Viewpoint

From Recognition to Clinical Practice: Advances and Challenges in the Multidimensional Assessment of Frailty in Heart Failure

France Matos de Oliveira,[1] *Sandrigo Mangini,*[1] *Fabiana Goulart Marcondes-Braga*[1]

Heart Institute (InCor) do Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo,[1] *São Paulo, SP – Brazil*

The concept of frailty has gained increasing relevance in recent years due to its association with worse clinical outcomes and prognosis across different health conditions. There is broad recognition of its role as a determinant of morbidity and mortality in patients with heart failure (HF); however, there is still no consensus regarding an optimal assessment model.[1-4] In addition to the absence of a universally accepted instrument, this scenario reflects a conceptual issue: can frailty in advanced HF be adequately represented by a single-point and predominantly physical assessment?

In this article, we argue that it cannot. Frailty in advanced HF should not be reduced to a physical marker of vulnerability. Rather, it is a multidimensional condition influenced by cognitive, psychosocial, and contextual factors, whose interpretation requires clinical integration and sensitivity from the healthcare team.

To understand this limitation, it is necessary to revisit the concept of frailty and its evolution from its initial formulation in geriatrics to its still challenging application in the context of advanced HF. Frailty is characterized by an increased susceptibility to stressors resulting from diminished physiological reserves and a reduced adaptive response capacity. Consequently, frail individuals are at greater risk of clinical decompensation, adverse events, functional decline, and disability when exposed to physical or clinical stressors.[1-3]

This vulnerability is particularly important in HF, a condition in which frailty and the disease itself establish a bidirectional relationship. This interaction stems, in part, from shared pathophysiological mechanisms, such as systemic inflammation and sarcopenia, as well as overlapping clinical manifestations, including fatigue and exercise intolerance.[1,4]

In the consensus statement of the International Society for Heart and Lung Transplantation (ISHLT), these convergences are highlighted as central to the understanding and assessment of frailty. According to leading experts in the field, frailty and HF share mechanisms such as neurohormonal activation, chronic inflammation, immunosenescence, sarcopenia, and adipose tissue dysfunction. Frailty may predispose individuals to the development of HF, whereas progression of HF may accelerate the onset of frailty through further reduction of physiological reserve. In some patients, improvement in hemodynamic status may partially reverse frailty, suggesting that at least part of this process is potentially modifiable.[4]

In this context, the ISHLT recommends incorporating frailty assessment into the care of patients with advanced HF and developing strategies for its management. Although evidence regarding the reversibility of frailty following left ventricular assist device implantation or heart transplantation remains limited, available studies suggest improvement after three months, albeit without a uniform response across patients. This finding underscores the need to identify factors associated with recovery.[4]

There are several ways to measure frailty, and two models stand out in the literature: the Fried Frailty Phenotype and the Deficit Accumulation Index proposed by Rockwood. The Fried model conceptualizes frailty as a predominantly physical clinical syndrome, identified by five criteria: exhaustion, unintentional weight loss, muscle weakness, and reductions in gait speed and physical activity level. In contrast, the Rockwood model adopts a broader perspective, based on the progressive accumulation of deficits across multiple domains, including clinical, functional, cognitive, and psychosocial impairments.[5-7] These models have been instrumental in establishing frailty assessment; however, their application in patients with advanced HF requires caution, particularly when symptoms of the disease overlap with frailty criteria.

In light of these considerations, although these archetypes contribute to the understanding and measurement of frailty, their prognostic value does not translate into a gold-standard method for assessing the syndrome in HF. This gap arises from several factors, including the overlap between manifestations of frailty and symptoms of the disease itself, the heterogeneity of available assessment tools, and the multidimensional and potentially reversible nature of frailty.[1,4,5]

This issue shifts the debate from the simple selection of an assessment instrument to a broader question: which dimensions of vulnerability should be considered in advanced HF? As previously discussed, the answer has led to an expansion of the concept of frailty beyond the physical domain.

Accordingly, the view that frailty in HF constitutes a multidimensional, dynamic, and potentially reversible condition has gained increasing support. Its assessment should therefore integrate physical, cognitive, and psychosocial aspects throughout the entire course of the disease. For this reason, its management can hardly be reduced to a single intervention, requiring instead integrated and individualized strategies.[1,8-10]

Keywords

Frailty; Cognition; Heart Failure; Heart Transplantation

Mailing Address: Fabiana Goulart Marcondes-Braga •
Instituto do Coração do Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo – Av. Dr. Eneas de Carvalho Aguiar, 44. Postal Code 05403-000, São Paulo, SP – Brazil
E-mail: fgmarcondes@gmail.com
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The broadening of the frailty concept has favored the incorporation of the cognitive dimension into its assessment, a relevant aspect in HF and other chronic conditions. Cognitive impairment may limit a patient's ability to understand their clinical condition, make treatment-related decisions, maintain self-care behaviors, and recognize early signs of decompensation. In this context, the concept of cognitive frailty* emerged as an interface between physical vulnerability and cognitive decline and has been associated with an increased risk of adverse outcomes, including mortality.[2,11-17]

In HF, the risk of developing cognitive frailty appears to be high. Although the underlying mechanisms have not yet been fully elucidated, available evidence suggests the involvement of hemodynamic, vascular, and inflammatory alterations related to disease progression. Reduced cardiac output and cerebral blood flow, impaired cerebrovascular reactivity, and fluctuations in blood pressure may contribute to structural and functional changes in both white and gray matter, as observed in neuroimaging studies. These processes have been identified as potential components of the pathophysiology underlying cognitive impairment in patients with HF.[13,15,16]

Among candidates for heart transplantation with advanced HF, Jha et al.[2,3] suggested that incorporating measures of cognition and mood into the physical criteria of frailty broadens its prognostic value and enables a more comprehensive assessment of these patients' clinical vulnerability.

Beyond clinical aspects, socioeconomic and social factors may also influence the occurrence and progression of frailty in patients with HF. Conditions such as limited access to healthcare services, food insecurity, inadequate housing, and social isolation may intensify physical and cognitive decline, particularly among more vulnerable populations. Considering this context, we believe that frailty management should incorporate multiple strategies, combining clinical interventions with community-based actions, including the promotion of physical activity, nutritional support, social support networks, and policies aimed at reducing health inequalities.[1]

In our view, the central issue is no longer simply determining whether a patient is frail, but rather understanding how this vulnerability manifests itself, at what point in the clinical trajectory it is assessed, and which of its components are potentially modifiable. Therefore, we argue that frailty assessment should not be restricted to a single moment in the course of HF.

Recent evidence suggests that frailty screening should be performed longitudinally throughout the HF trajectory, including at the time of initial diagnosis, during outpatient follow-up, episodes of decompensation, hospitalizations, and evaluation for advanced therapies. This approach allows for the early identification of vulnerable patients, monitoring of frailty progression, and implementation of interventions that may alter its clinical course.[1]

Among the various advanced HF settings, candidates for heart transplantation represent a particularly important population for the study of frailty because of their high clinical complexity and the potential impact of frailty on therapeutic decision-making.

Most of the available evidence derives from international cohorts, in which the clinical, epidemiological, and healthcare profiles of transplant candidates may differ substantially from those observed in Brazil. This consideration is important because the expression of frailty depends not only on the patient's biological condition, but also on disease stage, underlying etiology, severity at the time of assessment, and access to specialized therapies. Therefore, interpreting frailty among Brazilian heart transplant candidates requires consideration of the healthcare context in which these patients are evaluated.

Data from a Brazilian prospective cohort of patients with advanced HF undergoing evaluation for heart transplantation reinforce the substantial burden of vulnerability within this population. The prevalence of physical frailty was 78.7%, while cognitive frailty was observed in 88.7% of patients.[7] Although these findings do not allow the determination of an ideal assessment model, they illustrate the magnitude and heterogeneity of vulnerability in this population when compared with international data.

These findings prompt reflection on how frailty should be interpreted in settings of severe clinical illness. Patients referred for advanced therapies often present with functional limitations resulting from HF itself, which may make it difficult to distinguish between manifestations of cardiovascular disease and components of frailty. In such situations, predominantly physical assessment tools may not fully capture the complexity of these individuals' clinical vulnerability.

The interpretation of these findings requires consideration of the specific characteristics of the population evaluated. Unlike what has been reported in many international cohorts, the patients included in this study were in a setting of severe clinical illness, often listed for heart transplantation under high-priority status, dependent on hemodynamic support and, in some cases, receiving intra-aortic balloon pump support. This scenario may intensify manifestations such as functional limitation, exercise intolerance, reduced mobility, and weight loss, all of which are also components of the Fried frailty phenotype used in this and in most studies in the field. Consequently, the high prevalence observed should be interpreted considering the clinical and healthcare complexity of these transplant candidates.

From our perspective, these findings broaden the understanding of frailty within the Brazilian context and reinforce that frailty assessment, particularly in cases of severe clinical illness, should be interpreted in a multidimensional and contextualized manner. Thus, beyond merely identifying the presence of the syndrome, it is essential to recognize its different clinical, cognitive, and functional manifestations in order to support individualized care decisions that are sensitive to the specific needs of patients with advanced HF, especially those being evaluated for advanced therapies such as heart transplantation.

In clinical practice, this perspective implies moving beyond the sporadic and purely descriptive use of frailty assessment based on clinical impression and advancing toward its structured incorporation into the longitudinal care of patients with advanced HF across the various stages of their clinical trajectory. Rather than serving solely as an isolated prognostic

*Heterogeneous clinical condition characterized by the coexistence of physical frailty and mild cognitive impairment (MCI), in the absence of dementia.[14]

tool, frailty assessment should help identify potentially modifiable vulnerabilities, guide multidisciplinary interventions, and support individualized decision-making throughout the disease course, including during episodes of decompensation, hospitalization, and evaluation for advanced therapies. Although frailty is not yet widely used as a decision-making criterion, the available evidence suggests that its assessment may enhance risk stratification, therapeutic planning, and discussions regarding the optimal timing of advanced interventions.

This approach can be operationalized through a longitudinal strategy of frailty assessment, intervention, and reassessment throughout the course of HF, as summarized in Figure 1.

Initial screening (stage 1) can be performed either during an outpatient visit or during hospitalization for decompensation, using brief instruments combined with clinical judgment. Patients identified as vulnerable proceed to a multidisciplinary assessment (stages 2 and 3), with the goal of distinguishing manifestations of HF itself from genuine components of frailty across physical, cognitive, psychological, and social domains. Based on this synthesis, individualized interventions – such as physical rehabilitation, nutritional support, cognitive stimulation, psychological support, and coordination of social support networks (stage 4) – are directed according to each patient's deficits and potential for reversibility. Periodic reassessments (stage 5) occur at clinically relevant moments, such as decompensations, hospitalizations, or evaluation for advanced therapies.

In summary, frailty assessment shifts from a one-time descriptive exercise to a continuous process capable of informing therapeutic decisions, including the appropriate timing for advanced therapies such as heart transplantation. The lack of a universally accepted instrument should not be interpreted as justification for omitting assessment. On the contrary, it reinforces the need for a structured, multidimensional, and longitudinal clinical approach capable of recognizing different trajectories of vulnerability and guiding potentially modifiable interventions.

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Author Contributions

Conception and design of the research, Data analysis and interpretation and Critical revision of the manuscript for important intellectual content: Oliveira FM, Mangini S, Marcondes-Braga FG; Data collection, Statistical analysis and Funding acquisition: Oliveira FM; Manuscript drafting: Oliveira FM, Marcondes-Braga FG.

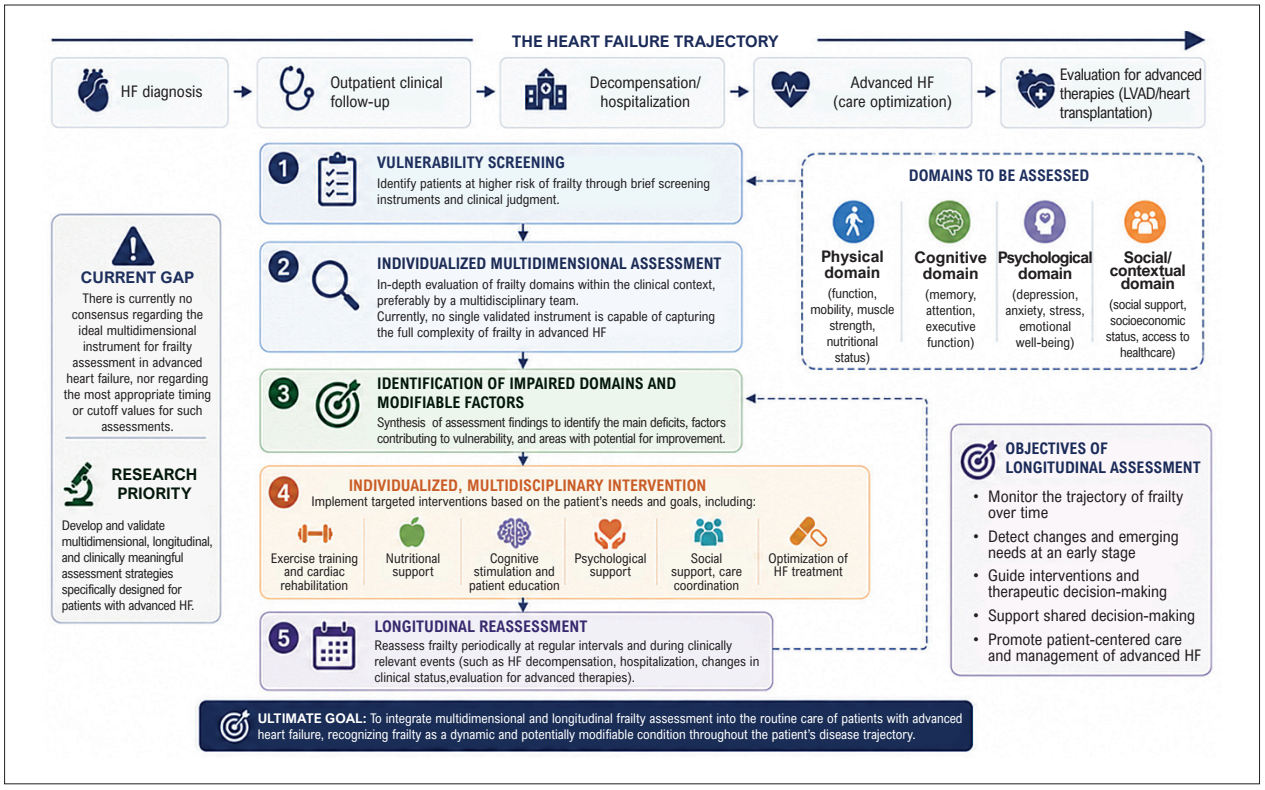


Figure 1 – *Longitudinal and multidimensional assessment of frailty in patients with advanced heart failure. HF: heart failure; LVAD: left ventricular assist device.*

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

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Ethics Approval and Consent to Participate

This study was approved by the Ethics Committee of the HC-FMUSP under the protocol number 97526818.4.0000.0068. All the procedures in this study were in accordance with the 1975 Helsinki Declaration, updated in 2013. Informed consent was obtained from all participants included in the study.

Use of Artificial Intelligence

During the preparation of this work, the author(s) used ChatGPT to improve the readability and clarity of the manuscript and, after revision, to create the central illustration. After using this tool/service, the author(s) reviewed and edited the content as needed and take full responsibility for the content of the published article.

Availability of Research Data

The underlying content of the research text is contained within the manuscript.

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