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Opinion Article

Implementing frailty assessment into a healthcare system: a clinical opinion paper

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Abstract

Frailty is a multifactorial medical syndrome characterized by reduced endurance and decreased physiological ability. The aim of this narrative literature review is to present the frailty diagnostic instruments that are already used in most Western countries and provide recommendations for use in clinical practice. Among the numerous available frailty instruments identified in current literature, the Frailty Index and the Physical Frailty Phenotype are most commonly used. There are large differences in each instrument design, ease of use by healthcare teams and also significant heterogeneity in the design of the studies based on these instruments. Therefore, future studies should be designed to properly address the discrepancy in the comparison of the existent instruments and consider their validity and feasibility of implementation in different healthcare settings with different healthcare providers.

Keywords: Screening, Frailty assessment, Frailty diagnosis, Frailty syndrome, Geriatric assessment instruments

Introduction

Frailty is a multifactorial medical syndrome characterized by reduced endurance and decreased physiological ability that increases the vulnerability of an individual to develop increased dependence and/or death[1]. Many parameters are included in the definition of frailty syndrome including exhaustion, unintentional weight loss, weakness, poor physical activity and slow walking speed, as reported by Fried et al. in 2001 in an endeavor to optimally define and standardize frailty as a clinical entity[2].

The prevalence of frailty is increasing, both as a result of more older people living longer in society and also due to the early detection and increased awareness of healthcare personnel[3]. However, calculation of prevalence of frailty syndrome remains challenging due to the heterogeneity of frailty definitions and diagnostic criteria that exist in current literature[4]. The association of frailty with decreased survival is also an issue of great significance for the geriatric population. A systematic review by Shamliyan et al. estimated that about 3-5% of deaths could have been delayed if frailty syndrome would have been recognized and prevented.4 Therefore, recognizing older people who can be classified as frail is pivotal in improving the health care system in Western societies[5,6].

Several risk factors for frailty have been recognized so far, including aging (individuals older than 65 years of age), female gender and low socio-economic status[3,7]. Pre-frailty syndrome, as defined by the Physical Frailty Phenotype (PFP) is also of great concern and should always be identified and properly addressed[2,7,8].

The aim of the present paper is to present the frailty diagnostic instruments that are already used in most Western countries, and also to recognize the appropriate tools and methods that can be implemented and are therefore recommended in order to identify frailty within a healthcare system. The authors focused on tools that are more commonly used.

Materials and methods

The MEDLINE/Pubmed and Scopus database were searched using "frailty screening instruments", "frailty

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assessment", "frailty diagnosis" and "geriatric assessment instruments" as keywords. Two independent reviewers (E.K. and D.T.) performed the literature search. Papers not written in English were excluded from the study. The end date for the literature search was set to July 2019.

Results

Overall frailty scores/tools

Many tools have been developed so far in order to accurately assess the functional state of individuals in the context of frailty syndrome. The most commonly used as reviewed by Buta et al. are the Physical Frailty Phenotype (PFP), the Frailty Index (FI), the Vulnerable Elders Survey (VES-13), the PRISMA-7 questionnaire and the Clinical Frailty Scale[9].

According to the PFP, for the definition of frailty 3 out of 5 of the following criteria should be met: slowed walking speed, unintentional weight loss, low physical activity level, low grip strength and low energy. When 1 or 2 criteria are present, individuals are considered to be in a pre-frail (intermediate) stage, whereas when 3 or more criteria are met they are considered frail[2].

On the other hand, the frailty index (FI) is a complex index which is based on the accumulation of various deficits that appear over time and include a broad spectrum of features that increase the risk for adverse events, including disability, cognitive and physical impairment and geriatric syndromes[10-12]. The original index includes 70 items, while shorter versions are available due to the complexity of the calculation, which makes FI time-consuming and possibly more useful for research than in clinical practice. Frailty Index is also strongly associated with increased mortality risk[13].

The Clinical Frailty Scale (CFS) developed by Rockwood et al in 2005[14]. While it was originally introduced to assess frailty in the context of the Canadian Study of Health and Aging, a five-year prospective study designed to assess the overall fitness and frailty of older individuals, it rapidly became a widely used instrument in clinical settings[15]. Its initial seven point scale, which later progressed to a nine-point scale, categorizes individuals according to their level of robustness, activity levels and dependence to others. It is also associated with hospital outcomes, as it can be used to predict the increased length of hospital stay and inpatient mortality[16]. However, it should be used with caution since the assessment is subjective and highly dependent on physician's clinical judgment.

There are also questionnaires that are used as screening tools for frailty. The Vulnerable Elders Survey (VES-13) is a simple, easy to perform 13-item self-reported questionnaire that assesses functional status and disability[17]. It does not require specialized personnel and can even be performed over the phone. A score equal or more than 3 corresponds to increased risk of functional decline and death over the next two years[18]. The PRISMA 7 questionnaire is simple to perform and can identify frailty among community-dwelling individuals and within primary care units. The questionnaire is comprised of seven questions which include: age (cut-off 85 years of age), gender, health issues that limit the individual's activities or force them to stay home, help in everyday tasks, the use of walking-aids and the need to rely on someone else in a daily-basis. Three or more affirmative answers indicate a positive result for frailty[19].

Assessment of frailty risk factors

Apart from the use of overall tools assessing frailty syndrome it is equally important to individually address underlying risk factors with a series of questions and simple diagnostic tests. Assessment of older individuals' functional status has been extensively studied over the years and can accurately be estimated by standardized questionnaires, like the ADL (Activities of Daily Living) Index introduced by Katz et al. and IADL Scale (Instrumental Activities of Daily Living), introduced by Lawton et al. in the 1960s[20,21]. Questions for assessing key activities necessary for everyday living (ADLs) include questions about whether the individual can perform the following activities alone: bathing, dressing, going to the toilet, moving, and feeding. On the other hand, phone use, meal preparation, homework, washing, using public transport or driving, taking medication and managing finances represent questions for the assessment of more complex activities, as expressed by IADLs. Grading depends on whether the individual is able to complete the above tasks without additional help, with difficulty or cannot finish the task without help.

Due to the multifactorial nature of frailty syndrome and the variety of risk factors that have been so far identified by current literature, other tests may also be needed in order to assess eyesight, hearing, bladder control, malnutrition, risk of falls, depression, cognitive perception and interaction with the environment[6]. Specific questionnaires and clinical tools are employed in clinical practice to properly address each of the above mentioned parameters, which is beyond the scope of this paper.

Discussion

There are three ways that patients get in touch with the healthcare system, the primary care units, hospital's emergency departments and elective admission to a hospital ward. These three "gates" of a healthcare system should be the areas where health care professionals can implement frailty assessment instruments. Primary care could hold a major role in the assessment of frailty and potentially give health care and advice that could improve the trajectory of frailty. However, many patients are introduced to the healthcare system at the emergency departments of the hospitals. Due to the large amount of patients the emergency departments serve, it is understood that they also can play a significant role for frailty screening. As for the patients who are electively admitted in a hospital ward for any elective procedure, it is easier to implement

frailty assessment instruments at some point during the patient's stay at the hospital. Doctors, nurses and other health professionals in all the above mentioned areas of healthcare system should always pay attention for frailty in every encounter with older people.

Validated instruments can be used to diagnose and identify frailty syndrome within clinical practice. These should be easy to perform during the patient's visit. Specifically, the presence of immobility, incontinence, multiple falls, cognitive decline or medication side effects should "ring a bell" of possible frailty which warrants deeper assessment. These indicators must alert every healthcare provider for the presence of frailty despite the presenting problem of patients[22]. At the time of patient's detailed assessment and clinical examination detection of indicators like decreased mobility, physical activity deficit, weight loss, muscle weakness or lack of strength (sarcopenia), lack of endurance or decreased stamina, poor balance, deficits in motor processing and poor cognitive condition should raise concern regarding the presence of underlying frailty syndrome and instigate interventions.

The tools that are discussed in this paper have also been identified in a systematic review performed by Buta et al and more recently by Dolenc et al.[9,23]. So far, the preferred instrument for accurate and early detection of frail individuals remains uncertain. Every instrument has both strengths and weaknesses. The choice of a particular instrument can be guided by many factors including the setting in which it is performed, the background of the medical personnel who administers the test and the available time for screening. Recent studies emphasize the use of these instruments in specific patient subgroups, like patients suffering from cardiovascular disease as described by Zao et al.[24]. The instruments identified and discussed within this paper are mostly clinical tools. However, radiological modalities could also be of great significance in frailty assessment in other settings like the perioperative care, as noted by Bentov et al.[25]. Most instruments also have differences regarding their scoring method and the way they evaluate frailty factors. Due to the structural differences in the various frailty tools comparison among them becomes a highly demanding task.

The two most frequently cited tools in the literature, as mentioned above, are the PFP 2 and the FI[10-12]. It has been shown by many authors that the validation and clinical applications of the above instruments differ significantly[26,27]. More specifically, the PFP divides individuals into three categories, the robust, the prefrail and the frail individuals. This phenotype is characterized by multisystem dysregulation which therefore disrupts the homeostatic mechanisms required to resist to various stressors, which subsequently reinforces the idea that the PFP can be used both as a way to identify one's functional status and as a means of risk prediction[28]. The biological background embedded in the PFP might be of benefit in elucidating the underlying mechanisms and etiology of frailty syndrome[27]. The authors of the present study focused on the PFP as it seems to dominate current literature and also because it can be of assistance in defining frailty as a medical entity[1].

Many authors in numerous studies have attempted to make adaptations of the PFP, driven by the lack of accurate measurements in certain studies[29] and the need for simplifications on test application in order to make patient assessment in clinical settings faster and easier[11,30-32]. The majority of the existent adaptations mainly address the issue of their ability to yield comparable results and their efficiency regarding risk prediction of several detrimental frailty consequences including disability and death[29,33-36]. Nevertheless, in the aforementioned studies researchers have not been able to compare the subgroups of the five PFP criteria for their preciseness in distinguishing between the risks of unfavorable effects of aging in frail and non-frail individuals. What is more, the PFP simplifications have not yet been assessed for their ability to accurately define frailty syndrome relative to the initial PFP[34-36].

Alternatively, the Frailty Index (FI) covers a wider variety of frailty factors[37]. Alongside items regarding present physical and psychological functioning, the FI also includes other deficits and co-morbidities which remain relatively steady and are amenable to change. Further research is warranted to elucidate to what extent co-morbidities are an integral part of FI or could be treated as a discrete entity that guides the therapeutic interventions in the setting of frailty. It is important to note that the FI seems to outperform the PFP in the prediction of adverse health outcomes, as it includes a greater variety of risk factors and has a continuous and more precisely graded scoring method[11]. The FI possesses the distinct advantage of not being a fixed index. Item choice is free as long as the minimum of 40 items is achieved. As a result, the number of items that are not subjected to change can be altered and minimized relatively to the number of changeable items according to the purpose that the tool serves every time. This is why the FI needs to be translated in clinical terms in order to be used in either research context or clinical setting[11].

Furthermore, it is of utmost importance to consider whether it is possible to employ a single outcome measure in order to quantify frailty. This measure would have to depict both the fluctuation and gradual deterioration of frailty with time and the interplay of the many associated factors. The attempt to describe and standardize a certain set of factors and weight them according to their effect on frailty remains a challenging pursuit and a highly debatable issue. The authors of the present study recommend the use of a fixed-scoring index with variables that are representative of the intervention aim. Recent studies showed that significant results were noted with the implementation of physical activity, when FI was used as a frailty measurement tool[38,39]. However, further research of the potentials of the FI is needed, especially those that are clinically relevant, in order to be employed as a primary outcome measure. Most

instruments identified in this study classify an individual as either frail or not frail, like the PFP. But, as frailty is a dynamic entity, a continuous scoring scale on multiple levels would be preferred, like that used in FI. Despite not having a specific cut-off point for frailty diagnosis this is not mandatory in order to be used in clinical trials.

This narrative review has inherent limitations. The literature search was meticulous but not systematic. We were interested in scales and tools that could be used in clinical practice. However, the assessment tools for frailty syndrome are numerous and vary substantially in their design and uses, it is pivotal to understand that different instruments measure frailty in different settings and comparison should not always be the ultimate goal. Apart from the great variety in each instrument design, there is also significant heterogeneity in the design of the studies based on these instruments. Therefore, future studies should be designed to properly address the discrepancy in the comparison of the existent instruments.

Overall, both PFP and FI are commonly used to assess frailty. Due to the multifactorial nature of frailty other parameters, like the functional status, eyesight, hearing, bladder control, malnutrition, risk of falls, depression, cognitive perception and interaction with the environment should also be addressed in clinical practice using specific tests and questionnaires. Frailty assessment instruments can help design health care interventions, measure outcomes, and stratify hazards. It is understood that frailty grading is important and the assessment should not be limited in predicting mortality but also to guide the implementation of new strategies in order to improve quality of life. Continuous efforts are required to further study the validity and utility of these tools. Their adaptation to a specific healthcare system is a strenuous and long lasting endeavor that demands extensive study and research to ultimately reflect the population the healthcare system serves.

References

1. Morley JE, Vellas B, van Kan GA, Anker SD, Bauer JM, Bernabei R, et al. Frailty consensus: a call to action. J Am Med Dir Assoc 2013;14(6):392-7.
2. Fried LP, Tangen CM, Walston J, Newman AB, Hirsch C, Gottdiener J, et al. Frailty in older adults: evidence for a phenotype. J Gerontol A Biol Sci Med Sci 2001;56(3):M146-56.
3. Ofori-Asenso R, Chin KL, Mazidi M, Zomer E, Ilomaki J, Zullo AR, et al. Global Incidence of Frailty and Prefrailty Among Community-Dwelling Older Adults: A Systematic Review and Meta-analysis. JAMA Netw Open 2019;2(8):e198398.
4. Shamliyan T, Talley KMC, Ramakrishnan R, Kane RL. Association of frailty with survival: A systematic literature review. Ageing Research Reviews 2013 2013/03/01/;12(2):719-36.
5. Rouge Bugat ME, Cestac P, Oustric S, Vellas B, Nourhashemi F. Detecting frailty in primary care: a major challenge for primary care physicians. J Am Med Dir Assoc 2012;13(8):669-72.
6. Reuben DB. Better ways to care for older persons: is anybody listening? J Am Geriatr Soc 2009;57(12):2348-9.
7. Siriwardhana DD, Hardoon S, Rait G, Weerasinghe MC, Walters KR. Prevalence of frailty and prefrailty among community-dwelling older adults in low-income and middle-income countries: a systematic review and meta-analysis. BMJ Open 2018;8(3):e018195.
8. Kojima G, Taniguchi Y, Iliffe S, Jivraj S, Walters K. Transitions between frailty states among community-dwelling older people: A systematic review and meta-analysis. Ageing Res Rev 2019;50:81-8.
9. Buta BJ, Walston JD, Godino JG, Park M, Kalyani RR, Xue QL, et al. Frailty assessment instruments: Systematic characterization of the uses and contexts of highly-cited instruments. Ageing Res Rev 2016;26:53-61.
10. Mitnitski AB, Song X, Rockwood K. The estimation of relative fitness and frailty in community-dwelling older adults using self-report data. J Gerontol A Biol Sci Med Sci 2004;59(6):M627-32.
11. Rockwood K, Andrew M, Mitnitski A. A comparison of two approaches to measuring frailty in elderly people. J Gerontol A Biol Sci Med Sci 2007;62(7):738-43.
12. Rockwood K, Mitnitski A. Frailty in relation to the accumulation of deficits. J Gerontol A Biol Sci Med Sci 2007;62(7):722-7.
13. Kulminski AM, Ukraintseva SV, Kulminskaya IV, Arbeev KG, Land K, Yashin AI. Cumulative deficits better characterize susceptibility to death in elderly people than phenotypic frailty: lessons from the Cardiovascular Health Study. J Am Geriatr Soc 2008;56(5):898-903.
14. Rockwood K, Song X, MacKnight C, Bergman H, Hogan DB, McDowell I, et al. A global clinical measure of fitness and frailty in elderly people. CMAJ. 2005 Aug 30;173(5):489-95.
15. O'Caoimh R, Costello M, Small C, Spooner L, Flannery A, O'Reilly L, et al. Comparison of Frailty Screening Instruments in the Emergency Department. Int J Environ Res Public Health. 2019 Sep 27;16(19).
16. Wallis SJ, Wall J, Biram RW, Romero-Ortuno R. Association of the clinical frailty scale with hospital outcomes. QJM 2015;108(12):943-9.
17. Saliba D, Elliott M, Rubenstein LZ, Solomon DH, Young RT, Kamberg CJ, et al. The Vulnerable Elders Survey: a tool for identifying vulnerable older people in the community. J Am Geriatr Soc 2001;49(12):1691-9.
18. Min L, Yoon W, Mariano J, Wenger NS, Elliott MN, Kamberg C, et al. The vulnerable elders-13 survey predicts 5-year functional decline and mortality outcomes in older ambulatory care patients. J Am Geriatr Soc 2009;57(11):2070-6.
19. Hébert R, Durand PJ, Dubuc N, Tourigny A. PRISMA: a new model of integrated service delivery for the frail older people in Canada. Int J Integr Care 2003;3:e08.
20. Katz S, Ford AB, Moskowitz RW, Jackson BA, Jaffe MW. Studies of illness in the aged. The index of ADL: a standardized measure of biological and psychosocial function. JAMA 1963;185:914-9.
21. Lawton MP, Brody EM. Assessment of older people: self-maintaining and instrumental activities of daily living. Gerontologist 1969 Autumn;9(3):179-86.
22. Ferrucci L, Guralnik JM, Studenski S, Fried LP, Cutler GB, Jr., Walston JD. Designing randomized, controlled trials aimed at preventing or delaying functional decline and disability in frail, older persons: a consensus report. J Am Geriatr Soc 2004;52(4):625-34.
23. Dolenc E, Rotar-Pavlic D. Frailty Assessment Scales for the Elderly and their Application in Primary Care: A Systematic Literature Review. Zdr Varst 2019;58(2):91-100.
24. Zao A, Magalhaes S, Santos M. Frailty in cardiovascular disease: Screening tools. Rev Port Cardiol 2019;38(2):143-58.
25. Bentov I, Kaplan SJ, Pham TN, Reed MJ. Frailty assessment: from clinical to radiological tools. Br J Anaesth 2019;123(1):37-50.
26. Xue QL, Varadhan R. What is missing in the validation of frailty instruments? J Am Med Dir Assoc 2014;15(2):141-2.

27. Walston JD, Bandeen-Roche K. Frailty: a tale of two concepts. BMC Med 2015;13:185.
28. Fried LP, Xue QL, Cappola AR, Ferrucci L, Chaves P, Varadhan R, et al. Nonlinear multisystem physiological dysregulation associated with frailty in older women: implications for etiology and treatment. J Gerontol A Biol Sci Med Sci 2009;64(10):1049-57.
29. Ensrud KE, Ewing SK, Cawthon PM, Fink HA, Taylor BC, Cauley JA, et al. A comparison of frailty indexes for the prediction of falls, disability, fractures, and mortality in older men. J Am Geriatr Soc 2009;57(3):492-8.
30. Santos-Eggimann B, Cuenoud P, Spagnoli J, Junod J. Prevalence of frailty in middle-aged and older community-dwelling Europeans living in 10 countries. J Gerontol A Biol Sci Med Sci 2009;64(6):675-81.
31. Alvarado BE, Zunzunegui MV, Beland F, Bamvita JM. Life course social and health conditions linked to frailty in Latin American older men and women. J Gerontol A Biol Sci Med Sci 2008; 63(12):1399-406.
32. Avila-Funes JA, Amieva H, Barberger-Gateau P, Le Goff M, Raoux N, Ritchie K, et al. Cognitive impairment improves the predictive validity of the phenotype of frailty for adverse health outcomes: the three-city study. J Am Geriatr Soc 2009;57(3):453-61.
33. Woo J, Leung J, Morley JE. Comparison of frailty indicators based on clinical phenotype and the multiple deficit approach in predicting mortality and physical limitation. J Am Geriatr Soc 2012; 60(8):1478-86.
34. Kiely DK, Cupples LA, Lipsitz LA. Validation and comparison of two frailty indexes: The MOBILIZE Boston Study. J Am Geriatr Soc 2009; 57(9):1532-9.
35. Ensrud KE, Ewing SK, Taylor BC, Fink HA, Cawthon PM, Stone KL, et al. Comparison of 2 frailty indexes for prediction of falls, disability, fractures, and death in older women. Arch Intern Med 2008; 168(4):382-9.
36. Malmstrom TK, Miller DK, Morley JE. A comparison of four frailty models. J Am Geriatr Soc. 2014;62(4):721-6.
37. Mitnitski AB, Mogilner AJ, Rockwood K. Accumulation of deficits as a proxy measure of aging. Scientific World Journal 2001;1:323-36.
38. Hubbard RE, Fallah N, Searle SD, Mitnitski A, Rockwood K. Impact of exercise in community-dwelling older adults. PLoS One 2009; 4(7):e6174.
39. Peterson MJ, Giuliani C, Morey MC, Pieper CF, Evenson KR, Mercer V, et al. Physical activity as a preventative factor for frailty: the health, aging, and body composition study. J Gerontol A Biol Sci Med Sci 2009;64(1):61-8.
40. Cesari M, Gambassi G, Abellan van Kan G, Vellas B. The frailty phenotype and the frailty index: different instruments for different purposes. Age and Ageing 2013;43(1):10-2.