EDITORIAL

The challenge of the multifaceted prognosis in the older people and the Multidimensional Prognostic Index

Francesco Mattace-Raso[1] · Alberto Pilotto[2,3]

An accurate assessment of prognosis may have a crucial role in clinical decision making of the older people [1]. An increasing body of evidences indicates that the prognosis of older patients is strongly related to the presence of concomitant diseases and to the degree of physical, cognitive, biological, and social impairment [2].

The Comprehensive Geriatric Assessment (CGA) is the tool of choice to effectively explore these domains of health, especially in the functionally compromised and frail older subject [3]. The Multidimensional Prognostic Index (MPI) is a product of the CGA, that uses a mathematic algorithm including information about eight domains relevant for the global assessment of the older subjects (i.e., functional and cognitive status, nutrition, mobility and risk of pressure sores, multimorbidity, polypharmacy and co-habitation), to generate a numeric score (or index), between 0 and 1, that expresses the global risk of multidimensional impairment [4]. In this sense, we can say that MPI is able to translate the clinical evaluation of the CGA in a score that can accurately predict overall mortality and other negative outcomes, and therefore, be used as prognostic tool in older people.

The MPI was initially developed and validated as a prognostic index predicting mortality in hospitalized older patients [5]. A modified MPI, including the mini nutritional assessment short-form (MNA-SF), showed similar degree of accuracy as the original MPI, but could be completed in around 20 min [6]. Other versions of the MPI have been developed and validated in large populations of community-dwelling older subjects who underwent a standard CGA to be admitted to public health facilities, i.e., homecare services or nursing homes [7] as well as in population-based cohorts of older subjects living at home or in an institution in Sweden [8], Italy [9], Ireland [10] and in the United States within the framework of the osteo-arthritis initiative (OAI) [11]. All these studies confirmed the accuracy of the MPI in predicting life expectancy [8, 9] and the risk of hospitalization [8] during long periods of follow-up (from 12 to over 15 years) as well as the long-term risk of incident depression [10] and falls [11]. Moreover, in the context of the EU co-funded project EFFICHRONIC a self-administered version of the MPI (SELFY_MPI) was developed and validated as screening tool for community-dwelling patients with chronic diseases (or their caregivers) candidate to be managed through a self-management program [12, 13]; a short-form version of the SELFY_MPI was developed for older patients who attended an ambulatory visit by their general practitioners [14]. Very recently, a telephone-administered version of the MPI (TELE-MPI) was also developed and validated for remote monitoring of older adults during COVID-19 pandemic [15].

In the current issue of *Eur Geriatr Med*, Hansen et al. evaluated the predictive value of a previously validated [16] record-based MPI including data of the inpatient's electronic medical records to assess multidimensional frailty in a large cohort of 1.190 medical inpatients aged ≥ 75 years [17]. The results demonstrated that the record-based MPI, assessed at discharge in hospitalized older patients, accurately predicted post-discharge mortality (after 90-days and 1 year) and hospital readmissions in a dose-dependently manner; moreover the MPI value was associated with the hospital length-of-stay. These findings further support the concept that the MPI, although derived from different assessment scales in different settings (provided that these scales accurately explore all the domains linked to the multidimensional impairment), is able to express numerically the global health and functions to implement a multidimensional approach to

✉ Alberto Pilotto
alberto.pilotto@galliera.it

1 Division of Geriatric Medicine, Department of Internal Medicine, Erasmus MC University Medical Center, Rotterdam, The Netherlands

2 Geriatric Unit, Department of Geriatric Care, Orthogeriatrics and Rehabilitation, EO Galliera Hospital, Genova, Italy

3 Department of Interdisciplinary Medicine, University of Bari, Bari, Italy

the assessment of frailty in older people [18]. Indeed, the MPI is currently one of the most commonly used tools for evaluating frailty, both in primary care and hospital settings [19].

Large multicenter studies including more than 60.000 older subjects in different settings showed that the CGA-based MPI is able to: (1) predict mortality more accurately than other frailty instruments based on both phenotypic and multiple-deficits models [20]; (2) predict in-hospital length of stay [21, 22]; (3) to monitor changes of health and functional status during hospitalization [23, 24]; (4) identify those older patients who will be admitted to homecare services, nursing homes and/or re-hospitalized 1 year after discharge from the hospital [25]; (5) inform about health-related quality of life in older patients admitted to emergency department [26]; (6) predict burden on healthcare resources [27] and successful application for disability social benefits in older people with cognitive decline [28].

During the last 10 years, the MPI has been successfully applied in older patients with specific acute diseases [4, 18], i.e., gastrointestinal bleeding [29], pneumonia [30], heart failure [31], transient ischemic attach [32], and chronic disorders including dementia [33], late-life depression [34], liver cirrhosis [29], diabetes mellitus [35], chronic kidney disease [36] and cancer [37]. In all these studies, MPI resulted a well-calibrated prognostic tool with a good accuracy that is maintained both at short- and long-term follow-up showing a very high score in terms of validity, reliability and feasibility for the management of older persons in clinical practice [4, 18, 38].

Recently, the European project MPI_AGE explored in deep the role of the CGA-based MPI as tool for driving clinical decisions in frail older adults with multimorbidity [4, 39]. In this context, several clinical studies evaluated the appropriateness of "critical" treatments in geriatric setting, such as statins in secondary prevention of diabetes mellitus [40] and coronary artery disease [41], anticoagulants in atrial fibrillation [42], antidementia drugs in late-life dementia [43] or transcatheter aortic valve implantation (TAVI) in older patients with aortic stenosis [44, 45] and enteral tube feeding intervention in malnourished hospitalized older patients [46].

Finally, very recently independent studies demonstrated that the MPI could also extend to specific areas for personalized therapies such as for guiding immunotherapy in patients with advanced malignancies [47] or helping physicians in clinical decisions for older adults with chronic kidney disease on conservative treatment or renal replacement (hemodialysis or peritoneal dialysis) [48], or with acute myocardial infarction who underwent a percutaneous coronary intervention (PCI) [49], and in older patients candidate to elective surgery for colon-rectal cancer [50] or to non-invasive ventilation for acute respiratory failure [51]. Promising findings

from all these studies showed that in older adults the multidimensional approach warrants better clinical decisions (i.e., to treat or not to treat) depending on degree of multidimensional impairment of the subject. For these reasons the implementation of new MPI versions that facilitate the calculation of the MPI directly from information included in the clinical records such as the record-based MPI [16], as reported in the article of Hansen et al. [17], should be recommended to physicians to enhance the diffusion in clinical practice of the multidimensional approach to the frail older patient [18]. This seems to be particularly important during the recent COVID-19 pandemic in which an accurate prognosis, as improved by including physical and cognitive functioning information to age and comorbidities, should be the driver for the clinical decisions in the older patients, beyond the chronological age [52]. A multicenter prospective study on the potential usefulness of the MPI in hospitalized older patients with COVID-19 is ongoing in the frame of the Special Interest Group on the Comprehensive Geriatric Assessment (SIG-on-CGA) of the European Geriatric Medicine Society (EuGMS) to clarify this issue [53].

Compliance with ethical standards

Conflict of interest Authors declared no conflict of interest.

Ethical approval No ethical approval statement is required for this editorial article.

Informed consent No informed consent statement is required for this editorial article.

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