providing early warning of deteriorating health[1]. It is also a potentially broad commercial market, but access seems difficult because of certain barriers such as the technologies' complexity, costs, lack of evaluation, low acceptance, ethical issues, inadequate comprehension of user needs, etc. Experts and other lead players agree that lack of clarity as to who will pay for such interventions is a big hurdle[2]. **Method** We conducted extensive research on technologies for maintaining independence of frail elderly at home. We examined the potential effects of technologies in term of benefits to individuals rather than system benefits which are more dependent on context of deployment. We excluded low-technology devices, unspecific technologies such as sensory orthotic devices, technologies for housekeeping, safety technologies and domotics, interventional systems as cognitive simulation systems or chronic disease management. **Results & Discussion** We identified several publications on the elderly and social isolation (visiophonic communication, affective orthotic devices, personal emergency response systems), autonomy loss (technologies for activities of daily living), cognitive disorders at home (cognitive orthesis, wander and run-away management systems, telemonitoring), etc. Very few publications were specifically devoted to the frail elderly and few studies even included frail people. Research is dominated by systems for monitoring medical symptoms and using technologies for preventing disability is less common. Marziali et al.[3] showed that only 1% of the home health-care programmes studied self-help objectives. There is a lack of population description, of standardized frailty assessment, and also a lack of consensus on technology definitions: assistive technologies, telemonitoring and telecare, smart home and health smart homes, and so on[1]. Current evidence is increasingly based on a medical model but does not meet corresponding clinical evaluation standards. There is a need to study real people in real-world settings[4] and to apply standardized evaluation methods. However, randomised control trials are difficult to conduct for health technologies because of their complexity and the importance of the context into which they are deployed. This could mean a more adaptive, iterative, and pragmatic approach is more suitable. To conclude, the use of new technology by elderly people to continue living at home is feasible. Despite barriers, many older people already benefit from new technologies and the number of people aged 65+ who are using the internet is rising rapidly[5]. Elderly people will use technology if they feel the system benefits them.

**References**

1. Chan M, Campo E, Estève D, Fourniols JY. Smart homes - current features and future perspectives. Maturitas 2009;64(2):90-97
2. Alwan M, Nobel J. State of Technology in Aging Services According to Field Experts and Thought Leaders. Report Submitted to: Blue Shield of California Foundation February 2008. Center for Aging Services Technologies
3. Marziali E, Serafini JM, McCleary L. A systematic review of practice standards and research ethics in technology-based home health care intervention programmes for older adults. Journal of Aging and Health 2005;17(6):679–696; doi:10.1177/0898264305281100
4. Kang HG, Mahoney DF, Hoenig H, Hirth VA, Bonato P, Hajjar I, Lipsitz LA. In situ monitoring of health in older adults: technologies and issues. Journal of the American Geriatric Society 2010;58(8):1579-1586; doi:10.1111/j.1532-5415.2010.02959.x
5. Age UK. Technology and Older People Evidence Review; 2010; www.ageuk.org.uk/Documents/EN-GB/For-professionals/Research/Evidence_Review_Technology.pdf?dtrk=true; retrieved May 10, 2012

*Keywords:* frailty, technologies, evaluation
*Affiliation*: Gérontopole, Toulouse University Hospital, France; *E:* piau.a@chu-toulouse.fr
*Full paper*: No

C. Swine. ***Frailty: A biological syndrome, contribution of new technologies***. *Gerontechnology 2012;11(2):217;* doi:10.4017/gt.2012.11.02.785.00 **Purpose** To analyze the biological, inflammatory, immunological, and transcriptomic correlates of frailty in acute conditions and at recovery, in order to better understand the underlying mechanisms of frailty and to identify related biomarkers able to anticipate further decline in functional health in hospitalized older adults. **Method** Patients aged >75 years admitted for hip fracture, acute heart failure, or infection (n=118) were recruited. Functional decline was defined as decrease of one point in ADL-scale (0-6) between pre-admission and 3-months post-discharge status. The following parameters were analyzed on hospital admission: blood cytokines, insulin-like growth factor 1 (IGF-1), thymic function by sjTREC and DJβ•TREC measurement; multiplex cytokine assay after polyclonal stimulation of peripheral blood mononuclear cells (PBMC); phenotype profiling and replicative senescence by quantitative telomere PCR. For the analysis of the transcriptomic correlates, the abundance of a preselection of transcripts involved in inflammation, immunosenescence and stress response was compared between PBMC of healthy aged probands and the patients in acute phase of heart failure and at recovery. Therefore, a low-density DNA-array 'on-demand' able to detect 135 different transcript species (Eppendorf, Germany) involved in immunosenescence, and more specifically focusing the T-cell compartment, inflammation and oxidative stress, was used. The performance of biological parameters (IL6, IGF1) was also compared or associated with a clinical score (SHERPA) predicting functional decline in these patients. **Results & Discussion** Three months after discharge, functional decline (FD) occurred in 46 patients. In univariate analyses, patients with functional decline showed a significant decrease of T-cell proliferation (sj/DJbêta TREC ratio), TNFalpha/IL-4 ratio and CD8+CD28+ T-cell count. In a logistic regression model where age, admission diagnosis, and comorbidity were identified as confounding factors for FD, only telomere length of PBMC on admission was significantly associated with later FD (p=0.013). For the prediction of FD, Interleukin-6 (IL-6) and IGF1 were selected as candidates for the study since their levels were significantly different between decliners and non-decliners. We then compared the discrimination and calibration of the clinical score SHERPA on its own, with a model including SHERPA, Il-6, and IGF-1 (SHERPA +). The ROC curve [95%CI] for FD prediction was 0.79 [0.69-0.86] for SHERPA+ compared to 0.73 [0.63-0.81] for pure clinical SHERPA (p=0.14). In addition, SHERPA+ was better calibrated, as the predicted risk of FD within subgroups better matched the proportion who actually had FD (Brier score=0.185). Regarding the transcriptomic analyses, this study identified 22 transcripts differentially abundant in acute phase of heart failure in geriatric patients versus healthy aged subjects. Transcripts involved in inflammation, like TNFRSF1A, IL1R2 or IL10RB, and oxidative stress, like HMOX1 and PRDX6, were more abundant. Those associated with T-cell functions, like CD28, CD69 and LCK, were less abundant. The results were compared to two other major acute geriatric issues: infectious diseases and hip fracture[1]. In acute phase, compared to healthy aged subjects, the abundance of 15/22 transcripts was also altered in both geriatric infectious diseases and hip fracture, 3/22 also altered in geriatric infectious diseases or hip fracture and 3/22 (FAS, ILR4 and SRI) only in geriatric heart failure. In acutely ill frail older patients, decreased telomere length in PBMC on admission is associated with FD three months after hospital discharge, independent of age, admission diagnosis and comorbidity. Telomere shortening is a marker of replicative senescence. Decreased telomere length may reflect a loss of adaptive response that leads to failure to maintain functional homeostasis during an acute health event. Transcripts specific for inflammation and oxidative stress were more abundant in acute stress in these patients, and other potential pathways of frailty on the genomic level have also been identified.

**References**

1. Vo TKD, de Saint-Hubert M, Morrhaye G, Godard P, Geenen V, Martens HJ, Debacq-Chainiaux F, Swine C, Toussaint O. Transcriptomic biomarkers of the response of hospitalized geriatric patients admitted with heart failure. Comparison to hospitalized geriatric patients with infectious diseases or hip fracture. Mechanisms of Ageing and Development. 2011;132(3):131-139; doi:10.1016/j.mad.2011.02.002

*Keywords*: frailty, functional decline, biological markers, telomeres
*Affiliation*: CHU Mont Godinne ; IRSS/UCL,Clos Chapelle-aux-champs, Belgium;
*E*: christian.swine@uclouvain.be
*Full paper*: No

*G. SACCO, V. JOUMIER, A. DERREUMAUX, J.H. LEE, J. PIANO, N. BORDONE, A. KONIG, B. TEBOUL, E. MULIN, R. DAVID, O. GUERIN, F. BREMOND, P. ROBERT.* ***Assistive technologies for the assessment of instrumental activities of daily living in pre demential Alzheimer's disease.*** *Gerontechnology 2012;11(2):218;* doi:10.4017/gt.2012.11.02.656.00 **Purpose** The diagnosis of Alzheimer's disease (AD) at the pre-dementia stage is currently a major issue[1] and requires objective clinical markers to detect early cognitive, behavioural, and functional impairments[2]. However no objective behavioural or functional standardised evaluation is currently available. In this context the use of assistive technologies could improve the objective and standardised assessment of instrumental activities of daily living (IADL) [3,4]. The aim of this study is to propose an assessment of IADL using a video monitoring system in order to differentiate healthy elderly subjects from subjects with mild cognitive impairment (MCI). **Method** The experimental protocol comprises three phases: an initial medical consultation, an ecological assessment (EA), and a cognitive and behavioural assessment. During the EA, participants are asked to carry out 11 IADL (call a taxi, organise prescribed drugs and put them in a pill box, write a check, make tea, write a shopping list for lunch, etc...) in an experimentation room equipped with common objects of everyday life and with two video cameras. IADL have to be achieved in a logical order respecting four temporal execution constraints (planning) for a maximum duration of 15 minutes. Assessment criteria selected and collected after viewing the videos (blinded to diagnosis) are: total time spent in the room, number of omitted IADL, number of properly carried out IADL (i.e. number of activities performed and correctly achieved / the number of activities performed), ability to successfully organize IADL in respect with the initial instructions. **Results & Discussion** To date, 20 participants were recruited (healthy elderly participants: n=8, age=69.8±4.7 years, MMSE=29±0.8, IADL-E=9.6±1.5), (MCI: n=12, age=75.5±6.4, MMSE=26.0±2.5, IADL-E=10.0±2.5). Preliminary results show a significant difference (p=0.012) between the two subgroups on the video endpoint (the number of activities performed and correctly achieved / the number of activities performed). Inter-group differences (control vs. MCI) for the classical rating-scale of IADL-E were not found. Our preliminary results show that assistive technologies using video monitoring techniques seem to be more sensitive than current clinical tools (IADL-E scale) to differentiate healthy elderly from MCI-subjects. These results should be confirmed on a larger sample and be extended to a multicenter procedure. In the future, these assistive technologies could be implemented as part of the diagnostic toolbox for the pre-dementia stage of Alzheimer's disease.

**References**

1. Sperling RA, Aisen PS, Beckett LA, Bennett DA, Craft S, Fagan AM, Iwatsubog T, Jack CR, Kaye J, Montine TJ, Park DC, Reiman EM, Rowe CC, Siemers E, Stern Y, Yaffe K, Carrillo MC, Thies B, Morrison-Bogorad M, Wagster MV, Phelps CH. Towards defining the preclinical stages of Alzheimer's disease: recommendations from the National Institute on Aging–Alzheimer's Association workgroups on diagnostic guidelines for Alzheimer's disease. Alzheimer's & Dementia 2011;7(3):280-292; doi:10.1016/j.jalz.2011.03.003
2. Albert MS, DeKosky ST, Dickson D, Dubois B, Feldman HH, Fox NC, Gamst A, Holtzman DM, Jagust WJ, Petersen RC, Snyder PJ, Carrillo MC, Thies B, Phelps CH. The diagnosis of mild cognitive impairment due to Alzheimer's disease: recommendations from the National Institute on Aging-Alzheimer's Association workgroups on diagnostic guidelines for Alzheimer's disease. Alzheimer's & Dementia 2011;7(3):270-9; doi:10.1016/j.jalz.2011.03.008
3. Mulin E, Joumier V, Leroi I, Lee JH, Piano J, Bordone N, Derreumeaux A, Malléa P, Brocker P, Dechamps A, Romdhane R, Thonnat M, Bremond F, David R, Robert PH. Functional assessment using a video monitoring system in elderly participants with and without dementia. Presented at BMC; 2012
4. Joumier V, Mulin E, Lee JH, Piano J, Derreumaux A, David R, Malléa P, Dechamps A, Robert PH, Romdhane R, Thonnat M, Bremond F. Measurement instrument for assessing functional abilities of elderly people with and without dementia using a video monitoring system. Presented at International Conference on Bioinformatics and Biomedical Engineering, Beijing; 2012

*Keywords*: actigraphy-video, prodromal Alzheimer disease, autonomy, IADL
*Affiliation*: Centre Mémoire de Ressource et de Recherche, Nice, France;
*E:* sacco.g@chu-nice.fr
*Full paper*: No