

Technology support for enhancing daily resilience and safe ambulation of very old people

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Purpose To prove the feasibility of an “instrumented” territory-based care model (iTEM) to maintain safe mobility of elderly people. The model, inspired to WHO Recommendations 1, 10 and 12 (WHO, 2017), relies on adapted technology and protocols to deliver on-the-field functional assessment, safe and simple home-based exercises, and practical recommendations. **Method** Based on a technology-based functional assessment (Giacomozzi & Uccioli, 2013), the iTEM protocol was developed as follows: i) two validated functional tests were selected, namely the timed-up-and-go test (TUG) (Goldberg et al., 2012) to investigate balance and risk of fall, and the Heel Raise Test (HRT) (Jeon, 2014) to assess risk of fall, ankle mobility and muscle strength; ii) wearable instrumentation was selected, namely the insole system Pedar-X (novelGmbH, Germany), i.e. a reliable and safe medical device which, either insert-ed into socks (barefoot tests) or into the shoes, allows to measure the time of execution of each phase of the tests, and gait parameters associated with the plantar loading pat-tern; iii) markers were added to ad-hoc socks to semi-quantitatively monitor the ankle sagittal motion during the HRTs, exploiting videos from a webcam accurately placed in the sagittal plane. Markers were also added to the chair and to patient’s back to track sagittal patterns during TUG standing and sitting phases; iv) test protocols were defined in agreement with the literature (Goldberg et al., 2012; Jeon et al., 2014) with adaptations for the tar-get population, specifically: simplified instructions and practical demonstrations; HRT (equipped socks on) performed with both feet simultaneously and with the support of a front handle during the upright repetitions; usual walking aids allowed during TUG repetitions (with equipped socks and with shoes); v) a simple report was prepared to promptly show main results to the patients, to inform and motivate them to moderately exercise at home by daily repeating the test sequence; a paper booklet was prepared as well, to improve compliance and adherence at home; vi) a list of practical recommendations and follow-up scheduling was prepared also including indications for specific HealthCare System procedures, in case of seriously altered loading or balance, or inadequacy of footwear. 6 healthy adults volunteered for the in-lab tuning and validation of the iTEM protocol. Feasibility was then assessed on 10 old and very old people (75-91 years) with various co-morbidities. **Results and Discussion** The iTEM protocol seems to be feasible with all tests understood and executed correctly, and well accepted also by very old people. Despite their poor technology literacy, the volunteers well understood the meaning of the measured trajectories and coloured loading patterns. Compliance with the proposal for home-based daily exercise was good (2 out of 10 were doubtful about its usefulness). 2 volunteers agreed to adopt more comfortable and stable shoes and agreed to be re-tested after two weeks. The iTEM protocol is currently used in a Clinical, Diabetic Foot Service, and Ethical approval has been requested to start using it in a Geriatric Center.

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