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Review Article

# Linking Frailty Instruments to the International Classification of Functioning, Disability, and Health: A Systematic Review

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A B S T R A C T

To date, the major dilemma concerning frailty is the lack of a standardized language regarding its operationalization. Considering the demographic challenge that the world is facing, standardization of frailty identification is indeed the first step in tackling the burdensome consequences of frailty. To demonstrate this diversity in frailty assessment, the available frailty instruments have been linked to the International Classification of Functioning, Disability, and Health (ICF): a standardized and hierarchically coded language developed by World Health Organization regarding health conditions and their positive (functioning) and negative (disability) consequences. A systematic review on frailty instruments was carried out in PubMed, Web of Knowledge, and PsycINFO. The items of the identified frailty instruments were then linked to the ICF codes. 79 original or adapted frailty instruments were identified and categorized into single (n = 25) and multidomain (n = 54) groups. Only 5 frailty instruments (indexes) were linked to all 5 ICF components. Whereas the ICF components *Body Functions* and *Activities and Participation* were frequently linked to the frailty instruments, *Body Structures*, *Environmental* and *Personal factors* were sparingly represented mainly in the multidomain frailty instruments. This review highlights the heterogeneity in frailty operationalization. Environmental and personal factors should be given more thought in future frailty assessments. Being unambiguous, structured, and neutral, the ICF language allows comparing observations made with different frailty instruments. In conclusion, this systematic overview and ICF translation can be a cornerstone for future standardization of frailty assessment.


Population aging is nowadays one of the world's major demographic challenges. Between 2010 and 2050, it is estimated that the proportion of the world's population aged 65 years and older will increase by 188% and for the oldest old, that is, 85 years and older, by 351%.[1] This implies that the oldest old, who are the most vulnerable individuals, are the fastest growing group.

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One of the major concerns related to an aging population is frailty. There is a general agreement among researchers that frailty is a dynamic, age-related condition characterized by a decline beyond a certain threshold in the reserve capacity of multiple inter-related physiological systems leading to decreased resistance to stressors and an increased risk for adverse health outcomes, such as diminished mobility, falls, functional decline, hospitalization, and death.[2–4] Subsequently, this leads to increasing healthcare utilization costs and increasing demands on the social security systems.[5]

Notwithstanding this consensus on the core features of frailty and its burdensome consequences which require urgent and specific actions, to date the major dilemma concerning frailty is that there is no standardized language regarding its concept and operationalization. Although the number of published articles containing the Medline Medical Subject Headings term "frail elderly" has increased exponentially over the last 30 years, many articles still propose new definitions, further pathophysiological mechanisms, and different assessment instruments.[6]

Broadly speaking, frailty assessment instruments can be divided into 2 categories: the physical phenotype model and the multidomain model. According to the physical phenotype model proposed by Fried et al,[4] frailty is determined solely by a combination of 5 physical components: unintentional weight loss, exhaustion, weakness, slowness. and low physical activity. The basis of this model has been used to develop the Survey of Health, Aging, and Retirement in Europe Frailty Instrument, which has been operationalized and computerized in a European Union Project in an attempt to establish a common screening frailty tool to be used in primary care by European practitioners.[7] Another feasible and easy to administer frailty screening instrument for use in the community setting is the FRAIL instrument (fatigue, resistance, aerobic, illnesses, loss of weight).[8] This has been widely validated in US, Australia, and China.[9–11] On the other hand, the multidomain model is based on a broader concept of frailty and includes losses in the medical, psychological, cognitive, functional, and social domains.[12] The environmental domain, though scantily, has also been recently adopted in the multidomain model.[13] In this case, the multiple deficit model, known as the Frailty Index, is of particular interest. It has been mostly used for research purposes, and being based on a mathematical representation of accumulating deficits in an individual, it does not matter which variables are used as long as a minimum number of deficits are present.[14]

Such diversity in existing frailty definitions and assessments raises several concerns. First, the prevalence of frailty documented in literature varies considerably. Depending on the definition of frailty that has been used, the prevalence of frailty among community dwellers aged 65 years and older ranges between 4.0% and 59.1%.[15] Second, a high variability exists in the predictive accuracy for the outcomes of interest,[16] and there is much debate regarding which instrument measures frailty most appropriately.[17,18] Third, the available frailty instruments classify someone as frail, prefrail, or robust based on a preset threshold level of deficits. As a result, they identify a frail individual in a rigid and static way. This overlooks the fact that older people are a heterogeneous group and differ considerably in their capacity to live independently, in their longevity and in the burden caused by comorbidities.[19] Therefore, older people of the same chronologic age may have a different biological age and could develop frailty at different severities of deficits, which is not always captured by the available frailty instruments. Finally, the existing frailty instruments only measure deficits. Taking into account that frailty is a dynamic process where transition between different frailty states is possible, it is more justifiable to regard frailty as a complex interaction between the assets and deficits of the individual.[20,21] On one hand, there is successful aging or robustness—when the assets largely outweigh the deficits. On the other hand, when deficits clearly prevail over the assets, disability will be the result. In between lies frailty—a precarious balance between the assets and the deficits of an individual.[21] Although frailty is frequently regarded as a predisability state,[22,23] it is generally agreed that frailty is reversible,[24] and that not all frail older adults will eventually develop disabilities.[25]

The above mentioned limitations of the current frailty instruments could potentially be solved through the use of the universal language of the International Classification of Functioning, Disability, and Health (ICF) developed by the World Health Organization in 2001.[26] It provides a standardized common language regarding health conditions and their positive (functioning) and negative (disability) consequences. The ICF is composed of 5 prime components: body functions, body structures, activities, and participation grouped under the umbrella terms functioning and disability, and environmental and personal factors, grouped under the umbrella term contextual factors. The following characteristics of the ICF guided our choice: first and foremost, it has been developed by the World Health Organization so it is internationally recognized. In addition, the content of the ICF is classified in detail using a systematic alphanumeric coded system, thus, facilitating standardized and transparent communication regarding functioning and disability among researchers, policy makers, and healthcare workers worldwide. Furthermore, its extensive content covers both the intrinsic and extrinsic factors that can have an effect on the individual's health state and this bio-psycho-social approach is in line with the multidimensional and holistic concept of frailty. Moreover, the ICF language is formulated in neutral language and so can be used to describe assets (responsible for functioning), as well as deficits (responsible for disability) of an individual thus embracing the dynamic balance of frailty. Finally, it has qualifiers that can quantify the severity of the functioning and disability present, which could be interesting to assess changes in health status over time and to account for individual differences in susceptibility to frailty. As a result, the ICF has the potential to provide a standard universal framework for measuring frailty.

Indeed, attempts have already been made to translate the frailty language into the ICF. The results of this initiative were promising; 80% of the concepts of frailty were mapped to the ICF implying that the 2 are compatible.[27] In a more recent study, the framework of the ICF has been used to develop recommendations concerning the care of frail older individuals.[28] Since in the first case research was based on frailty language derived solely from 2 leading frailty articles and in the second case, the focus was on the management of frailty we decided to take this association between frailty and the ICF to a more specific level and actually translate the individual items of the existing frailty instruments into the fourth-level (that is, the most detailed category) of the ICF. Our research team has already mapped the Mini-Mental State Examination (MMSE)[29] and the Geriatric Minimum Data Set-25 (which allows for a standardized description of older persons participating in clinical research)[30] to the framework of the ICF,[31,32] thus, developing specific expertise.

The aim of this systematic review is first to establish an extensive list of the available frailty instruments, to link their items to the codes of the ICF and finally, to analyze the overlap and gaps among the available frailty instruments and the universal language of the ICF.

## Methods

### *Literature Search and Inclusion*

An extensive literature search has been performed collaboratively by three researchers in the electronic databases PubMed, Web of Knowledge, and PsycINFO. The following search terms were used to