

Frailty in Older Adults: An Evolutionary Concept Analysis

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The term *frailty* is often used to describe a subset of the older population with complex health issues. It is associated with dependence, disability, increased health care use, and mortality. An emergent problem is the lack of consensus as to the etiology and definition of frailty. The purpose of this concept analysis is to clarify the concept of frailty in the context of older adults and propose a definition of frailty that may be relevant to identification of frail older adults. The results from this analysis conclude frailty in older adults is a tenuous state of health that is the result of the complex interplay of physiological, psychosocial, and environmental stressors that increases an older adult's susceptibility to adverse health outcomes.

Keywords: frailty; concept analysis; older adult; elderly

The term *frailty* is frequently used to describe an older adult population with complex health needs and with increased risk for disability and mortality. Current estimates from population-based cohort studies indicate that the prevalence of frailty to be 7.3%–32% of those older than 65 years of age (Ensrud et al., 2008; Fried et al., 2001; Walston et al., 2006; Woods et al., 2005). After adjustment for age, race, gender, smoking, and comorbid illness, frail patients have a 1.2–2.5-fold increase risk for falls, decreased mobility, worsening activities of daily living (ADLs), institutionalization, and death (Fried et al., 2001).

With the demographic shift toward an aging population, older adults, families, health care systems, and policy makers will experience the impact of frailty. There is personal suffering for the frail older adult as a result of pain and discomfort associated from illness, loss of independence, and diminished quality of life (Hamerman, 1999). Also, the general thought of frailty being an undesirable state has led to situations of older adults being stigmatized for their poor health and increased health needs (Brown, Renwick, & Raphael, 1995). Frail older adults' loss of independence in managing their health needs may place a burden on family and friends. Many families are not prepared to manage the complex health needs associated with frail elders resulting in anxiety, depression, diminished quality of life, and economic strain for both the older adult and for family members (Naylor et al., 2004).

Frail elders are the largest group of health care consumers (Centers for Disease Control and Prevention, 2007). The projected increase in the older adult population will increase demand for services to meet their health needs. The complexity of health care needs and the necessary coordination of multiple providers will strain present health systems. There is concern that the growth in the older adult population and the decline in younger age groups will decrease the availability of both formal and informal care givers as well as governmental financial support. Current health care providers and policy makers acknowledge that there is a lack of management strategies and resources to care for frail elders and frailty is a major health problem needing attention (Markle-Reid & Brown, 2003; Vellas, Cestac, & Morley, 2012). An initial step in addressing this major health issue is the ability to identify older adults at risk for frailty and those that are frail.

Presently, there is not a universal definition of frailty leading to disparity of conceptual guidelines for establishing criteria for describing older adults as frail. These limitations indicate the critical need for further conceptual work on frailty. The purpose of this concept analysis is to clarify the concept of frailty in the context of older adults.

METHODS

Rodgers's evolutionary method (Rodgers & Knafl, 2000) was used to conduct this concept analysis. The evolutionary method of concept analysis is derived from contemporary philosophical thought emphasizing a heuristic cycle of continuing development necessary to create a foundation for further inquiry (Rodgers & Knafl, 2000, p. 84). According to this approach, concepts are formed by the identification of characteristics common to a class of objects or phenomena and the abstraction and clustering of these characteristics, along with some means of expression (Rodgers & Knafl, 2000, p. 78). These abstractions and clusters are influenced by contextual factors that will vary over time or across situations and highlight the dynamic nature of concepts.

The evolutionary method is an inductive analysis with the goal to clarify and develop concepts that are clear and useful rather than to only identify the essence of the concept (Rodgers & Knafl, 2000, p. 81). The method emphasizes a rigorous and systematic approach and identifies the concept's attributes, antecedents, consequences, and related terms.

SAMPLE

A comprehensive literature review was conducted using MEDLINE, PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Scopus, and PsycINFO databases from 1980 to 2013. Keywords for searching the databases included *frailty*, *frail elders*, *aged*, *concept analysis*, and *conceptual framework* (see Table 1). The inclusion criteria were English literature pertaining to the conceptual or theoretical analysis of frailty in older adults and studies that identified factors that correlated with frailty. To identify changes in the usage of the concept over time, the searches were conducted back to 1980; the time frailty was first introduced in the literature (Hogan, McKnight, & Bergman, 2003). The initial search uncovered 72 articles from

TABLE 1. Literature Review Analysis

Characteristics	Analysis Criteria
Publication	Author
	Title
	Journal
	Year of publication
	Discipline of authors
	Selected references from article references
Concept characteristics	Definitions
	Antecedents
	Attributes
	Consequences
	Related terms

MEDLINE, 4 from PubMed, 69 from CINAHL, 52 from Scopus, and 49 from PsycINFO, for a total of 246 articles. After reviewing the abstracts and eliminating articles that did not meet the inclusion criteria or were duplicate citations across databases, attempts were made to retrieve 121 articles. Some references after being read in their entirety were eliminated for not meeting the inclusion criteria. The reference lists from each article were pearled to identify additional potential references. The final result was a sample of 43 articles (see article selection algorithm in Figure 1).

DATA ANALYSIS

Each reference was assigned a letter according to discipline, *M* for medicine ($n = 22$) and *N* for nursing ($n = 2$); according to type, *C* for conceptual framework ($n = 15$) and *E* for empirical ($n = 4$); and a number. The author read every article in entirety for the general nature of the work and concept use. With a second reading, the author summarized the data according to the categories specified in Rodgers's model (attributes, antecedents, consequences, surrogate terms, and related terms). An additional heading of definitions was added to the categories. Definitions were analyzed to identify any terms relevant to the categories. Passages from the articles were recorded verbatim and sorted by label. The data from each category was analyzed separately. The focus of the analysis for attributes was on themes, and antecedents and consequences were analyzed for contextual information. Surrogate terms and related concepts were also identified. There may be many ways of expressing the same concept; these are classified as surrogate terms. Related terms have some relation to the concept being analyzed but do not share the same set of attributes. The data was collapsed and iteratively clustered into themes according to similar meanings (Rodgers & Knafl, 2000).

Ultimately, not all data was relevant; however, any contrary statements that offered important insights into the concept were included. As the data was reorganized, labels were identified to describe the significant characteristics of the concept. A reflective diary was kept to record thought processes, perceptions, and methodological decisions and to allow for an effective audit trail (Rodgers & Cowles, 1993).

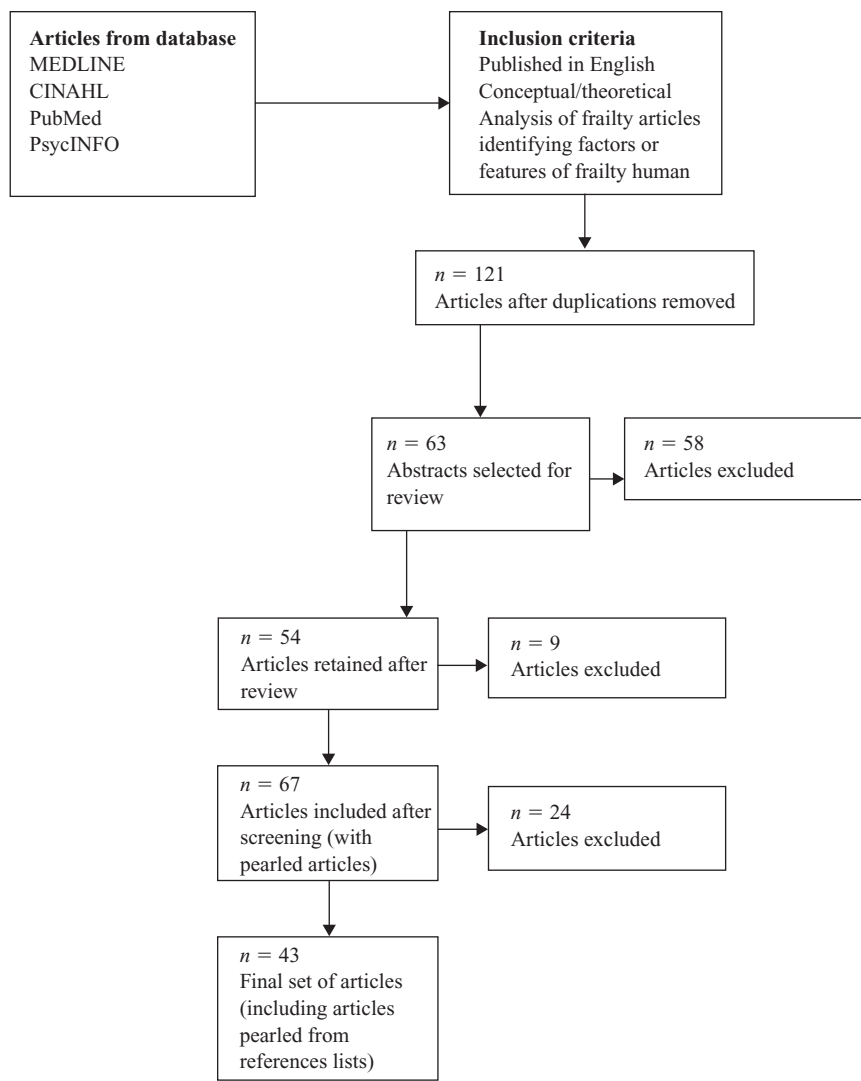


Figure 1. Article selection algorithm. CINAHL = Cumulative Index to Nursing and Allied Health Literature.

RESULTS

DEFINITIONS

Multiple definitions of frailty in older adults have been found in the literature (see Table 2). However, there were inconsistencies as to the conceptual and operational definition. These inconsistencies between definitions are most likely reflective of the continuing scientific inquiry on frailty and the purpose of the inquiry. For example, several definitions of frailty are indices. Fried and colleagues (2001) and Gill and colleagues (2006) defined frailty as having equal to or greater than three

TABLE 2. Frailty Definitions

Reference	Definition
Winograd et al. (1991)	A state of being neither “too independent” nor “too impaired” that puts the person at risk for adverse health outcomes
Rockwood, Fox, Stolee, Robertson, and Beattie (1994)	Those with whom the assets maintaining health and the deficits threatening it are in precarious balance.
Brown et al. (1995)	A diminished ability to carry out life functions, both personal and of a social nature, which may result from one factor or a combination of several factors
Campbell and Buckner (1997)	A condition or syndrome that results from a multi-system reduction in reserve capacity to the extent that number of physiological systems are close to or past the threshold of symptomatic clinical failure
Powell (1997)	Easily perturbed dynamic balance between assets and deficits
Fried et al. (2001)	Having equal to or greater than three of the following criteria: unintentional weight loss, poor endurance, slowness, and low activity
Mitnitski, Graham, Mogilner, and Rockwood (2002)	Age-associated accumulation of deficits
Brody, Johnson, Ried, Carder, and Perrin (2002)	Dependence on another person for daily care
Bortz (2002)	A state of muscular weakness and other secondary widely distributed losses of function and structure that are usually initiated by decreased levels of physical activity
Studenski et al. (2003)	Low gait speed, inability to rise from chair, and difficulties with balance
Ferrucci et al. (2004)	Impairment in physiological domains including mobility, balance, muscle strength, motor processing, cognition, nutrition, endurance, and physical activity
Fried, Ferrucci, Darer, Williamson, and Anderson (2004)	A physiologic state of increased vulnerability to stressors that result from decreased physiologic reserves and even dysregulation of multiple physiologic systems
Gill, Gahbauer, Allore, and Han (2006)	Having three or more of the following features: weight loss, exhaustion, low physical activity, muscle weakness, and slow walking speed
Ahmed, Mandel, and Fain (2007)	Decreased reserves in multiple organ systems
Lally and Crome (2007)	An accumulation of multiple deficits

(Continued)

TABLE 2. Frailty Definitions (Continued)

Reference	Definition
Abellan van Kan et al. (2010)	An attribute of aged people at increased risk for adverse outcomes
Gobbens, Luijkx, Wijnen-Sponselee, and Schols (2010)	A dynamic state affecting an individual who experiences losses in one or more domains of human functioning that are caused by the influence of a range of variables and which increases risk of adverse outcomes
Rockwood and Mitnitski (2012)	An accumulation of deficits
Weiss (2011)	Punished inefficiency
Langlois et al. (2012)	A complex health state of increased vulnerability to stressors because of impairments in multiple systems

features: unintentional weight loss, weakness, poor endurance, slowness, and low activity. Rockwood and Mitnitski (2012) referred to an accumulation of deficits from multiple health domains that can be counted. The authors postulated that it is the quantity of deficits that may be most significant in caring for older adults.

Other definitions of the concept refer to a state and the complexity of multiple health domains. Bortz (2002) defined frailty as a state of muscular weakness and other secondary, widely distributed losses of function and structure that are usually initiated by decreased levels of physical activity. Brown and colleagues (1995) defined frailty as a diminished ability to carry out life functions, both of a personal and a social nature, which may result from one factor or a combination of several factors. Likewise, Rockwood and colleagues (1994) refer to frail older adults as those in whom the assets to maintain health and the deficits threatening it are in precarious balance. The assets and deficits are identified as physical capability, self-reported health, and social support.

Frailty also has been defined as a geriatric syndrome (Ferrucci et al., 2004; Fried et al., 2001; Rockwood, 2005; Rockwood & Mitnitski, 2012; Slaets, 2006). A geriatric syndrome refers to multifactorial health conditions that occur when the accumulated effects of impairments in multiple systems render an older adult vulnerable to situational challenges (Tinetti et al., 1995). A geriatric syndrome usually has more than one cause and may involve many health systems. Other examples of geriatric syndromes are dizziness, gait problems, and falls.

ATTRIBUTES

An attribute is the characteristics or quality of the concept. The literature denotes two attributes of frailty: state and traits. Although the attributes are separate entities, they are nonetheless related. Similar to the states and traits of anxiety, the state of frailty refers to the transitory condition of frailty, whereas the traits are the more general and long-standing qualities of concept. The complex, synergistic, and

cumulative effects of multiple impairments increase an individual’s susceptibility to adverse health outcomes and influences placement on the continuum of frailty. The connectedness of the attributes supports the notion of frailty being a multi-factorial, interrelated syndrome. Table 3 presents the attributes and the literature supporting each attribute.

The first attribute is the state of frailty. The state of frailty refers to how the older adult is at a specific time and reflects situational factors that may influence levels of frailty. Authors refer to frailty as a tenuous, vulnerable state. Frail older adults are in a tenuous state where any disturbance in the metabolic or hormonal balance that can “tip the balance” of frailty (Fried et al., 2001; Hamerman, 1999; Walston et al., 2006). There may be wide fluctuations in health with an unpredictable pattern. Older adults with advanced cardiac or renal disease often straddle a fine line between stability and instability in health (Bortz, 2002). Gill and colleagues (2006) described frail older adults as experiencing frequent transitions between frailty states over time.

Rockwood and colleagues (Rockwood et al., 1994; Rockwood, Hogan, & MacKnight, 2000) refer to the state of being easily perturbed, or on a balance beam. The tenuous nature of frailty included day-to-day fluctuations. For example, an older adult

TABLE 3. Attributes of Frailty

Attributes	Definition	Example
State	The nature of frailty	The tenuous nature of frailty may include day-to-day fluctuations (Campbell & Buckner, 1997).
Traits	The characteristics of frailty	
• Complexity	The intricate arrangement of many factors	Many symptom consequences and risk factors of frailty are shared with depression in later life (Mezuk, Edwards, Lohman, Choi, & Lapane, 2011).
• Synergy	The interactive effects of physiological, psychological, social, and environmental factors that result in frailty	The cycle of frailty (Fried et al., 2001)
• Cumulative effects	A counting of deficits in multiple health domains	Frailty is caused by the age-associated accumulation of deficits (Rockwood & Mitnitski, 2012).
• Susceptibility	Increased vulnerability	Frailty is associated with the adverse effects of falls, disability, hospitalization, and death (Fried et al., 2001).

with arthritis may be unable to manage independently in cold or damp weather because of increased stiffness, swelling, and pain of affected joints. An individual may have unpredictable behavior related to dementia (Campbell & Buchner, 1997). The authors did not define the impact of the tenuous nature associated with frailty on older adults or caregivers but certainly there is the possibility of increased anxiety and fear.

The tenuous state of frailty denotes frailty as a continuum, that of being more or less frail (Ahmed et al., 2007; Bortz, 2002; Brown et al., 1995; Gill et al., 2006; Hamerman, 1999; Lally & Crome, 2007; Powell, 1997; Rockwood et al., 1994; Whitson, Purser, & Cohen, 2007). Hamerman (1999) described an evolving geriatric continuum in which frailty is a midpoint between independence and pre-death. Brown and colleagues (1995) have described the continuum as hardiness at one end and frailty at the other. This is similar to Bortz (2002), who suggested frailty is at the opposite end of vitality.

Some authors used biomarkers to determine individuals as not frail, pre-frail, and frail, supporting frailty as a continuum (Fried et al., 2001; Gill et al., 2006). The degree of frailty on the continuum represents the older adult's ability to carry out important practical and social ADLs and the specific position depends on the complex interaction among multiple factors (Brown et al., 1995; Rockwood, 2005). Brown and colleagues (1995) also suggested consideration of an individual along a hardiness–frailty continuum for each factor (biomedical, social, and environmental). However, the threshold for frailty on the continuum is individualized and most likely influenced by the interaction of biomedical, psychosocial, and environmental factors for each individual.

The second attribute is traits. The traits are the fixed characteristics of frailty. The literature indicated four traits associated with frailty: complexity, synergy, accumulation of impairments, and susceptibility. Complexity refers to intricacy of the concept. Authors depicted frailty as a complex syndrome that is multifactorial. For example, Rockwood and colleagues (1994) referred to frailty as a dynamic model of physiological deficits with a complex interplay of diminished social support, limited resources, attitudes toward health, and health practice. Several other authors identified coping skills, psychological stressors, social support, and environmental factors in addition to biological markers as characterizations of frailty (Brown et al., 1995; Hamerman, 1999; Markle-Reid & Brown, 2003; Whitson et al., 2007; Woo, Goggins, Sham, & Ho, 2005). All authors agreed that there is not a specific factor or arrangement of factors that result in frailty. Frailty was considered a constellation of deficits that are superimposed on the normal physiological processes of aging.

Complexity is also evident in the discrepancies of the relationships among frailty factors. Although the literature suggested strong support for a relationship between many factors that constitute frailty, there was disagreement as to the nature of the relationships. Factors that were identified as antecedents in some articles are attributes in others. For example, Fried et al. (2001) and Gill et al. (2006) included weight loss, low physical activity, muscle weakness, and slow walking speed as components of frailty. Other authors identified these factors as antecedents (Ahmed et al., 2007; Campbell & Buckner, 1997; Hamerman, 1999; Powell, 1997). There was also

the suggestion that antecedents and attributes of frailty are bidirectional (Bergman et al., 2007). For example, muscle weakness and slow walking speed is predictive of low physical activity, and older adults with low physical activity are more likely to have muscle weakness and slow walking speed. The possibility of antecedents and attributes being bidirectional supports frailty as a complex interplay of factors.

Synergy refers to the interactive characteristic of frailty. Features of frailty are not the result of change in a single system but the interaction of several systems (Espinoza & Walston, 2005). Underlying pathophysiological pathways are reported to be interactive and produce an effect that influences the presence and degree of frailty. Several authors have identified the interaction of coping skills, psychological stressors, social support, and environmental factors in addition to physiological and biological markers as characterizations of frailty (Brown et al., 1995; Hamerman, 1999; Markle-Reid & Brown, 2003; Weiss, 2011; Whitson et al., 2007; Woo et al., 2005). The notion of synergy suggests that minor physiological and psychological stressors superimposed on the age-related physiological changes increases the probability of adverse health outcomes for a frail older adult (Campbell & Buchner, 1997; Powell, 1997).

Cumulative effect refers to the multiple impairments superimposed on the aging process that is associated with frailty. Some authors emphasized only the accrual of physiological deficits, and others referred to the amassing of deficits across multiple health domains that culminate in frailty. For example, several authors have suggested that it is the combined reduction in physiological capacity in neurologic control, mechanical performance, and energy metabolism that are the major components of frailty (Bortz, 1993; Buchner & Wagner, 1992; Gill et al., 2006; Powell, 1997; Walston et al., 2006). Similarly, Campbell and Buckner (1997) referred to the multisystem reduction in physiological capacity that defines frailty. Fried and colleagues (2004) defined frailty as having three or more of the following core elements: weakness, poor endurance, weight loss, low physical activity, and slow gait speed. All of these authors suggested that frailty was the accumulation of reduced physiological reserves associated with aging.

Some authors suggested that it is the accumulating effects of biomedical deficits with psychosocial and environmental factors that characterize frailty (Gobbens et al., 2010; Morley 2010; Pei-Little, Schuurmans, Emmelot-Vonk, & Verhaar, 2009). Rockwood and colleagues (1994) referred to frailty as a dynamic model of physiological deficits with diminished social support, limited resources, attitudes toward health, and health practices.

Susceptibility is inextricably linked to frailty and refers to the frail older adult's likelihood of being affected by small changes in biomedical, psychosocial, or environmental factors. The notion of susceptibility suggests that diminished reserves and deficits of a frail older adult increase the probability of adverse health outcomes from minor physiologic and psychosocial stressors (Campbell & Buchner, 1997; Powell, 1997). Some authors discussed the susceptibility of frail elders to homeostasis instability as a result of minor infractions such as a medical procedure or a common ailment such as viral nasopharyngitis (Bortz, 2002; Fried et al., 2004). Other authors discussed the susceptibility of frail elders to adverse outcomes from psychosocial

and environmental factors (Brown et al., 1995; Rockwood et al., 2000; Rockwood & Mitnitski, 2012). Examples are the frail elderly woman who becomes malnourished because of the reduced support from a daughter to prepare meals or the frail elder who becomes acutely confused after visiting a relative living out of state.

RELATED TERMS

Related terms bear some relationship to the concept being analyzed, but they do not have the same precise set of attributes. The terms that appear most frequently in the literature are *disability*, *comorbidity*, and *vulnerability*.

Frailty and disability share several similarities. Each comprises a decrease in functional status and is associated with dependency. Also, the prevalence of frailty and disability increases with age. However, there are two distinct differences between the two terms. Frailty is multifactorial and results from deficits in multiple systems and domains. It is often difficult to determine a single cause of frailty but rather a broader range of physiological, psychosocial, and environmental factors. Conversely, disability can result from dysfunction from a single or multiple systems. Disability usually results from specific and often identifiable impairments. In addition, frailty is associated with instability or a tenuous nature, whereas disability may be stable and unlikely to change (Brown et al., 1995; Fried et al., 2001; Rockwood et al., 2000).

The relationship between frailty and comorbidity is complex. Comorbidity is defined as the concurrent presence of two or more medically diagnosed diseases in the same individual, with the diagnosis of each contributing disease based on established criteria (Fried et al., 2004). With aging, the presence of comorbidity increases partly because the frequency of individual chronic conditions rises with age. Many authors have discussed comorbidity as an antecedent to frailty (Brown et al., 1995; Fried et al., 2004; Rockwood et al., 2000). Fried and colleagues (2004) suggested comorbidity to be the aggregation of clinically manifested disease and frailty as the aggregation of subclinical losses of reserves across multiple physiological systems.

Vulnerability is often used to describe frail older adults and refers to being open or at risk of harm. Vulnerability is an inherent characteristic of frailty, but frailty is not synonymous with vulnerability. Vulnerability does not include the multifaceted characteristics of frailty. There is consensus from this analysis that the collective effects of multiple deficits are a significant characteristic of frailty. Collective deficits are not necessary for vulnerability. For example, an older adult hospitalized for congestive heart failure is vulnerable for functional decline but would not be considered frail unless the collective effects of acute and chronic illness superimposed on age-related changes resulted in decreased strength and functional impairment. Vulnerability also does not indicate a tenuous nature that is associated with frailty. Frailty is described in the literature as degrees of frailty: pre-frail, frail, advanced frailty; whereas vulnerability may be static. An older adult who is frail is vulnerable, but all older adults with vulnerability are not frail. Although frailty, comorbidity, and vulnerability may be intertwined, each is a separate entity.

ANTECEDENTS

Antecedents are the event or phenomena that precede the concept (Rodgers & Knafl, 2000). A large number of antecedents of frailty have been proposed in the literature and are categorized into seven factors: sociodemographic, pathophysiological, physical capacity, comorbidity, habitus, social networks, and environmental (Table 4). Sociodemographic relates to effect of age, gender, race and ethnicity, and education on frailty. Age was considered a predictor of frailty in almost all articles. It is unclear if age was considered an independent predictor of frailty, although the majority of authors refer to the increased prevalence of frailty in older adults. Rockwood and colleagues (2000) suggested any definition of frailty must include an association with aging. Collard, Boter, Schoevers, and Oude Voshaar (2012) found frailty to be common in later life. It was also argued that older adults accrue age-related adverse changes such as illnesses, muscle loss, and diminished strength, increasing the likelihood of frailty to occur in older adults versus younger age groups. Some articles did not mention age as an antecedent, but the study populations in the articles were older than 65 years of age, suggesting a belief in a relationship between age and frailty. Some authors noted a higher incidence of

TABLE 4. Antecedents of Frailty

Antecedents	Definition	Components Supported By Literature
Sociodemographic	Individual variables that precede frailty	Age, ⁸ gender, ⁴ race and ethnicity, ³ education ²
Pathophysiology	Physiology of abnormal states or disordered function	Cortisol levels, ¹ unintentional weight loss, ³ sarcopenia ³
Physical capacity	The ability to activate muscular systems and energy for prolonged deployment	ADLs and IADLs, ⁴ endurance, ⁶ self-report poor health ²
Comorbidity	Medical diagnosis and geriatric syndromes	Medical diagnosis including cognitive impairment and depression, ¹⁰ falls, ³ polypharmacy ²
Habitus	Lifestyle behaviors including coping skills	Numbers of days with 30 min of physical activity, ⁹ coping skills ³
Social networks	Availability of family/friends/hired assistance	Social support ⁶
Environment	Living setting and financial resources to maintain independence	Financial support, ⁴ safe neighborhood ²

Note. Superscript numbers refer to number of citations. ADLs = activities of daily living; IADLs = instrumental activities of daily living.

frailty in women than men (Fried et al., 2001; Gill et al., 2006; Rockwood et al., 2004). Yet, men were more likely to be frail than women in the Beaver Dam Study (Klein, Klein, Knudtson, & Lee, 2005).

Pathophysiology was identified as a central component of frailty. Some authors indicated the combined reduction in physiological capacity, neurologic control, mechanical performance, and energy metabolism in the development of frailty (Bortz, 2002; Buchner & Wagner, 1992; Gill et al., 2006; Powell, 1997; Walston et al., 2006). Some researchers have also evaluated inflammatory and neuroendocrine changes associated with frailty (Morley, Perry, & Miller, 2002; Walston et al., 2006). Several authors proposed declines in hormones such as sex hormones, insulin-like growth hormones as well as loss of muscle mass as contributing factors in the pathophysiology of frailty (Baumgartner, Waters, Gallagher, Morley, & Garry, 1999; Lamberts, van den Beld, & van der Lely, 1997; Morley et al., 2001). Bortz (1993) postulated that a loss of functional competence at the cellular level with thermodynamic decline and loss of energy stores lead to frailty. Bortz (2002) and Chin A Paw, Dekker, Feskens, Schouten, and Knowhout (1999) suggested the greatest contributor to frailty is a lifestyle consistent with inactivity and nutritional problems of either insufficient or excess calories.

The literature identified the presence of comorbidity as a contributing factor of frailty (Bortz, 2002; Brown et al., 1995; Buchner & Wagner, 1992; Chin A Paw et al., 1999; Fried et al., 2001; Gill et al., 2006; Hamerman, 1999; Searle, Mitnitski, Gahbauer, Gill, & Rockwood, 2008). This indicates a paradox within frailty research because comorbidity was identified as both a related term and contributing factor. As a contributing factor, cardiovascular, pulmonary, and renal diseases and depression were the most highly associated illnesses with frailty in the literature. However, no single disease–frailty dyad has been identified. With age, the presence of comorbidity increases markedly. It is estimated that 62% of older adults have two or more chronic illnesses (Woo et al., 2005). In addition, the literature has demonstrated comorbidity increases the risk of disability and mortality over and above the risk from individual diseases (Fried et al., 2004). Of note is the paradox of comorbidity in the literature. As previously stated, comorbidity was identified as a related term, antecedent, and consequence in the literature.

The contribution of cognitive impairment and depression factors to frailty has been identified in several studies (Avila-Funes et al., 2009; Brown et al., 1995; Chin A Paw et al., 1999; Fried et al., 2004; Lally & Crome, 2007; Puts, Lips, & Deeg, 2005; Rockwood et al., 1994; Speechley & Tinetti, 1991; Woo et al., 2005). Klein and colleagues (2005) noted an association of cardiovascular disease and hypertension with frailty. Additional authors suggested injuries such as falls or hip fracture may contribute or be a consequence of frailty.

Decreased physical capacity was frequently cited as an antecedent of frailty in the literature. Physical capacity incorporated functional ability as measured by ADLs and instrumental activities of daily living (IADLs), strength, endurance, dexterity, and gait and balance impairment. For example, Fried and colleagues (2001) referred to weakness, exhaustion, low physical activity, and slow walking speed as risk factors for frailty. Rockwood and Mitnitski (2012) included deficiencies in strength, mobility, balance, and ADLs, and IADLs as frailty indicators.

Habitus refers to an individual's lifestyle. It was postulated that low physical activity predisposes an individual to muscle atrophy, weakness, and slow mobility. The addition of chronic undernutrition, stressful life events, and depression perpetuates the cycle of frailty (Fried et al., 2001). Most authors indicated the importance of physical exercise to prevent and treat frailty. Habitus also includes coping skills, sense of self-worth, and spiritual factors such as hope or meaning of life (Brown et al., 1995; Woo et al., 2005). Rockwood and colleagues (1994) identified positive attitude toward health as an asset in the evaluation of frailty as an accumulation of deficits, and Ostir and colleagues (Ostir, Ottenbacher, & Markides, 2004; Ostir, Simonsick, Kasper, & Guralnik, 2002) postulated that knowing a person's level of positive affect is protective against the functional and physical decline associated with frailty.

Because the concept of frailty has evolved, researchers have investigated and supported the inclusion of social networks and environment as important frailty contributors. Social networks include informal and formal contacts that provide support from a consistent basis and can be easily and quickly employed with the fluctuating needs of an older adult. Environmental factors were identified as antecedents of frailty in six of the studies. These factors included available financial resources to provide adequate housing, food, health care, and medications and living milieu such as hazard within home, neighborhood safety, and proximity to stores and health providers.

CONSEQUENCES

Consequences of a concept refer to situations, events, or phenomena that follow an example of the concept (Rodgers & Cowles, 1993). Analysis of the literature revealed seven consequences: disability, fiscal, existential, morbidity, mortality, care environment, and advanced directives (see Table 5). All authors ($n = 43$) agreed that frailty predisposes an older adult to the development of other diseases, disability, increased health cost, increased need for supportive care environments, and increases risk of death and consequences of frailty are interactive. For example, frailty increased the risk for morbidity, which increased the risk of disability; permanent disability increased need for health care resources (hospitalization and institutionalization), and both morbidity and health care (hospitalization and institutionalization) add to the fiscal cost of frailty and increase the risk for mortality. Also several authors ($n = 7$) indicated that frailty is an important factor to include in treatment decisions regarding the existential being of the individual, risk of disability, and quality of life.

DISCUSSION

The purpose of this study was to clarify the concept of frailty in the context of older adults given the lack of consensus on a universal definition and disparity in criteria to determine frailty risk. Review of the literature identified two specific attributes of frailty: state and trait. State is the nature of frailty, that of the tenuousness of being

TABLE 5. Consequences

Consequence	Definition
Disability	An individual's decreased ability to independently perform ADLs, dependency for others for ADLs
Fiscal	The increased health care cost associated with increased hospitalization and emergency department admissions, short-term rehabilitation stays, outpatient physical therapy, nursing home care, home health care, home- and community-based programs, and caregiver financial expenditures
Existential	Subjective quality of life of frail older adult
Mortality	Increased risk of death
Morbidity	Frailty predisposes an older adult to the development of other illnesses
Care environment	Building, facility, space, and people that provide support an older adult
Advance directives	Legal documents that allow people to communicate their decisions about medical care to family, friends, and health care professionals in the event that they are unable to make those decisions themselves

Note. Each consequence was generated through consensus in the literature.
ADLs = activities of daily living.

frail. It is a response to stress superimposed on the physiology of aging. Traits are the fundamental characteristics of frailty and refer to the complexity, synergistic, and cumulative effects of multiple system impairment that renders an older adult susceptible to adverse health outcomes. This is not new information, but it is a novel approach to understanding a complex phenomenon. It represents the fluidity and the multifactorial nature of frailty. Similar to a geriatric syndrome, frailty does not fit a traditional discrete disease category but is multifactorial, may involve shared pathways, and the interaction of pathways have a negative impact on an older adult's health. Frailty involves a continuum with movement or transitions between frailty states of not frail to more frail.

A conceptual definition of frailty must include these two characteristics. Several conceptual definitions define frailty by pathophysiological criteria or by adding health deficits but do not reflect the tenuous state and complexity of frailty. Conceptual definitions that incorporate the state and traits of frailty are by Gobbens et al. (2010), Langlois et al. (2012), and Rockwood et al. (1994). All three definitions referred to frailty as a state that is tenuous and influenced by factors from multiple health domains. However, these definitions do not incorporate the complexity and synergistic effect of multiple factors that result in frailty. Based on the findings from this conceptual analysis, a new definition of frailty was formulated that incorporated the two attributes of frailty The new definition is as follows: Frailty is a tenuous

state of health that is the result of the complex interplay of physiological, psychosocial, and environmental stressors that increases an older adult's susceptibility to adverse health outcomes.

The literature provides strong support for a relationship among many factors that constitute frailty. However, there remains disagreement as to the nature of the relationships. Factors that are identified as antecedents in some articles are attributes or consequences in others. This creates confusion as to which occurs first, the factor or frailty. There was also the suggestion that antecedents and consequences of frailty are bidirectional (Bergman et al., 2007). For example, muscle weakness and slow walking speed is predictive of low physical activity, and older adults with low physical activity are more likely to have muscle weakness and slow walking speed. This confusion may be the result of indirect measurement of frailty. Because frailty is complex with a nondefinitive underlying pathology, present criteria measure manifestations of frailty. Therefore, researchers speculate certain factors make an older adult susceptible to frailty.

To facilitate the identification of older adults at risk for frailty present antecedents should be reconceptualized into risk factors. Although research is still needed to understand the pathophysiology of frailty, identification of risk factors is important to begin preventative and treatment interventions. It is important to note that because of the complexity, synergy, and cumulative effects of health impairments associated with frailty, a holistic approach to risk identification is warranted. Assessment of all health domains will be needed to address the multiple precursors of frailty. Based on the findings from this analysis, risk factors may be grouped into sociodemographic, physiologic, physical capacity, psychosocial, habitus, and environment. Sociodemographic risk factors are individual characteristics identified in the literature that may predispose an older adult to poor health: age, gender, race and ethnicity, and education. Physiologic refers to abnormal states or function such as alterations in inflammatory and neuroendocrine systems, weight loss, sarcopenia, and comorbidity. Physical capacity encompasses the individual's strength, endurance, and self-reports of perceived health status. Psychosocial factors include cognition, mental health, and social networks. Habitus consists of lifestyle behaviors that influence health status such as exercise, nutrition, smoking, substance use, and coping mechanisms. Environmental factors include financial resources, access to health care, transportation options, and living setting. Knowledge of these risk factors allows the health care provider to evaluate each health domain for inadequacies. It is also important to note that because of the multiple health domains associated with frailty, interventions will also need to address all risk factors. For example, an older adult female living independently experiencing muscle weakness and unsteady gait would be assessed for physiological causes, daily exercise routine, medications, nutrition, and social support networks. Interventions would be developed to address all areas of impairment and may include physical therapy, nutrition consultation, and activation of formal and informal social networks based on financial resources (insurance and personal finances) to allow the older female to remain at home.

This review highlights the relationship among frailty and related terms. The related terms of disability, comorbidity, and vulnerability reinforce the complexity and synergistic effects of frailty. There are similarities and overlaps among the terms. In the context of older adults, frailty encompasses the adverse effects of comorbidity, increases vulnerability to negative health, and may cause disability.

This review also underscores that all consequences of frailty are negative. The only possible positive outcomes were for older adults on the early or pre-frail continuum. Older adults termed as early or pre-frail were hypothesized to having a possibility of reversing a negative trend (Fried et al., 2001; Rockwood et al., 2000). However, there is limited evidence to support this hypothesis.

Further scientific inquiry is needed to advance the science of frailty and impact health policy. Researchers are challenged to develop complex models that incorporate the multifactorial nature of frailty and identify changes in variables over time. Models need to include all frailty domains and triangulation of data to fully capture the concept. There is consensus that frailty is nonstatic and tenuous in nature. Therefore, the ability to measure both positive and negative change is necessary. Assessing differences over time will allow for individualized interventions that may prevent or delay further advancement on the frailty continuum. Consensus as to the definition will assist in identifying measures that incorporate the complexity of frailty. The findings from future research can then be used to develop evidence-based interventions and influence health policy on methods to best meet the needs of frail older adults.

For the concept of frailty to have a practical use, its theoretical conceptualization needs to be translated into an operational definition that is best suited to need. For example, clinicians may be seeking a brief screening instrument that assesses and identifies risk factors of frailty. The conceptual definition proposed in this analysis can be used as the foundation for an operational definition and instrument development that will allow for the identification of older adults at risk for frailty. Once risk factors are identified targeted interventions can be initiated to prevent further health decline and the negative consequences associated with frailty.

CONCLUSION

The results from this analysis conclude frailty in older adults is a tenuous state of health that is the result of the complex interplay of physiological, psychosocial, and environmental stressors that increases an older adult's susceptibility to adverse health outcomes. However, further research and theoretical development with respect to the concept of frailty is necessary. The results of this analysis may serve as a starting point in the continuous cycle of concept development. By increasing the awareness of the complexity of frailty and the multiple domains that contribute to its development, an improved understanding of the phenomenon frailty will occur. As the older adult population increases, it will be essential to identify older adults at risk for frailty or who are frail and develop strategies to prevent frailty.

Knowledge of the multidimensionality of frailty and the risk factors for each older adult will improve the specificity of interventions and the negative outcomes associated with frailty.

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