Assessing the Whole Person: Examining how Psychosocial Factors are Currently Considered Within Frailty Screening Tools

by

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Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Abstracts:

This thesis aimed to better understand frailty screening tools through an assessment of the level of psychometric testing, the domains included within the tools and a comparison with stakeholders' perspective on frailty screening. This thesis is presented in manuscript format, and as such three abstracts are presented to reflect the components of this thesis. Each individual manuscript is presented as a results section of this thesis. An extended methodological approach, extended discussion and extended conclusion combine the results of all three studies, presented in abstract form below, to better understand frailty screening tools from the various research methods adopted.

Manuscript #1: Understanding Frailty: Older adults, caregiver and healthcare provider perspectives.

*Background***:** Frailty is a widely used concept to describe a state of vulnerability in older persons. Frailty is often defined in bio-medical terms, however such an approach may not adequately reflect all relevant perspectives on screening for frailty. This study examined older adult/caregiver (OA) and healthcare provider (HCP) perspectives on frailty screening.

Methods: Fourteen OA and 15 HCP completed semi-structured individual or focus group interviews. Interviews were audio recorded, transcribed verbatim and analyzed using line-by-line emergent coding techniques and inductive thematic analysis.

Results: The interviews yielded several themes (with associated subthemes) from HCP and OA perspectives: definitions and conceptualizations of frailty, perceptions of "frail", factors contributing to frailty (physical, nutrition, cognitive, pharmaceutical, social), and frailty screening (current practices, tools in use, factors to be considered, context, concerns, recommendations).

Conclusion: OA and HCP have similar perspectives regarding frailty; both identified frailty as multi-dimensional and dynamic. Biological, psychological, and social aspects were identified as important to include in frailty screening tools. HCP need clear "next steps" to provide meaning to frailty screening practices, which may improve use of frailty screening tools.

Manuscript #2: Understanding Frailty Screening: A Domain Mapping Exercise

Background: Many definitions and operationalisations of frailty exclude psychosocial factors, such as social isolation and mental health, despite considerable evidence of the links between frailty and these factors. This study aimed to investigate the health domains covered by frailty screening tools.

Methods: A systematic search of the literature was conducted in accordance with PRISMA guidelines. MEDLINE, CINAHL, EMBASE, and PsycInfo were searched from inception to December 31, 2018. Data related to the domains of each screening tool were extracted and mapped onto a framework based on the biopsychosocial model of Lehmans et al. (2009) and Wade & Halligans (2017).

Results: Sixty-seven frailty screening tools were captured in 79 articles. All screening tools assessed biological factors, 73% assessed psychological factors, 52% assessed social factors, and 78% assessed contextual factors. Under half (43%) of the tools evaluated all four domains, 33% evaluated three of four domains, 12% reported two of four domains, and 13% reported one domain (biological).

Conclusion: This review found considerable variation in the assessment domains covered by frailty screening tools. Frailty is a broad construct, and frailty screening tools need to cover a wide variety of domains to enhance screening and outcomes assessment.

Manuscript #3: Understanding Frailty Screening: A Systematic Search and Review

*Background***:** Agreement on a definition of frailty remains elusive, though consensus surrounds the general view that frailty is a state of vulnerability, which is influenced by a myriad of biological, health, and social factors. Accurate identification and detection of frailty requires valid and reliable screening tools. Previous reviews have noted the increased development of frailty screening tools over the past two decades. This review aimed to identify published frailty screening tools, understand the conceptual frameworks used, and report the psychometric testing of these tools.

*Methods***:** Following PRISMA guidelines, a systematic search was completed to identify relevant articles using the MEDLINE, CINAHL, EMBASE, and PsycInfo databases. We undertook quality assessments following COSMIN's Risk of Bias checklist and reported on the psychometric testing of the tools. We extracted data about the conceptual frameworks used for each tool.

Results: A total of 2213 potential studies were identified. Upon completion of a title-abstract screen and full-text review, 79 studies were included in the review. Sixty-seven frailty screening tools were identified. The frailty syndrome was the prominent framework used in the identified studies (n=27). Identified tools were published between 1991-2018, and a spike in the number of tools developed can be observed after 2011. Reliability and validity information was available in 31 studies.

*Conclusion***:** There is a continuing increase in the number of frailty screening tools, some with information on their psychometric properties. The Tilburg Frailty Index had the most readily available psychometric information and good results on the COSMIN checklist. The SHARE-FI, Edmonton Frail Scale, and Frailty Index based on Primary Care Data also showed adequate results on the COSMIN checklist.

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Dedication:

I dedicate this work to my grandparents, David and Jean Thorne and Jean Van Damme, as well as my family, Paul, Sara, Jane and Jack.

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Introduction and overview:

Over the past several decades, frailty has been “an evolving concept” (Rockwood et al. 1995). The need for a more dynamic definition of frailty, moving from a strictly biomedical perspective (Buchner & Wagner, 1992) to a dynamic one including psychosocial factors has been highlighted in research completed by Rockwood, Fox, Stolee, Robertson and Beattie (1995). Rockwood et al (1995) described frailty as a balance between assets and deficits. These assets and deficits range from medical to social, and changes to either side can change the risk of frailty (Rockwood et al. 1995). Fried (2001) later proposed a physiologic definition of frailty, referring to a frailty phenotype. Rockwood and Mitnitski (2007) later used a deficits-based approach reflecting a more biological perspective. This perspective discusses frailty as a physical state of being that is clinically recognizable, excluding psychosocial components as described in previous works (Rockwood & Mitnitski, 2007; Rockwood et al. 1995).

Previous research has demonstrated that psychosocial factors such as income, education, social isolation, and mental health are key contributors to older adults’ perceived quality of life, improved health outcomes, and decreased risk of mortality (Andrew & Keefe 2014). Research emphasizes the importance of maintaining quality of life and health outcomes for older persons, and particularly for older persons living with frailty (Frost et al. 2017). The demonstrated influence of psychosocial factors on health outcomes suggests potential value for screening and assessment tools to incorporate both psychosocial and biomedical factors in efforts to detect and assess frailty.

Currently, a working definition of frailty, as stated by the Canadian Frailty Network (CFN) is as follows:

> *"Frailty is a state of increased vulnerability, with reduced physical reserve and loss of function across multiple body systems. This reduces ability to cope with normal or minor stresses, which can cause rapid and dramatic changes in health." (CFN 2017)*

This definition is not clear on the inclusion of psychosocial factors within its conceptualization. This may reflect a shift away from a holistic conceptualization of frailty which incorporates physical and psychosocial factors as seen with the development of tools to assess only psychosocial factors, such as the Friendship Scale (Hawthorne, 2006) and Social Vulnerability Scale (Andrew & Keefe, 2014), or only the biomedical condition, such as the Clinical Frailty Scale (Rockwood et al, 2005). The separation of physical and psychosocial factors within frailty screening appears counter-intuitive given the plethora of research that exists to support the influence that psychosocial factors have on frailty outcomes (Levers et al. 2006).

This project aimed to understand how frailty screening tools currently consider psychosocial factors, while reporting on the testing of the psychometric properties of these tools. Literature has indicated that psychosocial factors contribute to frailty, but it is not clear how consistently these factors are assessed or measured, making their influence vague (Levers et al. 2006). By examining how psychosocial factors are considered within the literature and comparing results with stakeholder perspectives, researchers can better determine if screening processes are appropriately considering both psychosocial as well as biomedical factors, maximizing patient-centered outcomes. This may help to inform those involved in health and social care by encouraging a more compassionate, individualized approach for older adults. Holistic approaches to primary care have been proven to be more effective than treatment of single concerns (Jasemi et al. 2017) and this may be appropriate for considerations of frailty, particularly given the dynamic nature of this concept (Rockwood et al. 1995). Early and more accurate detection of all factors contributing to frailty, and health outcomes, may improve quality of life for older adults most at risk.

Literature Review:

Discussions regarding improving quality of patient care have increasingly focused on providing “patient-centered” care (Epstein & Street, 2011). Patient-centered care refers to the practice of involving patients in healthcare decisions through improved communication and understanding of the patient’s unique and individual needs (Epstein & Street, 2011; Morgan & Yoder, 2012; Jasemi et al, 2017). Patient-centered care respects the social and environmental contexts of an individual and aims to have patients feeling heard, respected and involved in care decisions (Epstein & Street, 2011). This is achieved through an improved focus on a patient’s individual needs and values, and adopting a biopsychosocial approach (Jasemi et al. 2017). Morgan & Yoder (2012) outline a case in their analysis of patient-centered care, where the patient required both physical and spiritual healing after suffering an accident which resulted in the death of a friend. This was respected by medical staff and resulted in the patient being able to set up a religious shrine for prayer that may have otherwise been overlooked, which would have been distressing for the patient, hindering the recovery process (Morgan & Yoder, 2012). Epstein and Street (2011) note that despite initial hesitation, practitioners have adopted this individualized approach, recognizing that good outcomes should be evaluated in terms of what is important to the individual patients as opposed to larger population “averages”.

Often synonymous with patient-centered care is “holistic care” (Jasemi et al, 2017). Holistic care is a comprehensive model of care, which along with a focus on patient centered care practices, acknowledges the importance of recognizing the person as a whole (Morgan & Yoder, 2012; Zamanzadeh et al. 2015; Jasemi et al, 2017). Holistic care specifically aims to include biological, spiritual, psychological and social aspects in its evaluation of health due to the interdependence of these domains in affecting health outcomes (Morgan & Yoder, 2012; Zamanzadeh et al, 2015; Jaseemi et al. 2017). Practicing holistic or patient centered care has been shown to improve treatment processes (Morgan & Yoder, 2012). Improvements in quality of life are observed through improved healing of conditions, decreased length of hospital stays, and improvements in patients' ability to handle adversity (Morgan & Yoder, 2012; Jasemi et al. 2017). The holistic model of care often involves collaboration between disciplines, and may encompass approaches such as medication, education, communication or support services, self-help strategies, and other complementary treatment paths (Zamanzadeh et al. 2015). Holistic care can be thought of as the model under which patient centered care is a best practice (Jasemi et al. 2017). Holistic models combined with patient-centered approaches can be utilized to improve outcomes for many health concerns, including frailty, particularly when screening processes accurately assess the whole person through examination of multiple health domains.

As previously mentioned, the concept of frailty has been evolving over the past several decades. Buchner & Wagner (1992) conceptualized frailty as reduced physiologic capacity in three main areas: neurologic control, mechanical performance, and energy metabolism. Frailty as a strictly biomedical condition as outlined by Buchner & Wagner (1992) evolved to a more comprehensive and dynamic approach which considers biopsychosocial aspects (Rockwood et al. 1995). Rockwood et al. (1995) illustrate frailty as a balance of assets and deficits. Assets in this dynamic model include health, attitudes towards health and health practices, social resources, and the support of caregivers while deficits are outlined as illness, disability, dependence on others, and burden on caregivers (Rockwood et al. 1995). This model suggested that changes in either the assets or deficits can influence not only one's frailty status, but also one's overall health status (Rockwood et al, 1995). Fried (2001) developed a definition based on the biomedical perspective, which distinguishes frailty from disability, while highlighting the physiologic components. This resulted in the introduction of the Fried Frailty Index, and reference to frailty as a syndrome or phenotype. Psychosocial components of frailty appear to be separated from the holistic conceptualization that has been observed through the development of the Friendship Scale (Hawthorne, 2006), and the Social Vulnerability Scale (Andrew & Keefe, 2014) which look at factors such as social isolation.

As the concept of frailty has not been universally operationalized, researchers remain in disagreement regarding the specific signs and symptoms that should be included in its operationalization (Sternberg et al, 2011) Recall that the Canadian Frailty Network (CFN), arguably the leading representative in matters of frailty within Canada, currently defines frailty as *"a state of increased vulnerability, with reduced physical reserve and loss of function across multiple body systems* (CFN, 2017)", aligning most with Fried's (2001) operationalization due to its focus on physical reserve and functioning. Currently, there appears to be two main approaches to frailty: a deficit approach and a syndrome approach (Morley et al. 2013; Lacas & Rockwood, 2012). The deficit approach most often utilizes a Frailty Index (Lacas & Rockwood, 2012) for evaluation, which adds together a person's deficits and divides the number of deficits present by the number of deficits measured to create an index. These deficits include signs and symptoms of disease, disease, disabilities, and laboratory measurements (Rockwood & Mitnitski, 2007). The syndrome approach is characterized by Frieds (2001) conceptualization and is an underlying state of dysregulation leading to the losses in five main areas: weight (unintentional loss), energy, strength, walking speed and physical activity levels (Morley et al. 2013). The syndrome approach is often favoured by clinicians and researchers due to the physiological undertones and measurable components within this operationalization (Sternberg et al. 2011).

Putting definitional differences aside, there is general agreement that frailty is a state of vulnerability, which is influenced by many factors (Rockwood, 2005). While there remains disagreement about which specific factors influence frailty, some factors highlighted within current literature include physical, social, cognitive, economic and behavioural factors (Rockwood, 2005; Rockwood et al, 1995; Morley et al. 2013; Schoenborn et al. 2018; Collard et al 2012; Levers et al. 2006; Gale et al.2017). Physical factors typically include weight loss, fatigue, reduced grip strength, lower levels of physical activity, decreased gait speed and disease (Schoenborn et al. 2018; Morley et al. 2013; Warmoth et al. 2016; Levers et al. 2006). Cognitive or psychological factors include mental health, attitudes towards health, and spiritual resources (Schoenborn et al. 2018; Morley et al. 2013; Warmoth et al. 2016; Levers et al. 2006). Social factors encompass social resources, social activities, socioeconomic status, loneliness, and social isolation (Levers et al. 2006; Gale et al. 2017; Andrew & Keefe. 2014). These factors, while not exhaustive, can be generally broken into biomedical factors and psychosocial factors.

The relationships between psychosocial factors and frailty are still somewhat misunderstood (Gale et al. 2017), yet many researchers agree that factors which extend beyond the biomedical perspective are important and deserve further attention within academic and clinical realms (Gale et al. 2017; Gao et al. 2017; Hoogendijk et al. 2014; An & Jang, 2018; Muscedere et al. 2016). Literature has demonstrated a consistent link between frailty and psychosocial factors both implicitly and explicitly (Muscedere et al. 2016; Bunt et al. 2017; Levers et al. 2006). A review by Morley et al. (2013) found that there were significantly higher prevalence rates of frailty when psychosocial frailty was included in the evaluation. This result supports previous work by Levers et al. (2006) who found in their systematic review that social factors contribute to frailty, but as the effects are unclear it is neither consistently assessed nor measured. Gao et al. (2017) support the connection between psychosocial factors and frailty, finding that social and behavioural determinants of health were important in achieving overall health outcomes for patients.

Recognizing the implications that frailty has, not only for the individual, but from a systems perspective, makes earlier detection and intervention even more important (CFN, 2018). Individuals living with frailty cost the system more due to increased use and demand on community resources, need for more hospital services, and extended stays in long term care facilities (CFN, 2018). Besides increased prevalence rates of frailty (Morley et al. (2013) Andrew & Keefe (2014) found that every social deficit resulted in a 5% increased risk of mortality. These findings suggest that screening tools and assessments would benefit from more holistic approaches (Gwyther et al. 2017). When screening tools recognize psychosocial as well as biomedical factors, there may be opportunity to maximize the effectiveness of screening programs and interventions through more individualized and patient centered approaches (Gwyther et al. 2017).

Many frailty screening tools are discussed within the frailty literature including but not limited to: the Program on Research for Integrating Services for the Maintenance of Autonomy Tool (PRISMA 7), the Fried Frailty Scale (FFS), the Survey of Health, Aging and Retirement in Europe Frailty Index (SHARE-FI), the Frailty Index (FI), the Fatigue, Resistance, Ambulation, Illness and Loss of weight scale (FRAIL Scale), and the Vulnerable Elderly Survey (VES) (Pialoux, Goyard, & Lesourd, 2010; Woo et al, 2015; de Vries et al, 2010). Reviews such as work completed by Pialoux, Goyard and Lesourd (2012), Hamaker et al (2012), and Apostolo et al. (2017), discuss the reliability, validity, or sensitivity of frailty screening tools and assessments. de Vries et al (2011) completed a systematic review of frailty tools nearly a decade ago that also included an assessment of how frailty instruments assess pscyhometric properties based on the current definition and conceptualization of frailty at the time. This was done in an attempt to provide a recommendation for the “best available” frailty instrument to evaluate outcome measures in clinical practice and in observational or experimental studies. de Vries (2011) examined frailty instruments against a set of eight domains that were developed *a priori* following guidelines for systematic reviews. These domains included nutritional status, physical activity, mobility, energy, strength, cognition, mood, and social relationships/social support. Despite including 20 instruments within their review, a recommendation was not able to be made for the “best available” instrument (de Vries et al. 2011). However, one important finding from this study was recognition of the increasing number of instruments being developed to evaluate frailty risk (de Vries et al. 2011).

Although de Vries (2011) does provide valuable knowledge on the area of frailty screening tools, the study is limited by how the authors chose to assess domains during the pscyhometric evaluation, and specifically psychosocial factors within frailty screening tools. Given that systematic reviews require decisions to be made a priori on the development of the charting process for assessment of the tools, de Vries (2011) chose to assess psychosocial factors in only one of two ways within frailty screening and assessment tools. The psychosocial factors assessed within tools included mood and social relationships or social support. Research has demonstrated many psychosocial factors that are discussed within the context of frailty, and thus this particular review may have been too narrow in scope (de Vries, 2011; Levers et al. 2006; Gale et al. 2017; Andrew et al. 2014; Schoenborn et al. 2018; Morley et al. 2013; Warmoth et al. 2016). Gao et al. (2017) outline that frailty caused by social or behavioural determinants of health may be reversible with aging, highlighting the importance of screening these domains. Given the demonstrated improved outcomes of patients when patient-centered practices are combined with holistic care models (Morgan & Yoder, 2012; Jasemi et al. 2017), there is a need to ensure that screening and assessment tools follow a more holistic approach that captures individual patients' needs and values.

Study Rationale:

This study was completed with support from the Canadian Frailty Network (CFN) Interdisciplinary Fellowship Program (IFP), aligning with their strategic priority of providing more compassionate, person-centered approaches to care (CFN, 2018[b]). CFN aims to improve outcomes for older adults living with frailty by providing opportunities to learn, research, and apply approaches that consider persons in a more holistic, coordinated, and caring manner (CFN, 2018[a]). The stated strategic priorities include aligning the care of patients with the values important to patients, care givers, family and friends, a concept not only highlighted in the IFP, but also within the proposed research through the analysis of frailty screening tools. (CFN, 2018[b]).

Care that encompasses a more holistic approach, one that considers a person's physical, psychological, social and spiritual needs, has consistently demonstrated improved outcomes for older adults (Bunt et al, 2017; Jasemi et al. 2017; Muscedere et al. 2016; Levers et al. 2006). With the plethora of information that links psychosocial factors to frailty (Levers et al. 2006), it is even more important that screening tools aimed at detecting and ultimately preventing or delaying the onset of frailty be holistic in their assessments. Given the shift away from the inclusion of psychosocial factors within the definition of frailty, towards a more biomedical perspective (Rockwood et al. 1995; Buchner & Wagner, 1992; Fried, 2001; Rockwood, 2007; CFN, 2018[a]), examining how frailty screening tools consider the whole person is important in understanding the aspects of the screening process that can be improved for these complex concerns.

This study used systematic search and review methodology alongside qualitative interviews with older adults, caregivers, and healthcare provider stakeholders to examine how psychosocial factors are currently considered within frailty screening and assessment tools. Tools for screening or assessment of frailty are typically used by primary care providers or specialists such as geriatricians, to accurately determine a patient’s current frailty risk status based on different health factors (Dent, Kowal & Hoogendijk, 2016). These tools can be used for both population screening and as a routine practice for a clinician’s patients (Dent, Kowal & Hoogendijk, 2016). These tools may indicate the need for intervention or access to resources to support the patient’s current health status and prevent further disability or disease as a result of frailty (Dent, Kowal & Hoogendijk, 2016). The objectives in undertaking this study were as follows:

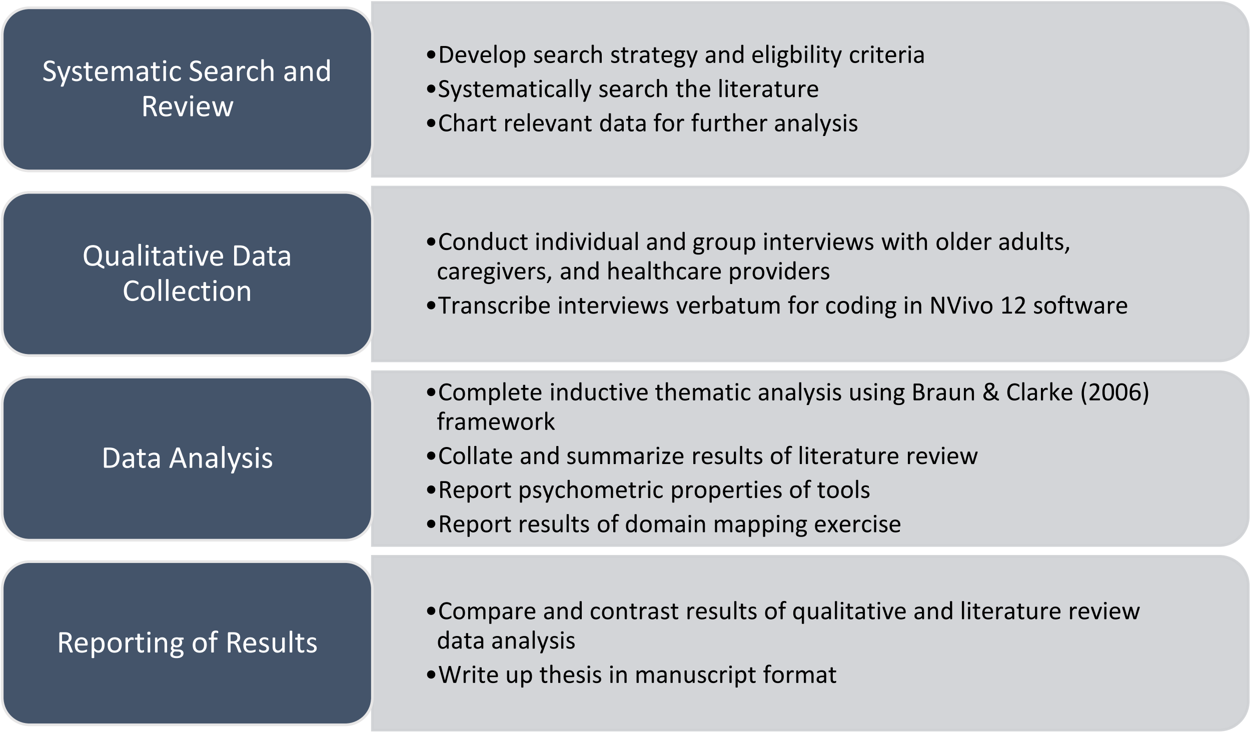
- Understand stakeholders’ perspectives on frailty screening;
- Identify published tools for screening and assessment of frailty in older adults;
- Identify domains assessed within screening tools;
- Understand the conceptual or empirical frameworks used for screening tools; and
- Report the psychometric testing of frailty screening tools.

The literature shows considerable work on the concept of frailty, however as previously stated there is inconsistency over the past decades in how it is defined (Rockwood et al. 1995; Buchner & Wagner, 1992; Fried, 2001; Rockwood, 2007; CFN, 2018[a]). This study explored which domains of health the developed frailty screening tools consider, specifically how or whether they consider psychosocial factors, and their psychometric testing. The importance of psychosocial factors on health outcomes has been demonstrated within the literature (Levers et al. 2006), thus it is important to understand if the screening tools utilized to assess health status accurately consider them as well. The first goal was to acquire familiarity and understanding of frailty screening tools that are currently in use. Next, these tools were examined to determine what domains of health they evaluated, the conceptual or empirical frameworks used for the development of these tools, and the psychometric testing of these tools. These aims were achieved through the systematic search and review process. Stakeholder interviews outline what is considered important to evaluate from their perspectives through qualitative methodology. Stakeholder consultations helped researchers to understand how these tools are currently used, including which ones are popular and why, followed by questions regarding what participants deem valuable to assess. These consultations improve our knowledge of why certain tools may be in use over others, how or if these tools are modified, and what factors influencing health stakeholders consider important when discussing frailty.

Through the completion of the systematic search and review, and analysis of qualitative data collected, this study can be utilized to provide context for future directions in the development of frailty screening tools, as well as future research regarding frailty. Specifically this project outlines the frailty tools that are available, what domains they assess and their psychometric testing. Furthermore, this research provides insights for the development of recommendations or modifications to current practices in frailty screening, including the tools used, and context for ways to better incorporate psychosocial factors into discussions regarding frailty. CFN has highlighted that many frailty screening tools can not only measure frailty status, but detect conditions that are causing deterioration (CFN, 2018[a]), which outlines the importance of ensuring the *whole* person is being evaluated, as these psychosocial factors can indicate health deterioration (Levers et al. 2006). This research may provide context for more holistic policy development and interventions to improve health and social outcomes.

Extended Methodological Approach:

This project had four main components: systematic search and review, qualitative data collection, data analysis, and reporting the results (thesis defense). Each component, with a brief description can be found in Figure 1. The systematic search and review process, which is discussed in detail in subsequent sections, is Phase A of the methodological process of this study and involved systematically searching the literature and charting relevant information. This phase was completed simultaneously with Phase B: qualitative data analysis. This phase, also discussed in more detail in subsequent sections, aimed to collect qualitative data to better understand perceptions regarding the frailty screening tools and the domains in which they currently do, or should address, as well as to identify gaps and potential limitations. Data analysis aimed to compare the findings of the systematic review, identify any new information discussed in the qualitative interviews as well as identify gaps and limitations. This was



Systematic Search and Review
- Develop search strategy and eligbility criteria
- Systematically search the literature
- Chart relevant data for further analysis

Qualitative Data Collection
- Conduct individual and group interviews with older adults, caregivers, and healthcare providers
- Transcribe interviews verbatum for coding in NVivo 12 software

Data Analysis
- Complete inductive thematic analysis using Braun & Clarke (2006) framework
- Collate and summarize results of literature review
- Report psychometric properties of tools
- Report results of domain mapping exercise

Reporting of Results
- Compare and contrast results of qualitative and literature review data analysis
- Write up thesis in manuscript format

Figure 1: Phases of Project

completed using Braun & Clarke (2006) thematic analysis approach, which is described in detail in subsequent sections. Lastly, reporting of the results – combining information obtained rom all phases of the methodological process -is reported in the form of this academic thesis.

This study utilized a two-phase methodological approach for data collection. A systematic search and review was completed as per PRISMA guidelines (Moher et al. 2009) and stakeholder consultations were utilized for comparative methods. Stakeholder consultations provide real world insights to the existing literature on frailty that may not be captured in a review (Grant & Booth, 2009). Specifically, stakeholder engagement helped researchers understand what clinicians, older adults and caregivers find important for assessment and screening of frailty. Each phase was completed simultaneously, and results were compared upon full completion of the study.

The systematic search and review had several objectives: identify published frailty tools, understand extent to which psychosocial factors are considered within frailty screening tools through a domain mapping exercise, identify their empirical or conceptual frameworks, and report the psychometric testing of identified screening tools. The domain mapping exercise utilized the dynamic biopsychosocial model, which will be discussed in a subsequent section. Phase B of the study involved qualitative data collection in the form of individual or group interviews with key informants as per the Braun & Clarke (2006) framework for inductive qualitative analysis. Key informants included older adults and caregivers and healthcare providers. Interview data were utilized to compare findings of the systematic search and review while providing context and direction for future research. Each phase will be detailed in subsequent sections.

Epistemology:

To support reflexivity of the project, it is important to acknowledge the epistemological perspective adopted throughout. Understanding the epistemological stance allows for the potential theoretical biases and perspectives to be acknowledged and minimized during all phases of the research processes (Creswell & Creswell, 2018). This project adopted a constructivist approach, which posits that individuals construct their own personal truths and meanings for whatever they engage in; accordingly, there is no universal “truth” (Creswell & Creswell, 2018). Individuals engage with the world based on the historical and social perspectives they have developed through interacting with those living in their world (Creswell & Creswell, 2018). Constructivist researchers believe that knowledge is constructed not created (Andrews, 2012). Given that frailty has proven to be an evolving concept, the constructivist lens embeds a flexibility that allowed for full examination of frailty and the factors that contribute to development and use of frailty screening tools based on individual perspectives and experiences. In this way, constructivism, with its interest in how knowledge or meaning is created, negotiated, sustained and modified based on personal truths and the historical and cultural settings in which participants live and work, was consistent with the needs of this project (Andrews, 2012; Creswell & Creswell, 2018).

Dynamic Biopsychosocial Model:

Theory used within research projects should correspond with one’s epistemological lens for the objectives of the research project to be consistently supported. As this project looked specifically at psychosocial factors and frailty, both the epistemological lens and theory should place importance on psychosocial factors pertinent to individuals and health. For these reasons, the dynamic biopsychosocial model was chosen. The dynamic biopsychosocial model is based on the systems approach first proposed by Engel (1981) simply called the Biopsychosocial model. In this model, each independent system is affected by all systems with which it interacts and is surrounded by, in short the environment, and vice-versa (Engel, 1981). This foundational model was further enhanced by Lehman et al. (2017) who proposed the dynamic biopsychosocial model (see Appendix A). The dynamic biopsychosocial model enhances the Engel model by outlining how biological, psychological, and interpersonal (social) factors are influenced by contextual factors such as culture, norms, policies and values in which a person is situated. Each of these factors contribute to a person's health status and health outcomes (Lehman et al. 2017).

The holistic dynamic biopsychosocial model afforded a good fit for the project with its stated aims of investigating whether frailty screening tools do examine the *whole* person and, thereby, augment biomedical factors. The dynamic biopsychosocial model supports the social constructivist lens as both place high importance on both the social-environmental factors and biological influences that contribute to an individual's health status (Lehman et al. 2017; Engel, 1981; Creswell & Creswell, 2018). This is consistent with the literature that states frailty is affected by biological, psychological and social factors, providing support for the inclusion of biopsychosocial factors within screening tools aimed at detecting and preventing risk of frailty. (Rockwood et al. 1995; Levers et al, 2006). Lehmen et al. (2017) provide specific examples of each domain within their discussion of the biopsychosocial model, which was utilized in the mapping of which domains are considered within frailty screening tools. The framework provided by Wade & Halligan (2017) on the biopsychosocial model, aligning with the conceptualization of the model as discussed by Lehmen et al. (2017) was utilized specifically for the domain mapping activity. The final framework used can be found in Appendix B.

Phase A: Systematic Search and Review of Literature

Phase A of the research project involved the systematic search and review of the literature regarding frailty screening tools. To ensure rigor throughout this process, the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRIMSA) guidelines as outlined by Moher et al (2015) were followed for the search process and used as a backbone during the review process. A systematic search and review allows researchers to include elements of the systematic review in a situation or scenario where conducting a full systematic review is not appropriate or possible (Grant & Booth 2009). As the project did not focus solely on reporting of psychometric properties nor the efficacy or effectiveness of treatment, and placed high importance on summarizing psychometric testing while understanding the domains, a traditional systematic review was not appropriate. Additionally, previous work (Sutton et al. 2016) indicates a substantial amount of work in the field of frailty research, indicating a scoping review would be inappropriate (Grant & Booth, 2009). Instead, systematic search and review methodology undertaken combine the breadth of a critical review with the rigorous and detail oriented methods of a systematic review to produce results (Grant & Booth, 2009). Systematic search and review enables a rigorous search of the literature to ensure selection of all relevant and appropriate studies and allows flexibility in the review process to focus on specific areas of interest that lie outside of classic systematic review outcomes (Grant & Booth, 2009). Phase A will be discussed in detail below.

Identifying the research question:

This study sought to determine *how screening tools aimed at identifying the risk of frailty in older adults currently consider psychosocial factors*. Recognizing that frailty has evolved in its terminology over the past decades, systematic search and review methodology allowed rigorous search strategies to be combined with more flexible analysis to meet study objectives

(Grant & Booth, 2009). Systematic search and reviews guidelines include adhering to one or more elements of a traditional systematic review (Grant & Booth, 2009). For the subsequent sections, systematic review protocols heavily inform the process and therefore will be referenced, despite researchers not completing a traditional full systematic review.

As per the Moher et al (2009) guidelines for conducting a systematic review, the research questions guide the parameters of the systematic search and influence subsequent steps in the systematic search framework. The research question ultimately outlines study objectives which should align closely with intended outcomes. The objectives of this study were as follows:

- Understand stakeholders' perspectives on frailty screening and psychosocial factors.
- Identify published tools for screening and assessment of frailty in older adults;
- Identify domains assessed within frailty screening tools;
- Understand the conceptual or empirical frameworks used for tools; and
- Report the psychometric testing of frailty screening tools

Study Selection Criteria:

For this study, initial works in the development of a frailty screening tool, or subsequent works that contribute to the modification or adaptation of frailty screening in some form, were sought. This included subsequent works which report on the psychometric properties of the tools, as these were needed to meet all study objectives. Study designs were not considered in eligibility criteria given that a comprehensive snapshot of the current literature was sought. Only studies published in English were included due to language limitations of the researcher. Study dates for inclusion were from the inception of the database until December 31, 2018. The database start was chosen to ensure complete review of the literature available, and the end-of-the-year end date ensured inclusion of all articles published within 2018. The full table of the eligibility criteria can be found in Appendix C.

Search Strategy:

For this project, search parameters were decided in consultation with the supervisor and a health sciences librarian based on the study objectives and research question. Key words related to the study objectives and purpose include “frailty”, “assessment”, and “tools”, as well as related synonyms of each. Liberati et al. (2009) outline that a full electronic search strategy should be presented for at least one major database so that it could be repeated. For this study, relevant articles were chosen from the electronic databases focused on social sciences, community health, public health, medicine, and rehabilitation, MEDLINE, CINAHL, EMBASE, and PsycInfo. These databases were chosen in consultation with a health sciences librarian. MEDLINE and EMBASE were selected due to their strength in health and medicine, and CINAHL and PsycInfo were chosen to capture any outliers.

MEDLINE is considered one of the most comprehensive electronic databases and, as such, search strategies for this database are reported in this thesis project and can be found in Appendix D (Liberati et al. 2009). The search syntax for MEDLINE was modified for other databases. Studies whose key words matched the search criteria, and whose abstract is related to frailty, assessment tools, and older adults, were saved for further evaluation of appropriateness based on inclusion criteria. The search strategy process was completed by a single reviewer. Information reported from the search strategy includes the database, platform or provider, and start and end dates of the search for each database (Liberati et al. 2009).

Identifying Relevant Studies:

Using the systematic search strategy outlined previously, one reviewer reported the total number of initial search results that appear by database. Title and abstracts were then compared to a set of eligibility criteria developed a priori as the initial screening process. This process involved one reviewer who reported the number of duplicates deleted, and the studies eliminated during the title-abstract review. The number of studies included at this stage can be found in the flow chart as well. Following the title-abstract screen, a full-text screening process using the eligibility criteria began utilizing two independent reviewers. The independent reviewers screened full-text articles and decided independently which should be excluded and which should be included based on the eligibility criteria developed a priori. When both reviewers completed this process, they came together to compare studies chosen for inclusion and exclusion. A Cohen's kappa statistic was completed to look at the level of agreement between the two reviewers while taking into consideration the possibility of chance agreement (Hallgren, 2012). Detailed notes on decisions as independent reviewers, and on reaching consensus, can be found in the audit trail used to increase methodological rigor. Refworks was used to manage the study search, screening, and selection processes (Refworks, 2018).

Data Extraction:

As per systematic review protocols outlined in the literature, charts for data extraction were developed a priori (Liberati et al. 2009; Moher et al. 2009). Charts were developed in an Excel document so relevant and important data related to the research project can be easily recorded in one place for analysis. One reviewer engaged in data extraction from the list of included articles determined through previous steps.. Data items within the charts were explicitly and clearly defined to be understandable for those unfamiliar with the topic (Liberati et al. 2009).

A second reviewer reread data extraction charts once complete to ensure there were no missing sections of data.

For this study, chart information was divided into two categories: logistical, and study related. Logistical information refers to organizational information including title of the study, authors, publication date, and database source. Study related information refers to the specific information sought after to answer study objectives. This information includes name of frailty tool, psychometric properties of frailty tool reported, conceptual framework used and clearly identified, and information relevant to assess the domains included within the tool. Information relevant to assess domains included within the tool refers to explicit or implicit discussion of domains, based on the dynamic biopsychosocial model. Information extracted included tabulations on whether biological, psychological, social and behavioural factors were discussed, and if so which ones and how. The information collected was utilized to map out the domains that exist in the frailty screening tools for further assessment which will be discussed subsequently. An excerpt from the data extraction chart can be found in Appendix E.

Phase A Data Analysis:

The first method of analysis completed upon successful extraction of the data was global reporting on the number of possible frailty assessment tools. This reporting was completed in a chart format developed within excel, where tabulations of frailty screening tools can occur. The chart for this analysis includes information on the name of the tool, year published, conceptual framework identified, and number of studies found that report on the psychometric properties of the tool. Next, utilizing information from the conceptualization and development of each tool, the researcher completed a domain mapping activity. This domain mapping activity utilized the dynamic biopsychosocial model as a conceptual framework for evaluation. As previously discussed, the dynamic biopsychosocial model conceives of health as influenced by biological, psychological, and interpersonal (social) factors which are each further influenced by contextual factors (Lehman et al. 2017). Contextual factors can be thought of as individual circumstances and include cultural norms, values, and local policy, which affect health (Lehman et al. 2017). These components within the model were utilized to determine which domains were assessed within each frailty screening tool.

Critical subjective analysis of what the evaluation components are asking about was mapped onto the framework to determine the domains assessed for each tool based on the biopsychosocial framework proposed by Lehman et al. (2017). Two other researchers reviewed the results of the domain mapping activity for the reduction of bias by providing another perspective. Disagreements were discussed until a consensus was reached. A summary chart was developed based on the results of the domain mapping activity to better understand how, or if, each tool is representing different facets of health in its evaluation of frailty or frailty risk. This chart was developed after completion of the mapping exercise to ensure that all important factors are included and can be found in Appendix F.

The COSMIN checklist, and particularly the Risk of Bias tool (boxes 3-10), was utilized to examine studies reporting on psychometric testing, such as reliability, validity and responsiveness. The COSMIN Risk of Bias checklist is a tool developed specifically to help identify methodologically sound instruments, design and report psychometric studies, and inform the peer review process (Rosenkoetter & Tate, 2018). The COSMIN checklist is nine boxes with sub-questions within each box used to evaluate the methodological quality of studies, thereby giving insights into the quality of the tool itself (Terwee et al. 2012). The nine boxes evaluate the following properties: structural validity, internal consistency, cross-cultural validity/measurement invariance, reliability, measurement error, criterion validity, hypothesis testing for construct validity, and responsiveness. The COSMIN checklist still provided flexibility, as only boxes relevant to the particular study being examined need to be filled out. The checklist was utilized as per instructions within the COSMIN checklist manual available for use from the COSMIN web site (Terwee et al. 2012). Reporting of the psychometric testing of the identified tools was completed in a formal manner utilizing the COSMIN tables provided as an additional tool for download from the COSMIN website.

The COSMIN Risk of Bias checklist utilized two independent researchers that each completed the checklist. Following COSMIN guidelines, the lower score from each rater is used to come up with the final score, which indicates the quality of the work being examined, and reports the psychometric testing of the study (Terwee et al. 2012). This analysis allowed researchers to give a comprehensive snapshot of the frailty screening and assessment tools that currently exist.

Phase B: Qualitative Methodology:

Consultation with Stakeholders:

The stated objectives for this study included furthering the understanding of what is important to stakeholders when assessing frailty status, and particularly their perspective on psychosocial factors. These objectives would be likely left unfulfilled solely through a systematic search and review, as literature reviews are often unable to provide answers to more complex contextual questions such as “why” or “how” (Grant & Booth, 2009). Qualitative analysis provides a unique opportunity to delve into the reasons behind why we do things (Andersen, 2017). Thus, consultation with key informants extended the results of the systematic search and review and provided insights into the purpose of evaluations through real-world experiences and practice. It also provided an opportunity to compare the results of the systematic search and review with the insights of the stakeholders which can highlight both similarities and discrepancies, indicating where further research may be needed. The consultation process for this study involved qualitative interviews with healthcare providers and older adults and caregivers. Interviews took the form of individual or group interviews depending on the preference of the participant. Healthcare providers were individuals within the health industry who have experience working with older adults, an understanding of frailty, and a willingness to discuss their current processes with older adults. Perspectives were heard from occupational therapists, physiotherapists, pharmacists, nurse practitioners, registered nurses, physician's assistants, and geriatric specialists including geriatric emergency medicine nurses, and geriatricians. The specific protocol for interviews and focus groups is detailed later.

This study was reviewed and received ethics clearance through the University of Waterloo's Office of Research Ethics (ORE #23037). This study has minimal risks associated with it. Risks were associated with participation in group interviews or focus groups, in which we could not guarantee fellow participants would not disclose information that was discussed. To mitigate this potential issue, all participants were asked to keep content of the interviews confidential, and to refrain from discussion regarding the interviews once the interview has been completed. A letter of information, consent form, and letter of feedback were provided and can be found in the Appendices G, H, and I.

Why Qualitative Methodology:

Qualitative methodology has become increasingly popular in health research due to improved recognition and understanding of the complexities and influence of psychosocial dimensions on health, and thus the limitations that quantitative approaches have towards understanding these constructs (Eakin, 2016). The concept of frailty is no exception to this. With an ever-evolving definition, frailty and its signs and symptoms have been inconsistently addressed in the research literature (Rockwood, 2005). Thus, qualitative research, which ultimately engages in sense making or interpretation and considers an individual’s values, beliefs and experiences (Andersen, 2017), was instrumental in uncovering what domains should be assessed within frailty screening tools, such as psychosocial domains.

Sample and Recruitment:

For this study, purposive sampling of individuals with some level of familiarity with the concept of frailty was utilized. Purposive sampling is the active or “purposeful” selection of participants based on qualities the participants possess such as knowledge or familiarity with a subject (Etikan et al. 2016). Purposive sampling can produce rich, descriptive data from participants who have some level of familiarity with content that may not be commonplace knowledge—such as frailty and psychosocial factors (Barbour et al. 2001; Tongco, 2007). Purposive sampling of participants allows participants to be selected who can provide significant contributions to the knowledge gap under study, improving the breadth and depth of knowledge of a given topic (Polkinghorne, 2005; Tongco, 2007). In an effort to improve participant recruitment, a snowball approach was also used to complement purposive sampling.. Snowball recruitment refers to the recommendation, and often introduction, of potential participants from current participants’ personal networks(Patrick et al. 1998).

This study intended to be comprehensive in nature, therefore perspectives from two categories of individuals were pursued: older adults and caregivers, and healthcare providers. Participants from each category contributed a unique perspective on the issue of frailty, screening tools, and psychosocial factors. Recruitment exceeded the original aim of 20 participants - 28 participants (older adults and caregivers n=14, healthcare providers n=14) were recruited. The anticipated minimum number of participants for each category was based on a study conducted by Monahan and Fisher (2010), and supported by research from Hagaman and Wutich (2017) that suggests that general qualitative research needs a minimum of 20 participants for relevant themes to be identified and saturation reached. Saturation was identified when no new or emergent information for categorized themes occurred, and no new themes were identified (Hagaman & Wutich, 2017). It is useful to recall that saturation, rather than equating with repetition of the same theme defined in the same way, instead indicates that the theme is robust in its description, with rich evidence to support the researcher's analysis (Monahan & Fisher, 2010; Hagaman & Wutich, 2017). Using purposive sampling techniques to elicit a wide variety of perspectives aided in reaching saturation, and it is believed that participant views were fully captured. Evidence of saturation will be found in the results section.

Participants for this study included older adults over the age of 65, caregivers of older-adults, and healthcare providers who deal with frailty and older adults in their practice. Both male and female participants were recruited for this study. Age restrictions were in place only for older adult participants because we were actively seeking older adult perspectives. No restrictions on culture or disability were set, however participation was limited to English speaking due to language limitations of the researcher. Participants were recruited using a recruitment poster and email (see Appendices J, K) which will display contact information for the researcher who can provide additional information as outlined in the recruitment script (see Appendix L). These posters were electronically sent strategically to community groups, clinics, and other relevant support program areas with granted permissions. Email contact to potential recruitment sites or persons was initiated by appropriate gatekeepers (see Appendix K). Additionally, the researcher utilized the Geriatric Health Systems (GHS) research partners such as Seniors Helping As Research Partners (SHARP) as gatekeepers and participants in the study for members interested.

Data Collection:

Qualitative data collection took the form of either a focus group or individual interview, the most common forms of qualitative data collection (Gill et al. 2008). For both individual interviews and focus group interviews the initial process remained the same. Participants were given an opportunity to read the letter of information, and the researcher then reviewed the letter of information with the participants to ensure comprehension (see Appendix G). If the participant agreed to participate, informed consent was obtained through a signed consent form (see Appendix H). The ability to withdraw from the study at any point before publication was highlighted. Once consent was obtained, the interviews began. Interviews were semi-structured and held at a location that was safe, convenient, and comfortable for participants and at a date and time suitable to the participants (Gill et al. 2008). The location was also chosen to be free from distractions; often private meeting rooms were used. Semi-structured interviews allowed participants to take the conversation in directions not anticipated by the researcher and uncover and elaborate important relevant information (Gill et al. 2008). Interviews were audio-recorded for transcription accuracy and were be approximately 30-60 minutes in length. Recordings were transcribed verbatim before analysis began using Microsoft word, and the audio recordings from each session. The semi-structured interview guides can be found in Appendix M.

Individual interviews were intended for healthcare providers, as scheduling constraints of primary care providers often limit focus group interview coordination. Individual interviews may provide important contexts to social or cultural norms and can foster robust descriptive data from an individual participant (Hoffman, 2007). The researcher-interviewer was attentive to the participant by actively listening, being mindful of their body language, and giving feedback as appropriate (Gill et al. 2008). Despite the research potential of interviews, they do have limitations. For instance, interviews can be limited by time constraints in that it can take time to develop a rapport with participants in order to obtain valuable data (Hoffman, 2007; Gill et al. 2008; Davis, 1992). Power dynamics can also be present, for example, an interviewer traditionally holds some level of power of the interviewee in working situations where someone may be vying for a job, and this workplace connotation can transfer over to the research context. Interviewers must be aware of the implicit power dynamics at play and be cognizant of the impression they are giving participants through appropriate dress, and meeting locations (Davis, 1992). The researcher-interviewer for this project made every effort to ensure that participants feel valued, accepted, and not judged (Davis, 1992).

Focus group interviews were utilized for all older adults and caregiver participants. However, one focus group did occur for a group of healthcare providers due to concurrent availability and willingness of participants. Focus groups facilitate group interaction which can lead to data that would be less accessible in an individual setting (Agar & MacDonald, 1995). Moreover, because focus group members engage in discussions not only with the interviewer but also with other participants, a broad range of perspectives can be discussed (Agar & MacDonald, 1995). Indeed, focus groups are useful in uncovering new areas for exploration, such as certain social categories previously unknown, and can offer evaluation of significance within topics (Agar & MacDonald, 1995). In this research study the objective was to unveil facets of health that older adults considered important to screen for or have discussions with their primary care providers about. However, focus groups participants can be unintentionally limiting so the researchers must have strategies in place to overcome these limitations. Additionally, interactions can be restricted by dominant personalities, and unspoken group constraints may become evident where an alternative perspective is lost for fear of exclusion from the group (Agar & MacDonald, 1995; Hoffman, 2007). The researcher-interviewer monitored power dynamics to help ensure that all participants remained comfortable with expressing their views (Hoffman, 2007). The interviewer role aimed to be minimal, engaging only to ask for further explanation or to redirect the conversation back to the topic at hand as necessary (Hoffman, 2007).

Coding, Theming and Interpreting Data:

The transcribed data were read and re-read to improve familiarity with the content, following Braun & Clarke's (2006) guidelines for inductive thematic analysis of data. Given the project's open inquiry into understanding what stakeholders deem important to screen for, an inductive approach was most appropriate as it focuses on discovery, compared to deductive approaches which focus on a detailed analysis of an aspect of the project (Braun & Clarke, 2006). Line by line emergent coding techniques were utilized to allow for the identification of data that may not be initially recognized as important within the context of the entire transcript (Charmaz, 2014). Codes generated through the emergent coding process stick closely to the data to ensure that codes remained grounded within the data and researcher influence minimized (Glaser & Holton, 2004). Inductive thematic analysis using emergent coding techniques helped to ensure that themes developed in later stages of analysis were data driven (Braun & Clarke, 2006). Themes will be discussed in subsequent sections.

The coding process utilized NVivo 12 software to complete the line-by-line emergent coding. Individual codes identified relevant sections of the data that reflected the research interests and referred to the basic element of the raw data that can be assessed in a meaningful way during analysis (Braun & Clark, 2006). A review of codes occurred upon completion of the coding process to allow for refinement and to allow the researcher to become more familiar with the data (Braun & Clarke, 2006). Upon completion of the coding, a codebook was printed from NVivo 12 to start the thematic analysis process. Codes were individually laid out on a conference table and the researcher identified and developed themes by collating all similar codes to relevant themes, thereby refocusing the data analysis in a broader manner (Braun & Clark, 2006). A whiteboard was utilized to organize thoughts and visualize developed themes during this process (see Appendix N). The researcher then utilized excel to develop a complete codebook that included main themes along with sub-themes, the original code, and referenced text. As Braun & Clark (2006) suggest, themes were then reviewed by another researcher to ensure accuracy, appropriateness, and rigor in the process. Once themes were finalized, analysis of the data and writing of the final report began. The report writing stage offered a final opportunity for analysis that relates the inductive analysis back to the research question, objectives, and literature in a meaningful way (Braun & Clarke, 2006).

Completion of the coding and theming of the data were based on participant group first, with older adults and caregivers separate from healthcare providers. This approach allowed for the themes generated by each group to be analyzed separately so they may be compared before being treated comprehensively. This method is called triangulation of data and improves methodological rigor through the adding of another layer to the analysis (Morse, 2015). Triangulation expands the understanding of the topic by allowing the researcher to observe differences between participant groups before treating the data comprehensively and combining appropriate themes (Morse, 2015).

Ensuring Methodological Rigor in Qualitative Research:

To ensure quality within the research, the standard four pillars of qualitative methodological rigor will be reviewed: credibility, dependability, confirmability, and transferability (Eakin, 2016; Barusch et al. 2011). These terms are often represented in quantitative research respectively as internal validity, reliability, objectivity, and external validity (Eakin, 2016).

Credibility refers to how accurately the data are represented and was ensured by engaging "checks" throughout the research project to encourage reflection on current processes (Barusch et al. 2011) and was completed after each step of the research process has been completed. These "checks" facilitated comparative methods where the researcher could critically think about the differences and similarities within the data as analysis is underway, making notes as appropriate (Silverman, 2013). Silverman (2013) encourages researchers to actively seek out anomalies or deviant cases and consider how they influence data analysis and conclusions, adding to the robustness of the data. Accordingly, the researcher engaged in triangulation of data, first coding and theming perspectives from caregivers and older adults, and then completing the healthcare provider's interviews. Again, the idea was to look at themes from each stakeholder group and compare them prior to bringing the data together for comprehensive treatment (Morse, 2015). To further develop credibility, a second researcher reviewed the developed themes and codes to provide a secondary perspective.

Dependability refers to the reproducibility of the results. This study produced an audit trail regarding decisions made during the research process and detailed methodological processes (Barusch et al. 2011). This audit trail involves notes on decision processes such as theme development and refinement, and was kept in a notebook that can be reviewed (Barusch et al. 2011). Engaging in an audit trail improves reflexivity and helped the researcher to clarify decisions before moving forward (Silverman, 2013). Additionally, audit trails are an opportunity for methodological awareness and improvement of research rigor (Silverman, 2013). Dependability was further improved through effective interview techniques that facilitate thick descriptive data that allows an opportunity to observe replication or duplication of thoughts and ideas during the research process (Morse, 2015).

Confirmability refers to how objectively the resulting themes and codes match the data and was ensured using inductive, line-by-line emergent coding. This ensured that codes stick as closely to the data as possible, and minimize researchers projecting personal biases onto the data (Glaser & Holton, 2004).

Lastly, *transferability* refers to the generalizability of any findings to alternative contexts. To aid transferability, this study utilized interviews with a wide variety of key informants, to ensure that as many possible perspectives as possible were found. Engaging a variety of participants in good interviewing techniques to obtain rich and robust data allowed all perspectives to be considered so that readers relate to the experiences discussed within the subsequent results and discussion sections (Smith et al. 2018; Barusch et al 2011, Andersen, 2017). Triangulation of data also improved transferability within the context of the research project as well (Morse, 2015).

Results: Manuscripts

Manuscript 1: Understanding Frailty: Perspectives of older adults, caregivers, and healthcare providers

Background:

Frailty has proven to be an evolving concept over the past several decades. The Canadian Frailty Network (CFN) currently defines frailty as *"a state of increased vulnerability, with reduced physical reserve and loss of function across multiple body systems"* (CFN, 2017). This definition has progressed from a strictly biomedical condition (Buchner & Wagner, 1992) to a comprehensive and dynamic approach (Rockwood et al. 1995) which considers biopsychosocial aspects, illustrated within a balance of assets (health, attitudes towards health and health practices, social resources, caregivers) and deficits (illness, disability, disease, dependence on others, burden on caregivers). The dynamic frailty model suggests that changes in either the assets or deficits could influence not only one's frailty status, but also one's overall health status (Rockwood et al, 1995). As the concept of frailty has not been universally operationalized, researchers remain in disagreement regarding the specific signs and symptoms that should be included in its operationalization (Sternberg et al, 2011).

Currently, there appear to be two prominent frailty conceptualizations within the literature: a deficit approach and a syndrome approach (Morley et al. 2013; Lacas & Rockwood, 2012). The deficits approach combines a person's deficit (signs and symptoms of disease, disease, disabilities, laboratory measurements) to create a score (Rockwood & Mitinksi, 2007). The higher the score, the more frail a person is considered to be (Rockwood & Mitinksi, 2007). Fried (2001) presents the frailty syndrome or phenotype approach introducing the Fried Frailty Index (FFI) which identifies frailty as losses in weight (unintentional loss), energy, strength, speed, and physical activity levels. Both the FFI and accumulation of deficits models appear to remove the psychosocial components of frailty from the holistic conceptualization which may have motivated the development of the Friendship Scale (Hawthrone, 2006) and the more recent Social Vulnerability Scale (Andrew & Keefe, 2014). The syndrome approach is often favoured by clinicians and researchers due to the physiological undertones and measurable components within this operationalization (Sternberg et al. 2011).

Putting definition differences aside, there is general agreement that frailty is a state of vulnerability, which is influenced by many factors including physical, social, cognitive, economic and behavioural aspects (Rockwood, 2005; Rockwood et al, 1995; Morley et al. 2013; Schoenborn et al. 2018; Collard et al 2012; Levers et al. 2006; Gale et al.2017). Physical factors typically include weight loss, fatigue, decreased grip strength, reduced physical activity, decreased gait speed and disease (Schoenborn et al. 2018; Morley et al. 2013; Warmoth et al. 2016; Levers et al. 2006). Cognitive or psychological factors include cognitive impairment, mental health, attitudes towards health, and spiritual resources (Schoenborn et al. 2018; Morley et al. 2013; Warmoth et al. 2016; Levers et al. 2006). Social factors encompass social resources, social activities, socioeconomic status, loneliness, and social isolation (Levers et al. 2006; Gale et al. 2017; Andrew & Keefe 2014).

Given the demonstrated role psychosocial factors such as income, education, social isolation and mental health, among other factors, have in determining older adults perceived quality of life, health outcomes, and mortality risks, inclusion of these aspects in frailty screening should be closely considered (Andrew & Keefe 2014). Morley et al. (2013) found significantly higher prevalence rates of frailty when psychosocial factors were included in evaluation. Andrew & Keefe (2014) found that for every social deficit, patients experience a 5% increase in mortality risk. Recognizing the implications frailty has on both the individual, caregivers, and healthcare system makes accurate and earlier detection of frailty important (CFN, 2017[a]). The healthcare system spends more on individuals living with frailty due to extended stays in acute care and long-term care settings, engagement with more community resources, and increased use of hospital services (CFN, 2017[a]).

Screening processes can provide insights into patient's quality of life and health outcomes which are important considerations when treating individuals living with frailty (Gwyther et al. 2017; Frost et al. 2017). Components of screening tools developed to detect frailty should align with what healthcare providers who use frailty screening tools, and other stakeholders such as older adults and caregivers, feel are important. For screening to be implemented more routinely, healthcare providers must see the benefit which involves identifying what they feel is important to consider with regards to frailty screening. Similarly, if older adults and caregivers are not being asked about aspects of their life that they feel are applicable to frailty, relevant information may not be as readily shared.

Study Rationale:

The relationships between psychosocial factors and frailty are still somewhat misunderstood (Gale et al. 2017). Yet many researchers agree that factors which extend beyond the bio-medical perspective are important and deserve further attention within academic and clinical realms (Gale et al. 2017; Gao et al. 2017; Hoogendijk et al. 2014; An & Jang, 2018; Muscedere et al. 2016). This study examined stakeholder (older adults, caregivers and healthcare providers) perspectives on how psychosocial factors are currently considered, or should be considered, within frailty screening and assessment tools.

Methods:

This study utilized a qualitative methodological approach to understand individuals' experiences with frailty and frailty screening tools to better identify what is important to include in frailty screening tools. Qualitative methodologies provide the foundations for understanding opinions and perceptions regarding frailty and frailty screening from those who are dealing with frailty on a regular basis rather than outside opinions (Agar et al. 1995). This allows for frailty to be explained by those whom are at the front lines and ensure their perceptions and experiences are regarded within the literature in a way that quantitative methodology could not define (Silverman, 2013). Quantitative research methods often use pre-conceived notions of frailty while qualitative provides an opportunity for open discovery of motivations and the significance of frailty and frailty screening processes (Agar et al. 1995).

Qualitative data collection took the form of either a focus group or individual interview, the most common forms of qualitative data collection, which allows for participants specific views and experiences to be heard (Gill et al. 2008). Focus groups provide an opportunity to recognize important concepts through group interaction, where conversations aim to resemble that between friendly neighbors (Agar et al. 1995). This allows researchers to observe the group interaction and identify areas of significance or uncover new territory (Agar et al. 1995). Individual interviews allow for more extensive explanations of concepts uncovered due to the opportunity to expand on concepts more thoroughly through effective probing techniques from interviewers to make motivations and actions better known (Agar et al. 1995). Both interview formats were utilized to promote engagement in the study, as some participants were more comfortable one-on-one versus in a group setting, and to accommodate conflicting schedules.

The lead researcher gave each participant the option of individual or focus group settings, and allowed for participants to choose which method they were most comfortable with.

This study used triangulation techniques for data collection, therefore perspectives from two categories of individuals was pursued: older adults and caregivers (n=14), and healthcare providers (n=15). To eliminate the need for older adults to identify as frail, something previous literature has indicated is disliked due to the negative stigma associated with frailty (Mudge & Hubbard, 2018), older adults and caregivers were not defined as separate participant groups. Instead older adults and caregivers were treated as one cohesive participant group which outlined the perceptions, experiences, and concerns of frail older adults and their caregivers. The contribution of older adults and caregivers alongside healthcare providers allowed a larger breadth of perspectives to be heard from various participants who contributed knowledge about frailty and frailty screening processes from different backgrounds. Healthcare providers are the individuals who would likely engage in frailty screening within their professional practice. Healthcare providers can provide insights on current frailty screening tools used within different primary care settings, how effectively they feel these tools are used, insights on the comprehensiveness of tools, and their perspectives on any gaps or areas of concerns with regards to frailty screening tools. Older adults and caregivers can provide patient insights to what they feel is important to screen for with regards to frailty, and their experiences (if any) of being screened for frailty.

Older adults primarily discussed the types of factors they felt were important to consider regarding frailty, and healthcare providers expanded on this while contributing information about frailty screening processes. Recruiting participants from different backgrounds (healthcare provider versus older adult and caregiver) allowed for triangulation of data where researchers engaged in comparative methods between the two stakeholder groups and with the literature (Barbour, 2001). Triangulation also improves internal validity by using more than one method of data collection to answer the research question (Barbour, 2001).

This study engaged in two forms of recruitment. First purposive recruitment of individuals with some level of familiarity with the construct of frailty was conducted. Familiarity with frailty was considered an asset but was not a requirement. Second, a snowball approach was used to complement purposive recruitment and expanded recruitment pools (Barbour et al, 2001; Patrick et al. 1998). Where purposive sampling utilizes a researcher's personal or community networks to engage possible participants, snowball approaches use current participants to identify future possible participants (Barbour, 2001). Participants for this study were recruited from southwestern Ontario through author's personal networks, healthcare clinics, and Geriatric Health Systems Research Group (GHS) research partners such as the Seniors Helping As Research Partners (SHARP) group.

Both, individual interviews and focus groups used a semi-structured interview guide exploring the conceptualization of frailty, and factors which stakeholders felt were important to include in frailty screening. For example, stakeholders were asked: *"What do you think would make a person or older adult frail?"* Semi-structured interviews are beneficial because they provide direction but leave the conversation open so that participants can contribute information that the interviewer may not have recognized as important (Morse, 2015). The focus groups and interviews were audio recorded and transcribed verbatim. Six individual interviews with healthcare providers, one focus group with healthcare providers (n=8), and three focus groups with older adults and caregivers were completed (n=6, 4, and 4) after obtaining informed consent. All interviews were between 30 and 60 minutes in length, audio recorded and transcribed verbatim. Healthcare providers interviewed included physiotherapists (n=2), nurse practitioners (n=5), pharmacist (n=1), physician’s assistant (n=1), geriatric emergency medicine nurses (n=2), occupational therapist (n=1), and geriatrician (n=1). Healthcare providers were from south-western Ontario, in both urban and rural locations.

Following Braun & Clarke’s (2006) guidelines for inductive thematic analysis of data, the transcripts were read and re-read by the lead author to improve familiarity with the content. Using NVivo 12 software for the management of qualitative data, the coding process took place using Braun & Clarke’s (2006) approach. First each interview transcript was read to improve familiarity with the data, then individual codes were developed using line-by-line emergent coding techniques which refer to the most basic segment of the transcript (Braun & Clarke, 2006). Next, a review of codes occurred upon completion of the coding process to ensure all data was coded, refine codes when appropriate, and improve the researcher’s familiarity with the data prior to engaging in thematic analysis (Braun & Clarke, 2006).

Lastly, thematic analysis began by generating initial themes identified in the review of codes and collating similar codes together (Braun & Clarke, 2006). This was an iterative process, whereby themes and codes included in themes changed and shifted as the researcher became more familiar and identifies patterns within the data (Braun & Clarke, 2006). This refocused the data to broader level themes rather than individual codes (Braun & Clarke 2006). Upon completion, each theme and associated codes were reviewed by two independent researchers, which allows for themes to be better refined and defined (Braun & Clarke, 2006). Any shifting of codes was discussed until a consensus was reached. Completion of the coding and theming of the data was based on participant group first, with older adults and caregivers separate from healthcare providers. This approach allowed for the themes generated by each stakeholder group to be analyzed separately so they may be compared before being treated as one comprehensive dataset.

Results:

Participants from each group contributed a unique perspective on the issue of frailty, screening tools, and psychosocial factors. Major themes identified during analysis included: definitions and conceptualizations of frailty, perceptions of the term “frail”, factors contributing to frailty (physical, nutrition, cognitive, pharmaceutical, social,), frailty implications and risks, frailty screening (current practices, current tools in use, factors that should be considered in frailty, context, concerns, recommendations), and experiences with frail older adults. Three major themes are described below and a summary table of all relevant themes can be found in Appendix O.

Frail Conceptualizations and Definitions

Participants in this study demonstrated that the term frailty continues to lack clarity, with several different conceptualizations of frailty described amongst participants. Overall, older adults and healthcare providers both described frailty as vulnerability, multifactorial, and existing on a spectrum. One healthcare provider commented, ‘ *“I see frailty… as a syndrome of sorts, a condition that… is on a spectrum”.* Older adults complemented these sentiments outlining that frailty is “*a condition that one can go in and out of*”. All participants saw frailty as a syndrome, lack of flexibility or adaptability to mitigate stressors or handle adversity, and compromise in one or more areas of health.

There was a level of pragmatism in the discussion of frailty amongst healthcare providers. Providers identified frailty as important to diagnose, with one commenting that this was due to the multifactorial nature of frailty, which increases its significance. Frailty was described by one provider as homeostenosis or reduced reserve capacity:

> *"I like that concept of homeostenosis where there is just not a lot of flexibility in the physiologic, social and the whole system. So that person is much more likely to have a decompensation from a particular insult."*

Decomposition and lack of flexibility to adversity was often described by providers as physical deconditioning, withdrawal from activities of interest of pleasure, mental health concerns, or cognitive impairment.

In comparison, older adults described frailty less specifically than healthcare providers, using broad and more generic terms. Their descriptions of frailty help to highlight the uncertainty in defining this topic. One older adult described frailty as *"not being able to achieve a certain level, be that mental, physical, or anything else",* while another said that *"you can be frail in one and not another…you could have osteoporosis and have frailty physically, but be mentally just as alert as a tack".* The older adults and caregivers mostly talked about the physical aspects of frailty, claiming that "*you don't think about the other aspects,"* likely because physical frailty is more easily observable. Older adults also described a dislike for the term frail, indicating there was often a negative connotation associated with the label.

Overall, both groups highlighted that frailty is vulnerability, a reduced ability to adapt to stress, and that it is dynamic in nature. Often frailty was described as being triggered by some adverse event like a fall, illness, death of a loved one, or stemming from loneliness. Interestingly, frailty was not considered to be determined by age. One provider noted that they see *"people who are 85 and robust and are not frail whatsoever, and I see people who are 72 or 65 or 60 and are very frail",* while an older adult commented that *"frailty is not necessarily in elderly or old* *age'*. These remarks challenge stereotypical views of frailty where age is a key factor in determining a diagnosis of frailty.

Factors contributing to Frailty

Factors contributing to frailty encompassed various factors influencing health status. Physical, cognitive and social factors were each described as being important considerations for frailty screening. Most prominent in the discussion amongst both participant groups were physical factors. Observable traits associated with frailty such as decreased muscle mass, weight loss, and decreased mobility were described by both groups of participants as they relate to Activities of Daily Living (ADL) and functional capacity. The ability to complete ADLs, or to self-manage, was often associated with strength and mobility by both participant groups. An inability to self-manage was described by older adults as a physical indicator of frailty, particularly when an individual had trouble with bathing or negotiating stairs at home, potentially leading to falls.

Falls were identified by both groups as influencing frailty either by being a triggering event causing frailty or an indication that someone has become frail. Healthcare providers said that hearing that a patient is falling is a worrisome sign which indicates a need for further investigation. One provider commented:

> *"I want to know the circumstances of the fall… if they can tell me, you know when, how recent, or has there been multiple, inside [or] outside … was there a pattern? Is there something else going on there that is predisposing you to falling? Are you tripping on your foot or are you blacking out?"*

The circumstances surrounding a fall were used to indicate if an underlying condition related to frailty, such as chronic urinary tract infections or vertigo, needed to be addressed. Alternatively, if a fall has caused a fracture such as a hip or leg fracture, this can result in a new frailty diagnosis due to the impact on ADLs, susceptibility to more falls, or increased risk of infection. Frailty could be prolonged by a continued fear of falling even after a full physical recovery was made. Older adults described falls as a major event, saying that it "*can change everything"* with regards to their health status trajectories. Falls were often described as associated with other physical declines, such as vision loss, hearing loss, balance concerns, and declines in energy levels. Some older adults and caregivers suggested that sleep was an important factor for maintaining energy levels, and overall health status. Healthcare providers agreed with older adults that irregular sleep patterns might be troublesome, indicating that napping during the day often results in an inability to maintain restful sleep required at night.

Pharmaceutical considerations also affect frailty in multiple domains. Providers described the importance of carefully considering prescriptions for older adults due to possible side effects and contraindications with other medications or conditions. One provider described prescribing as a balance of risks and benefits:

> *"… everything is a risk/benefit. So in medication, we can say do you want this medication? But what would happen if we gave the medication? What are the potential side effects? What is going to be the therapeutic benefit? What is the burden of taking a medication?... People don't want to take pills, or they don't want to take another pill, so that's something to consider.*

Providers stressed the importance of thoroughly assessing risks and benefits when prescribing to older adults. Another provider referenced that older adults shouldn't be on any more than 5 medications, and no more than 3 medication in one category, describing risks of polypharmacy. Healthcare providers recognized that polypharmacy requires strict adherence and compliance by patients to ensure these side effects and contraindications are minimized. Despite patients taking medications properly, providers described how side effects can still be observed. Pharmacists were identified by older adults as a valued member of the care team, and a resource to help frail older adults manage and understand their medications and associated risks.

Nutrition was also described by both older adults and healthcare providers as influencing frailty through multiple domains. Nutritional influences on physical frailty include malnutrition, where patients are not getting the caloric nor vitamins and minerals required to maintain good health. Nutritional deficiencies were identified as "*a big part of frailty*" by one provider, and another provider described how malnutrition influences energy levels, perpetuating the risk for falls, inactivity, and cognitive abilities such as concentration. Nutrition was also described within the context of social and cultural norms. Older adults and healthcare providers described social aspects to eating, where individuals associated meals with time for connection. When loneliness or social isolation occurs, providers felt that frail older adults may be less inclined to consume meals. Providers also identified concerns for frail older adults when care transitions are occurring. When a frail person transitions into assisted living or nursing home care, they may not have access to culturally familiar meals, further perpetuating malnutrition. Ensuring older adults have access to the foods they are familiar with that provide proper nutrition could improve frailty risk status.

Cognition was another factor that was broadly linked to frailty by both healthcare providers and older adults. A prominent cognitive factor that was described by all participants as influencing frailty status was cognitive impairment or dementia. One provider described how the development of cognitive impairment can complicate treatment plans for older adults.

> *"It just gets in the way of everything and kind of throws a monkey wrench into any kind of a plan that we would do with prevention. Not completely, but eventually and sort of invariably it can complicate things."*

Cognition was described by one provider as impacting a patient's motivation, organization and overall ability to complete ADLs, or to appropriately engage in other beneficial interventions such as exercise. Identifying cognitive impairment is important for ensuring that patients are able to follow treatment plans as prescribed, and continue to live independently with resources implemented as necessary.

Another prominent cognitive influence on frailty described by both healthcare providers and older adults was mental health status. Providers outlined how depression can influence a person's drive or motivation to remain engaged in activities of pleasure. One provider described concerns about the mental health status of older adults:

> *"Well it is really important… they're second highest group of depression and they have the means to carry it out. And again, they are losing friends constantly. So depression is one of the major geriatric giants essentially."*

Older adults felt that mental health is one of the hardest concerns for healthcare providers to diagnose within older adult populations. One older adult commented:

> *"…Probably the hardest for doctors to diagnose [is] mental health. I think one of the most difficult aspects of mental health with regard to seniors are the very subtle areas of so called age-related issues… loneliness, isolation, abandonment, [and] depression on a relatively low level but chronic, ongoing. That must be [difficult for] doctors to know what to do with. The patient isn't serious enough psychologically to be sent to a psychiatrist or psychologist and yet they are not recovering."*

Both older adults and healthcare providers identified that depression may be more prevalent due to the chronic losses that are associated with aging. Chronic loss included physical losses such as mobility, vision, or hearing, whereby people are less able to engage with their communities, or as social loss such as death of a loved one, estrangement from family members, or decreased contact with friends and family.

Social loss was described by both participant groups as a significant social factor in frailty risk, and one which could manifest in physical or cognitive symptoms. One older adult described loneliness as influencing frailty through physical manifestations:

> "*I think when people are lonely they don't want to, well they want to interact with other people, but they don't have the opportunity and then that affects them physically because they sort of sit and vegetate...*"

Both participant groups described how social influences could be the triggering event that initiates the onset of frailty. Older adults identified that communication could become more difficult for frail older adults, and further limit social interactions and feeling of connectedness to those around them. An example described by older adult participants was struggling to communicate through the use of technologies such as telephones due to dexterity issues with dialing a number on a phone, hearing loss, or changes in mobility that make getting up to answer the phone difficult.

Living alone was considered to increase risk of frailty by increasing risk of loneliness, depression, anxiety, or withdrawal from the community. However, healthcare providers acknowledged that living arrangements must align to the values of the patient, and ensure their safety. Safety within the home should be conversational topics between patients and providers. If a patient's health has declined so that stairs or bathing become risks factors for falls, resources need to be identified to maintain health status and reduce frailty risk. This requires identification of frailty risk earlier to ensure interventions are received in a timely manner.

Overall, frailty was described as influenced by physical, cognitive, and social factors. Healthcare providers and older adults described these factors within the context of including them in frailty screening in some capacity.

Frailty Screening

Frailty screening was almost exclusively discussed amongst healthcare providers. Older adults described factors they felt were important to include in frailty screening, but healthcare providers provided insight into current practices within their healthcare positions. Providers agree that identifying frailty was important, but felt current literature and screening guidelines are ineffective at articulating the implications of a score. Results should provide more meaningful and action-oriented information for patients and providers. Many described how they use their own methods to determine the functional ability of clients, often based on more formal screens, but modified to suit their unique clinical needs. Providers identified that formal screening tools may be too time consuming to complete, which is why use of frailty screening was perceived by providers as low when not mandated. Even when screening is mandated, providers described an inconsistency in what tool is used within various settings, causing confusion when trying to compare scores from the same individual over time and in different geographic locations. To combat this, many providers described using a comprehensive health history to better understand a patient’s health journey and identify when changes have occurred that may need to be addressed. One provider provided an example for why understanding a patient’s history is important:

> "I*t could be that somebody seems really frail and everyone's like 'well he's 90 this is normal for 90' [or] 'Of course, he's 90!' And then you find out actually no this person was working, this person was playing golf, this person was driving a carpool…This is different."*

Health history can also indicate areas of risk. Providers identified lifestyle habits that would influence frailty risk as questions they would ask when discussing health history. These habits included things like smoking, alcohol consumption, and education level.

Home visits were identified by healthcare providers as an opportunity to gather information to assist in assessing a patient. Homecare visits were described as indicating how well a person is functioning within their home through visual observations of the state of the home or how well the person can guide a provider throughout the home. Home visits were also described as giving insights into nutritional concerns by simply looking inside a patient's fridge or pantry to ensure that what the patient is reporting aligns with what is available within the home. When homecare visits are not possible, providers described using specific questions about mobility within the home, transportation and exercise habits to better understand a person's lifestyle and routine. Although the answers to these questions are self-reported by patients, they can provide context to a patient's frailty status, and may identify areas of concern. Providers also described the importance of understanding patients' self-perceived health status. Providers described comparing their visual assessment with the answers to their formal or informal screening questions, and the perspective of the patient to see if these different perspectives align. If there is disconnect between how well a person appears to be doing and how that person feels they are doing, further investigation could be required.

Often current screening practices were described by providers as using clinical judgement. Clinical judgement was referenced as being developed over time with exposure and experience, as well as through mentoring. However, there was disagreement amongst providers about the appropriateness of using only clinical judgement. Some providers felt that clinical judgement could sometimes override a formal assessment, and lead to further investigation for a patient in spite of the assessment results. Others described clinical judgement as something that should not be relied on, because *"you don't know what you don't know".* Implementing consistent frailty screening could help providers identify concerns related to frailty more effectively.

Several formal frailty screening tools were identified as currently in use during interviews with healthcare providers. These included included the Assessment Urgency Algorithm (AUA), Clinical Frailty Scale (CFS), interRAI tools, seniors fitness test (SFT), short physical performance battery (SPPB), gait speed, sit-to-stands, and balance tests. Providers appreciated that the AUA included a question about caregiver stress as this was described as an important concern. The CFS was described as easy to use due to the pictures. The visual prompts on the frailty scale make it easier for providers to assign a frailty score. However, these pictures rely on the observable physical aspects of frailty, and may overlook psychosocial ones. Providers described conflicting feelings about interRAI tools, with some describing concerns about how subjective the tool was, while others voiced appreciation over the inclusion of caregiver stress. Providers also articulated concern over the inclusion of the caregiver's perceptions of a patient's status as it could introduce bias or inaccurate information depending on the relationship between caregiver and patient. Providers discussed how often family members or caregivers may be out of touch with the actual status of the patient. However, if caregivers and patients have a good relationship and are present in the patient’s life, they can provide helpful information to help direct treatment plans.

Tools that looked more obviously at physical components, such as the SFT, were praised due to the normative data that allowed for easy comparisons. The SFT was also described as a positive tool for test-retest scenarios to observe if interventions were effective, and could be modified to suit the patient’s abilities. The SPPB was also used to assess frailty, but providers indicated it was not as sensitive to change as other tools. Standardized gait speed testing was also considered a good indicator of frailty, but could be difficult to administer depending on setting. Sit-to-stand testing was considered important to include in assessments as well, as it provided a good indicator of leg strength, and a functional movement pattern. Some providers also added a balance test to assessments, describing it as a good indicator of falls risk, and were surprised it was not included in formal assessments like the SFT or SPPB.

Providers identified the importance of understanding the context in which frailty screening takes place. Many assessments were identified as currently completed in emergency room settings, where an individual is likely already experiencing decreased function and increased vulnerability. Understanding where screening has taken place, the context of why a screen was initiated, and understanding the current state of the patient in this situation, can shed light on the output of the tool. Providers also described the impact of inconsistent screening. If screening is completed inconsistently, it does not always provide useful or accurate information. One provider outlined how they often get “one-off” screens which make it “*hard to really get an accurate picture… It gives you this picture in this time but it doesn’t let you know how it got to this point”.* Accuracy was also a concern when discussing what frailty screening tools currently include in evaluation. Providers felt mainly physical aspects of frailty were evaluated in current tools, missing other risks commonly observed within their healthcare settings. One provider outlined an example:

> "*I keep on getting the one offs…I see and sometimes screen [patients] a six, which is the highest number saying that…they're not functioning at home. And you look at the person and they are walking and talking, and the reason they're not functioning at home is because they are sad."*

Providers described how frailty screening tools may be missing important factors such as cognitive, social, and emotional components. These factors were described by both patients and providers as possible underlying causes for frailty in individuals but providers felt they are not captured in frailty tools and so often go unnoticed without further investigation.

Recommendations for frailty screening were identified by both older adults and healthcare providers. Healthcare providers identified the need for more consistency in how frailty is approached, outlining how "*you've got nine different nurses with nine different opinions doing it nine different ways".* There is a demonstrated need for consistency in the tool that is used and how different tools relate to one-another so results are transferable to different settings. Another part of improving consistency is ensuring that tools selected have good inter-rater reliability to ensure bias is reduced and an accurate representation of patients is produced no matter who administers the screen.

Providers also outlined a need for consistency in the timing of screening, describing how screening should be completed routinely to identify concerns earlier. Some suggested implementing tools on an annual or even quarterly basis so providers have an opportunity to detect changes earlier. To promote more regular screening, tools also need to be quick and easy to administer. Providers described how "*people don't pick up on those deficits unless you use the* *tool."* Routine screening may use a team approach, requiring better information sharing practices amongst allied health professionals. Older adults discussed their support for the use of interdisciplinary teams to manage health concerns, describing that many health concerns related to frailty may be better suited to other members of an interdisciplinary care team such as a physiotherapist, nurse, or social worker. This provides promising insights that older adults would likely support using allied health professionals to support frailty management. Due to the multidimensional nature of frailty described by both participant groups, multidisciplinary teams provide a good opportunity to screen for frailty based on their area of expertise.

Overall, formal frailty screening was described by providers as needing refinement. Providers identified several areas of concern including accuracy, consistency, and providing meaningful results. Many frailty screening tools were identified by providers, each with benefits and drawbacks. Action-oriented outcomes were described as beneficial for patients and providers, and may increase the uptake of frailty screening.

Discussion:

Both older adults and healthcare providers identified that frailty was multifactorial. Frailty was described as influenced by many factors, including biological, psychological and social factors, aligning with Levers et al.'s (2006) findings. In this study, older adults described frailty as linked to overall health decline and a loss of independence. Given this conceptualization, it was unsurprising that older adults disliked the term "frail". Mudge and Hubbard (2018) also found that older adults found "frail" a highly negative term. Warmoth et al. (2016) found that feeling frail and identifying as frail incorporated negative and often fearful views about aging as being feeble, dependent, and vulnerable. Older adults often resist this label, and when they self-identify this way, it is more often due to disengagement from activities, both socially and physically, than due to functional impairment or poor health (Warmoth et al. 2016). This often leads to increased risk of depression, fear, and vulnerability (Warmoth et al. 2016). Participants in this study provided further support for these sentiments, acknowledging the impact that social, psychological and spiritual factors have on physical health and vice-versa.

Nutrition was a large concern for healthcare providers due to its influence on other concerns such as fatigue, dizziness, continence, and falls risk. Nutritional deficits have been identified in previous work as influencing frailty risk, as they impact overall functional reserve (Levers et al. 2006). Nutrition was often linked to the ability to cook or manage meals independently as part of ADLs. ADLs often associated with describing functional capacity were also identified as related to frailty risk or status, supporting previous research by Levers et al. (2006), who found that diminishing independence in ADLs was a symptom of frailty. Participants linked ADLs to mobility, both within the house and within community settings. Mobility was described as a means to access resources within the community, such as transportation to grocery stores, healthcare providers, and social gatherings. Literature currently supports the influence that access to transportation can have on engagement in community activities (Krout, 2008). Mobility within the home was described as navigating stairs, moving between rooms or other ADLs, including toileting, bathing, cooking, and cleaning.

Falls was a major factor that contributed to frailty. Falls were described as one of the possible triggering events leading to frailty. Older adults described falls as significant because they were often unable to fully recover their full abilities pre-fall. These sentiments are supported by Ruthig et al. (2007), who found that fear of falling was founded on fears of loss of autonomy, leading to consequences on older adults' health. Falls can lead to avoidance behaviours that influence physical activity levels, social engagement, and overall quality of life, which in turn can impact psychological well-being (Ruthig et al. 2007). Perhaps it is for these reasons that providers from all disciplines identified history of falls as one of the biggest indicators of frailty status.

Falling was often linked to polypharmacy. Providers identified multiple medications as a concern for frail older adults due to the side effects or contraindications often present with consumption. Side effects, otherwise known as adverse drug reactions, can include delirium, fatigue, balance concerns, dehydration, increased risk of falls, and increased risk of hospitalization (Hilmer & Gnjidic, 2009). It is important to understand possible side effects before prescribing, and providers outlined concern over the number of medications older adults were on. This is supported by research by Garfinkle and Mangin (2010), who describe the importance of decreasing drug burden amongst older adults through a risk to benefit ratio. The present study supported the use of risk-to-benefit analysis where providers identified careful considerations before prescribing to ensure the best outcomes for patients.

Older adults were pleased with the larger role pharmacists were playing in care teams, and felt they were helpful in explaining possible side effects to patients. This may help to reduce the number of emergency room or family physician visits as older adults are more knowledgeable about what to expect, and better equipped to recognize and handle these side effects. Similarly, if pharmacists continue to be more involved, they can develop strategies with patients to promote the importance of adherence and compliance with patients and to develop a pharmaceutical management plan. Research has indicated the use of web-based applications and other technologies may support medication compliance through reminders (Granger & Bosworth, 2011).

Cognition was seen as related to frailty due to its influence on a person’s ability to self-manage. Cognition has been previously acknowledged as independently associated with frailty (Clegg et al. 2013). One provider described cognitive impairment as “throwing a monkey-wrench” into self-management plans because you cannot rely on plans working long-term or a new routine lasting. Cognitive impairment impacts each person uniquely, and as such will require more personalized and multi-domain care strategies that are flexible to accommodate the dynamic nature of this condition (Ngandu et al. 2015). Individualized and dynamic care strategies require spending more time with patients, which can be difficult with time constraints due to the high number of patients on a provider’s roster (West, Barron & Reeves, 2005).

Cognition also includes mental health status, another factor that was related to frailty within our results. Mental health was described as an area of adversity that can be hard to diagnose, but that which can impact health related behaviours such as the motivation to complete ADLs (cooking, cleaning, bathing) and instrumental activities. Mental health concerns such as depression and anxiety can lead to withdrawal from activities of pleasure and malnutrition and affect physical health status (de Hert et al. 2013; Sickel, Seacat & Nabors, 2019). Identification of mental health concerns may require patients to be more forthcoming with information about how they are feeling, as signs and symptoms can be subtle and require a certain level of trust, disclosure, and vulnerability that can be difficult. Much has changed in the past 50 years with mental health, and the stigma surrounding mental health is starting to change, but stigma continues to influence health decisions (Sickel, Seacat & Nabors, 2019). Providers must be aware of the historical and cultural perspectives of patients to ensure they are building a relationship that fosters honest disclosure of information so possible indicators of health deterioration are identified and not overlooked.

Social influences on frailty included living arrangements. This study highlighted the importance of a person’s autonomy when choosing living arrangements. As providers identified, some patients wish to move into more supportive living environments, and some choose to age in place. Providing support to patients is important no matter what living arrangements they may be in, and this fosters patient-centred care. However, a person’s preferred living environment may no longer be safe, and a transition to alternate environments should be supported. As research by Coleman et al. (2004) found, effective care transitions can increase confidence and reduce healthcare utilization. Living alone was considered to increase risk of frailty as it could lead to loneliness, feelings of depression or anxiety, and withdrawal from community engagement. This is supported by Holt-Lunstad et al. (2015) who identified that living alone is correlated to variables such as depression and marital status. Loneliness has been found to have the same associated risk for mortality as other well-established risk factors such as physical activity, substance abuse, and obesity (Holt-Lunstad et al. 2015), and this can be a complicated social factor to overcome as it takes time to develop new meaningful relationships with people. Older adults are at a higher risk of loneliness due to the increased number of losses they experience as they age (Taub et al. 2015). As participants identified, loss is a chronic part of aging, and loss of a loved one can be difficult to overcome.

Current practices identified several frailty screening tools that were known or currently in use across various settings. The CFS was identified as a simple tool whose associated pictures made it easier for providers to use. The AUA and inteRAI tools were both tools identified as currently in use and described as easy to use, but providers were unclear about what the output of the tools meant. Providers wanted to better understand the meaning of the tool’s results and how results could, or should, influence their care plans. SPPB, SFT, gait speed, sit-to-stand and balance testing were all identified as tools that providers used or adapted to suit the needs of patients and particular healthcare settings. Providers liked the normative data that was associated with some tools, as this provided context for both patients and providers on where patients functioned relative to peers. Developing normative datasets for frailty screening tools may help to apply meaning to results for clinicians and improve the use of frailty screening tools across different care settings.

All providers felt that a thorough and accurate health history generated valuable information. Health history helped providers understand the patient's context, current complaint, and change in functional status. Taking a health history is mandated for many healthcare professionals including physicians, chiropractors, and nurse practitioners (CPSO, 2012; CCO, 2018; CNO, 2019), but the level of detail and the effectiveness of taking a health history could vary based on personal characteristics and the type of relationship providers have with patients. As older adults indicated, they often hide how they are feeling and may not disclose important information. Providing a safe and welcoming environment is essential to obtaining an accurate picture of each unique patient.

Providers described the use of clinical judgement to determine a person's health status, or decide if further investigation is needed. Clinical judgement was described as a "gut feeling" based on observations that initiated further investigation. Clinical judgement was also described as over-riding a tool's score based on personal experience and previous patient interactions. This provides interesting insights to providers' thoughts about screening tools, hinting at a lack of trust in results. This may indicate a need for better training in the implementation of tools and improved knowledge translation about the importance of using screening tools in practice. Providers did identify concern over the accuracy of tools currently in use, voicing concerns of how holistic, valid and reliable tools are. Clinical judgement may be useful if the tools currently in use are not sensitive enough to detect change, or if a tool does not encompass health and frailty holistically. Clinical judgement was described as something that developed over time and with more exposure and experience with a variety of situations. Providers identified mentorship as a positive influence on the development of good clinical judgement. Generally, providers warned that clinical judgement should not be used as a replacement, but rather a method of triangulation or a guide throughout patient interactions. Tools would be particularly helpful at developing clinical judgement for new staff through effective training, and when used routinely can identify and provide earlier interventions for frailty risk.

Frailty screening can be complicated by the context in which a screen occurred. As participants noted, screens completed in emergency situations may not provide an accurate depiction of a person. Similar to a white-coat syndrome where patients' blood pressures increase in physicians' offices (Verdecchia et al. 1995), frailty scores could fluctuate depending on where the screen is taking place. Emergency rooms and hospitals often cause distress for people, and a single screen completed in this setting is unlikely to provide meaningful results. Routine screening across multiple healthcare settings may help to improve this. Further research should look at the accuracy of results across various health settings.

Older adults are currently living longer and healthier lives, and chronological age is not an exclusive determinant of one's ability to function (Lubitz et al. 2003). Physical appearance, although providing a valuable data point, should not be the determining factor for care. Healthcare providers should strive to maintain health through preventive or proactive care; which can reduce the burden on resources within the healthcare system (Lubitz et al. 2003). Healthier individuals over the age of 70 have lower annual expenditures within the system, offsetting any expenditures required due to increased longevity associated with improved health status (Lubitz et al. 2003). Frailty, due to its dynamic and multi-factorial nature, is one construct that would benefit from preventive care, and could improve the lives of older adults.

The current study has strength in the breadth of perspectives that were included. Healthcare professionals from a variety of backgrounds provided input to frailty screening procedures across different settings. Furthermore, perspectives were obtained from various parts of South-Western Ontario, providing input from different geographic locations within the region. Perspectives were also provided from both urban and rural settings. However, this study was limited by the depth of healthcare provider perspectives. There was a large variety of healthcare provider perspectives, but only a few contributors of each type of professional perspective obtained. Future research could examine the differences between providers by profession, and by geographic setting.

Future works should focus on implementing routine frailty screening in primary care and allied health care settings effectively and efficiently. All stakeholders supported interdisciplinary collaboration for frailty indicating there may be opportunity to utilize these sources of care to improve the effectiveness and efficiency of frailty identification and interventions. As providers discussed, understanding the impact of a frailty score is important for increasing uptake of routine screening. Future work should focus on clarifying action items for clinicians' after a frailty screen has been completed. This may include protocols for what kinds of interventions should be implemented to improve the various factors that contribute to frailty and improving the understanding of how these factors impact frailty risk.

Conclusion:

Overall, older adults and healthcare providers have very similar perspectives of frailty - both understand frailty to be multi-dimensional and dynamic. Understanding each patient as a unique individual may allow for more subtle changes to be observed earlier, and interventions provided sooner. This can be facilitated by more holistic and routine screening processes where changes may be detected earlier. Engaging in holistic screening practices which leave patients feeling more valued as individuals may result in improved patient buy-in, and better adherence to prescribed interventions. However, providers need clarity on what the "next steps" are when completing a frailty screen. This involves improving knowledge on frailty risks and implications which provide meaning to results, and clear action items based on results of frailty screening. Improved clarity on the role of frailty screening tools may improve the uptake of using frailty screening tools across various healthcare settings.

Manuscript 2: *Understanding Frailty Screening: A Domain Mapping Exercise*

Introduction and Overview

Over the past several decades, considerable discussion and debate has surrounded the definition of frailty in older persons. Researchers such as Collard, Boter, Schoevers, and Voshaar (2012) have acknowledged the dynamic nature of frailty as something that extends beyond Buchner and Wagner's (1992) strictly biomedical definition to include psychosocial factors. The separation of physical and psychosocial factors in assessment of frailty feels counter-intuitive, given research showing that psychosocial factors influence functional frailty outcomes (Levers et al. 2006). Currently, a working definition of frailty, as stated by the Canadian Frailty Network (CFN), is as follows:

> *"Frailty is a state of increased vulnerability, with reduced physical reserve and loss of function across multiple body systems. This reduces ability to cope with normal or minor stresses, which can cause rapid and dramatic changes in health." (CFN, 2017)*

This definition does not explicitly include psychosocial factors and may reflect a shift away from a holistic conceptualization of frailty. This is reflected with the use of frailty screening tools that provide a primarily biomedical assessment, such as the Clinical Frailty Scale, which is based on clinical judgement of clinicians (Rockwood et al, 2005). Other tools assess only psychosocial factors, such as the Friendship Scale (Hawthorne, 2006) and Social Vulnerability Scale (Andrew & Keefe, 2014).

As Levers et al. (2006) notes, literature has indicated that psychosocial factors contribute to frailty, but it is not clear how consistently these factors are assessed or measured, making their influence unclear. Morley et al. (2013) have argued for a more in-depth assessment of frailty that includes both psychosocial and biomedical domains. Tools that do not capture the full scope of frailty will inaccurately rule in or rule out frailty in specific individuals. As such, researchers, clinicians, and policy makers will be using invalid data to guide policy, practice, and the development of care plans. The matter is amplified by the absence of a gold standard clinical definition of frailty, and the lack of objective clinical tests to diagnose the problem.This research project used a domain mapping method to understand how individual frailty screening and assessment tools currently assess or measure psychosocial and biological domains within their evaluations.

Methods:

This study utilized systematic search and review methodology (Grant and Booth, 2009) and followed PRISMA guidelines (Moher et al., 2009) to examine how psychosocial and biomedical factors are currently considered within frailty screening and assessment tools. Electronic databases focused on social sciences, community health, public health, medicine, and rehabilitation, including MEDLINE, CINAHL, EMBASE, and PsycInfo were searched from the inception of the database to December 31, 2018. The search strategy was developed a priori and included terms related to the objectives of this study such as “screening” or “assessment”, “frail”, and “validation” or “development”. The search strategy used for MEDLINE can be found in Appendix D.

Articles were included in the review if they explicitly discussed a screening or assessment method to evaluate frailty, the full text was available, the aim of the article was to discuss the development or psychometric properties of screening tools (validity, reliability, reproducibility), and the article described the initial development of a tool or a subsequent modification of a tool. Articles were excluded if no information about the domains or psychometric properties of the tools were discussed, full text was not available, full text was in a language other than English, or included a frailty screening tool that was only intended for use in a specific population (e.g., cancer, respiratory, cardiac, cognitive impairment). One reviewer conducted the literature search and completed title and abstract screening. Two independent reviewers then completed full-text reviews. Disagreements were resolved by consensus.

The domain mapping activity utilized the biopsychosocial model proposed by Lehman et al. (2009) and Wade and Halligan (2017). The biopsychosocial model outlines how the core factors, identified as biological, psychological and social factors, are influenced by contextual factors which influence an individual’s health status (Wade & Halligan, 2017). We created tables to identify how each tool measured core factors (biological, psychological, social) and contextual factors based on the biopsychosocial framework. Biological factors included individual factors, nutrition, medical conditions, and physical/functional abilities. Psychological factors included cognitive abilities, emotional regulation, motivation, stress appraisal, behaviour, and mental health. Social factors included use of community resources, living situations, leisure, social status, social connections, and support (family/friend). Contextual factors included personal, social, temporal, and physical factors. Detailed descriptions of each can be found in Appendix B. If a component of a tool fit into one of the core factors as well as into a contextual factor, then researchers included it in both aspects. Data related to how each tool assessed and evaluated frailty were extracted from each article into a summary table to initially label components as biological, psychological, or social. From here, information was mapped from the summary charts into a spreadsheet which contained all of the specific biopsychosocial framework components for a more detailed analysis of how the core components were represented in frailty screening tools. One reviewer undertook the initial data extraction process and a second reviewer vetted the results.

Results:

Overall, the systematic search identified 2213 potential articles for inclusion. After a single reviewer completed the title and abstract screen, 1520 were removed. A reference check completed on previous systematic reviews on frailty screening tools revealed 21 additional articles for inclusion. Upon completion, we included 79 articles in the review, and 67 unique tools were identified and discussed in these articles. The PRISMA flow chart indicating the study selection process can be found in Figure 2. A kappa score of 0.64 indicated moderate agreement between the two reviewers (McHugh, 2012).

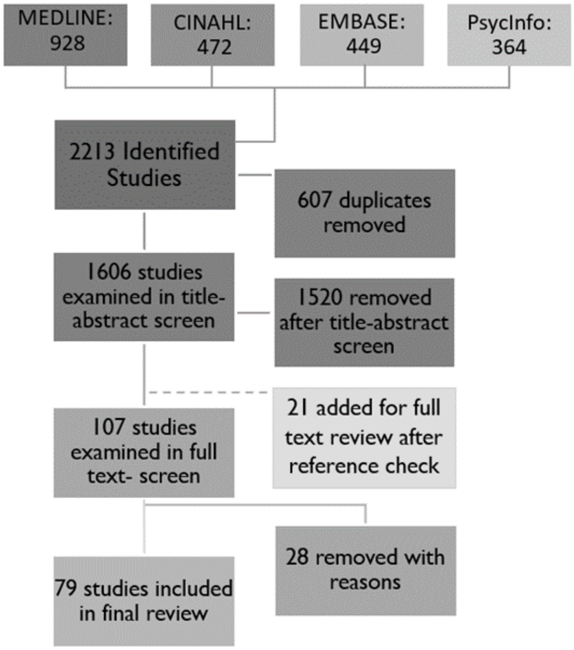


Figure 2: PRISMA flow chart for systematic search

All tools assessed biological factors (n=67); 30% (n=20) evaluated personal factors; 64% (n=43) nutritional factors; 75% (n=50) medical conditions; and 94% (n=63) physical/functional abilities. Psychological factors were assessed by 73% (n=49) of the tools; 19% (n=13) evaluated self-rated health; 57% (n=37) evaluated cognitive abilities; 24% (n=16) evaluated emotional regulation; 13% (n=9) evaluated motivation; 9% (n=6) evaluated stress appraisal; 13% (n=13) evaluated behaviour; and 43% (n=29) evaluated mental health status. Over half (52%) (n=35) of the tools included social factors; 12% (n=8) evaluated community factors, 28% (n=19) evaluated living situations, 12% (n=8) evaluated leisure, 16% (n=11) evaluated social status; 13% (n=9) evaluated social connections; and 13% (n=9) evaluated social support (friends/family). Contextual factors were assessed by 78% (n=52) of tools; 43% (n=29) evaluated personal context (life goals, beliefs, past experience, expectations, attitudes, financial resources); 31% (n=21) evaluated social context (family and friends, and local culture); 64% (n=43) evaluated temporal context (stage in life, stage in illness); and 39% (n=26) evaluated physical context (actual environment person is situated, use of assistive devices). Figure 3 depicts the domains that were included in each frailty screening tool. Figure 4 depicts an overview of how frailty tools assess frailty based on the domains covered.

With regards to the comprehensiveness of the tools, 43% (n=28) examined all domains in some manner, and 33% (n=22) assessed three domains. Of the tools which assessed three domains, one assessed biological, psychological, and social factors; 27% (n=6) assessed biological, social and contextual, and 68% (n=15) assessed biological, psychological, and contextual factors. Figure 5 depicts the proportions of which domains were assessed in tools which assessed three domains. The tools which only assessed two factors (12%) all evaluated biological factors; of these, 38% (n=3) assessed biological and contextual factors, and 63% (n=5) evaluated biological and psychological factors. Figure 6 depicts the proportions of which domains were assessed in tools which assessed two domains. The tools which assessed one factor (13%; n=9) all considered only biological factors.

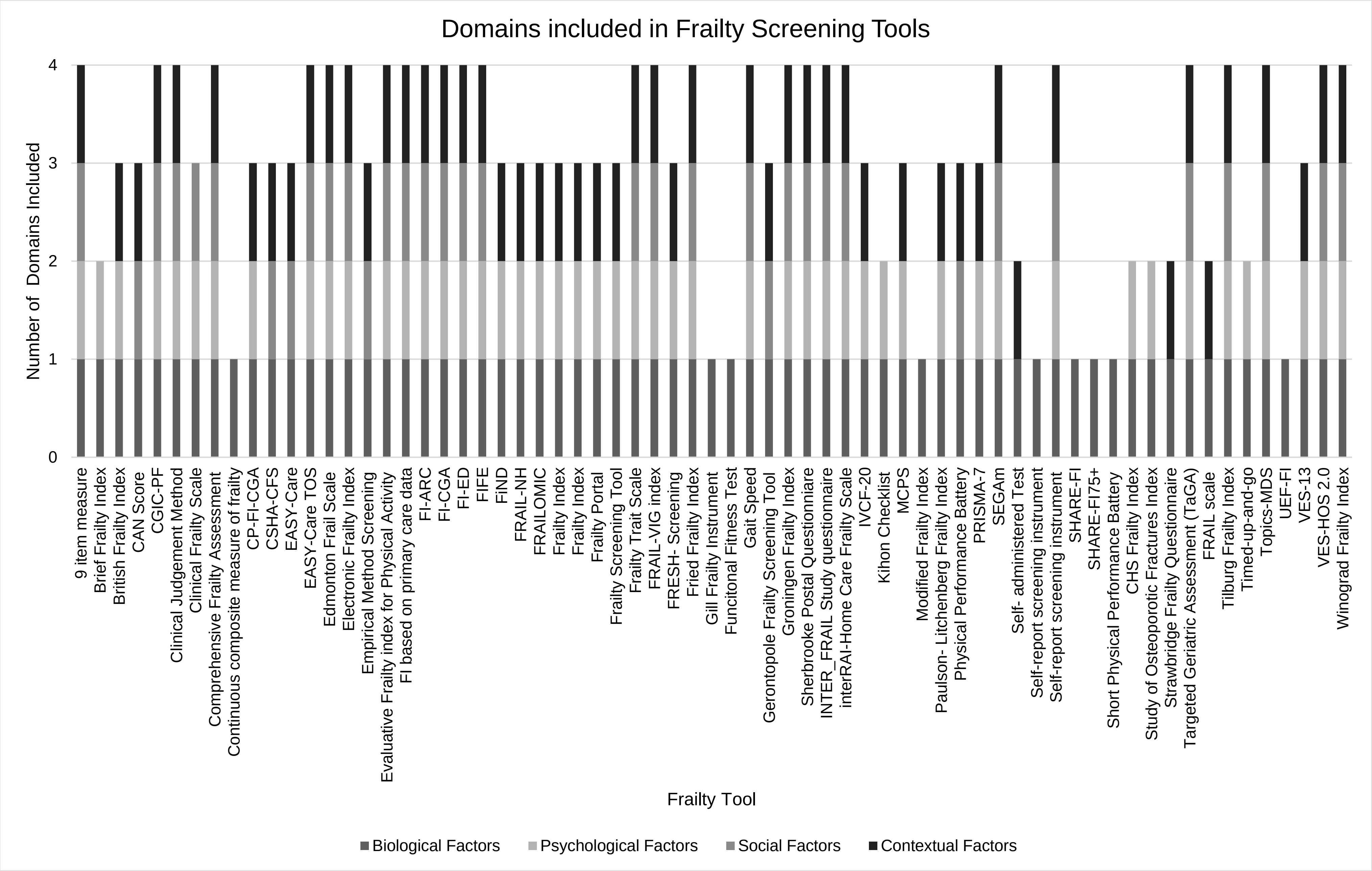


Figure 3: Domains included in Frailty Screening Tools

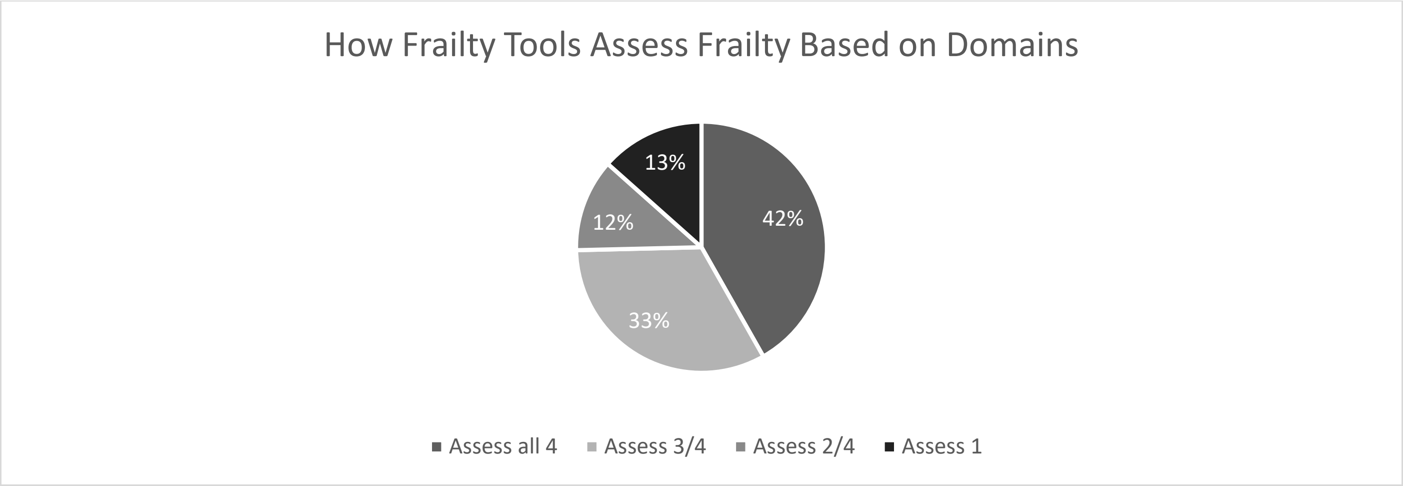


Figure 4: Overview of frailty screening and number domains assessed

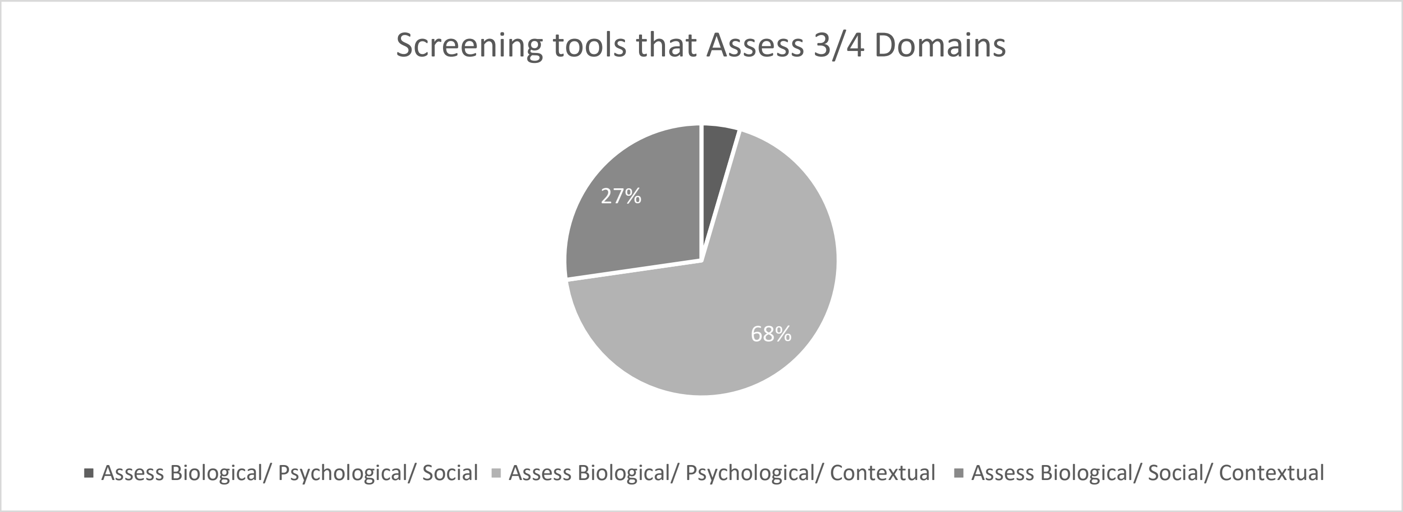


Figure 5: Overview of frailty screening tools which assessed 3/4 domains

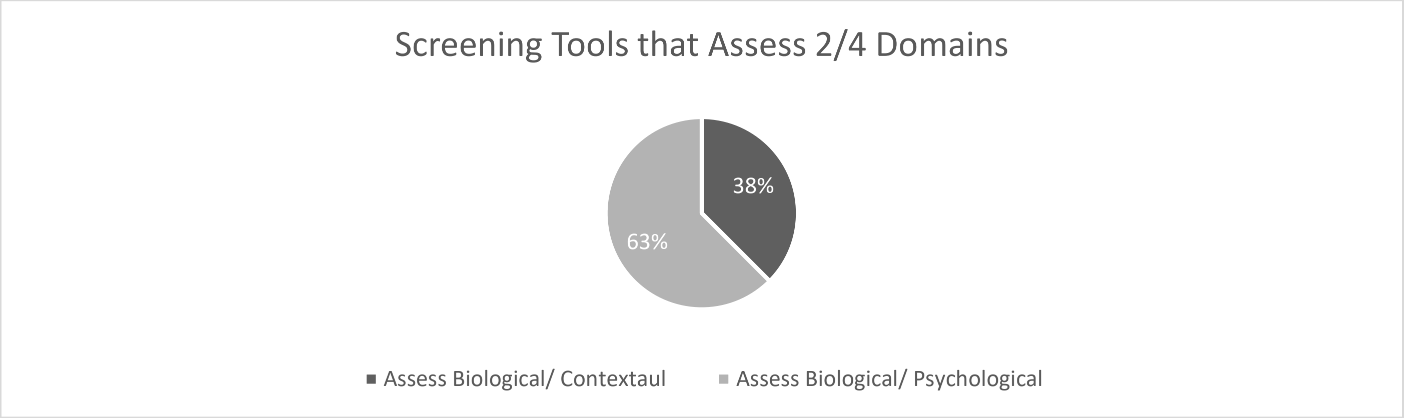


Figure 6: Overview of frailty screening tools which assessed 2/4 domains

Discussion:

This review identified 67 frailty screening tools measuring a magnitude of items. Even within broad domains (biological, psychological, social, and contextual factors) specific components differed. Current literature shows that frailty is conceptualized in different ways, likely the cause for the multiplicity of screening tools published as each tool includes different factors according to the stated conceptualization. Most often frailty is conceptualized either as a frailty syndrome/phenotype or as a frailty index (Mudge et al. 2018).

A frailty syndrome is considered a defined set of signs and symptoms, often including phenotypic measurements such as sarcopenia or other biological markers of health (Mudge et al. 2018; Morley et al. 2013). The syndrome is considered a "pre-disability" marker, whereby as functional status worsens a patient moved from frailty to disability (Mudge et al. 2018). This review has demonstrated a consensus on the importance of the biological determinants of frailty as observed in their inclusion of frailty screening. All screening tools included biological factors in some capacity (n=67) such as nutrition, medical conditions, physical/functional capacity, or individual factors (age, sex, BMI etc.). This is unsurprising given the physiological undertones of the major conceptualizations of frailty (Sternberg et al. 2011). This study found that 63 of the 67 of tools identified used these kinds of performance indicators such as gait speed, grip strength, and functional capacity were often used as measurement components in the phenotypic conceptualization of frailty assessment (Mudge et al. 2018; Morley et al. 2013).

Alternatively, the frailty index approach is based on an 'accumulation of deficits' model, where health deficits such as primary or chronic diseases, ability to complete activities of daily living or instrumental activities of daily living, and mobility are tabulated to create a score (Morley et al. 2013). Since a body of research has highlighted that deficits or performance-based indicators of frailty are determined by psychological factors such as cognitive impairment or mental health (Morley et al. 2013), it is promising that 49 of the 67 tools identified assessed psychological components.

The conceptualization of frailty has evolved over the past decades, and these conceptualizations do not always include social considerations (Morley et al. 2013). Collard et al. (2012) had found that broader or more holistic conceptualizations of frailty, e.g., those which included factors such as cognition or social aspects, produced statistically significant increases in frailty prevalence rates versus narrower definitions. However, social factors were identified in only 35 of the 67 tools (n =52%). The social factors most often included in the assessment of frailty were living arrangements and social status. Living arrangement were evaluated in 19 of the 67 tools (n=28%) and social status in 11 out of 67 tools (n=16%). Living situations such as institutionalization or living alone have previously been linked to frailty (Levers et al. 2006). Specifically, the literature indicates that frailty is linked to increased risk of institutionalization often caused by an increased dependence on activities of daily living and other self-care activities (Rockwood et al. 1994). Similarly, it is well accepted that social status, including education and economic position, impacts health through behaviour, access to healthcare, and access to affordable and safe housing (Andrew, Mitnitski & Rockwood, 2008). Socioeconomic status has also been linked to cognitive functioning, material deprivation, and increased risk of falls (Andrew & Keefe, 2014). With the numerous links between social status and overall health as well as frailty risk, it is disappointing that it was only included in 16% of the frailty screening tools. Inclusion of such items could help to identify individuals at risk for frailty sooner.

While the inclusion of more holistic factors within many frailty screening tools is promising for more accurate and earlier detection and intervention for frailty, researchers should be concerned about the number of tools which exist to evaluate frailty status. Even with an understanding of the potential benefits of routine screening practices within primary care settings on overall health and positive patient-centered outcomes (Mudge et al. 2018), choosing the “right” tool may prove difficult given the vast number of tools that exist. Frailty has been consistently linked to holistic factors, and results from this study indicate numerous tools that will touch on biological, psychological, social and contextual factors related to health (n=28). Until a consensus on frailty is reached, researchers and clinicians trying to decipher which tool to use should pay close attention to how authors conceptualize and evaluate frailty, to select the best tool for their unique needs. This comes down to understanding the purpose in screening for frailty status and specifically what type of information is required. Frailty screening tools exist for use in specific populations (such as persons with specific diseases who were not the focus of this study), as well as in different settings, and with different modes of administration. Self-report tools may be helpful for individuals unable to travel to clinicians, or for researchers who have participants across broad geographic regions. Other tools are intended for use in emergency room settings, long term care settings, and primary care settings. Future research should examine which tools would be best suited for use in various clinical settings, and how scores can be compared across tools to improve consistency and to apply meaning to the scores. However, frailty screening tools must also be valid and reliable to ensure consistency in this process to identify individuals living with frailty. Elsewhere there is work which reports on the psychometric properties of the tools identified in this domain mapping review.

Frailty tools should lead to clear action (Mudge et al. 2018), but research is limited in understanding what the next steps should be. The ambiguity surrounding frailty perpetuates this problem. While there is continued debate on how frailty in defined, there remains limited opportunity to truly understand how interventions can improve outcomes for patients. Conceptualizations can either be too vague, for example relating frailty only to vulnerability (Lutomski et al. 2013), and it can thus be difficult to define interventions to improve this as the context is lacking. Alternatively, if frailty is defined too narrowly, with reference to specific chronic diseases or conditions (Drubbel et al. 2013), individuals who are at risk for adverse outcomes but who do not have the specific conditions may be overlooked. Frailty consensus would provide significant support for actionable items. Currently, with so many tools assessing various aspects of health, it is difficult to create actionable items that would make consistent meaningful changes in patients' lives. Future research should focus on understanding which tools are most appropriate in different care settings to ensure the needs of patients are correctly identified and clear actionable items can be prescribed. Ideally, one tool would be identified as appropriate for use across various settings so comparisons can be made to scores obtained.

One consistent frailty screening tool could also be implemented for routine screening practices. Routine frailty screening may be used to determine domains of health that require further investigation and may allow practitioners to observe more subtle changes sooner. As mentioned, Collard et al. (2012) argued that screening should assess each domain separately to better understand the needs of patients, and while this approach would have merit, the practical use of multiple screening tools within primary care settings is questionable. Healthcare providers have limited time with patients and use of multiple screening tools may be too time consuming as has been found with comprehensive geriatric assessments (Lacas & Rockwood 2012). Instead, regular frailty screening may prove more effective as a routine health monitoring process to identify areas of concern across health domains sooner and provide appropriate interventions or solutions.

Previous reviews by Sutton et al. (2016), Sutorius et al. 2016, Clegg et al. 2015, Pialoux et al. 2012 captured 38, 10, 7, and 10 tools respectively, while this review identified 67. This allowed for a broader evaluation of frailty screening tools, and a more accurate representation to the research and clinical communities of how many tools exist. Despite this increase in the number of tools identified, the search may not have captured all available tools. There may be tools that are in use but as yet unpublished, or published in a language other than English, or not accessible. For this study, tools were excluded which assessed frailty in specific populations such as cancer, cardiac, or respiratory patients, and patients with cognitive impairments. These criteria excluded known tools such as the simple prognostic risk score for psychogeriatric patients (Pijpers et al. 2009), or FRAIL-NH in long term care facilities (Kaehr et al. 2016), which evaluate frailty in specific subpopulations.

Conclusion:

The screening tools identified in this review consider multiple health domains related to frailty. When screening and assessment methods reflect holistic conceptualizations to health there may be greater opportunity to identify health related concerns sooner, particularly when screening is completed on a routine basis. Holistic tools provide a foundation to identify frailty earlier and thus intervene sooner with patient-centered options. Earlier detection leads to the opportunity for earlier intervention and promotes a space for improved health outcomes.

Manuscript 3: ***Understanding Frailty Screening – A systematic search and review***

Introduction and Overview:

The concept of frailty has not been universally operationalized, and researchers disagree about the specific signs and symptoms that should be included in its operationalization (Sternberg et al, 2011). The Canadian Frailty Network (CFN) defines frailty as *"a state of increased vulnerability, with reduced physical reserve and loss of function across multiple body systems* (CFN, 2017[a])".

Currently, there appear to be two main approaches to operationalizing frailty: a deficit approach and a syndrome approach (Morley et al. 2013; Lacas & Rockwood, 2012). The deficit approach most often utilizes the Frailty Index (Lacas & Rockwood, 2012) for evaluation, and adds together a person's deficits to create a score. These deficits include signs and symptoms of disease, diseases, disabilities, and laboratory measurements (Rockwood & Mitnitski, 2007). The syndrome approach is characterized by Fried's (2001) conceptualization and is an underlying state of dysregulation leading to the loss of five main areas: weight loss (unintentional loss), energy, strength, speed and physical activity levels (Morley et al. 2013). The syndrome approach is often favoured by clinicians and researchers due to the physiological undertones and measurable components within this operationalization (Sternberg et al. 2011).

Putting definitional differences aside, there is underlying agreement that frailty is a state of vulnerability, which is influenced by many factors including physical, psychological and social deficits (Bunt et al. 2017). Frailty is a collection of symptoms that are not recognizable with a single clinical or laboratory test (Lacas & Rockwood, 2012). As such, an array of scales has been developed to identify the presence of frailty, and the number of instruments published reflects the disagreements over the precise operationalization and definition of the condition (Rockwood, 2005).

Research is inconsistent in estimating the prevalence of frailty (Collard et al. 2012). Depending on the conceptualization used, previous research has indicated that frailty prevalence ranges from 4%-59% in community dwelling older adults (Collard et al. 2012). Collard et al. (2012) found in their cohort study that on average 10.7% of the 61 500 participants were considered frail, while 41.6% were considered pre-frail. Frailty appears to increase with age and occurs more often in women (Buckinx et al. 2015). Prevalence of frailty is also impacted by socioeconomic status and education, as well as health status, chronic disease, and disability (Buckinx et al. 2015). Frailty has been associated with negative health outcomes including falls, disability, hospitalization, homecare needs, and mortality (Buckinx et al. 2015). The Canadian Study on Health and Aging found frailty was associated with an increased risk of death over five years and was the most important predictor of death and institutionalization among mildly and severely frail individuals (Rockwood et al. 2004; Ensrud et al. 2008). The Study of Osteoporotic Fractures demonstrated an association between frailty and falls, risk of disability, overnight hospitalization, emergency department visits, and all-cause mortality rates (Ensrud et al. 2008; Kiely et al. 2009). Recognizing the implications that frailty has, not only for the individual but also from a systems perspective, makes earlier detection and intervention even more important (CFN, 2018). Individuals living with frailty cost the healthcare system more due to increased use and demand on community resources and hospital services, and extended stays in long-term care facilities (CFN, 2018).

Previous reviews have noted the increased rate of development for frailty screening tools (de Vries et al. 2011). No review has been able to make a recommendation on the optimal screening tool due to limited information on psychometric properties (Sutton et al. 2016; de Vries et al. 2011). Given the increased rate of frailty screening tool development, and the need to assess the psychometric properties of these instruments, this review aimed to catalogue frailty scales, their conceptual frameworks, and psychometric testing completed.

Methods:

Rigorous processes drawing upon systematic search and review methodology were adopted. Systematic search and review methodology, as outlined by Grant & Booth (2009), enables the inclusion of elements of a full systematic review when study objectives would not be fully obtained through a traditional systematic review or critical review. (Grant & Booth, 2009). For this study, systematic review elements followed Preferred Reporting Items for a Systematic reviews and Meta-Analysis (PRISMA) guidelines (Liberati et al. 2009) to obtain, screen, and extract relevant data. To understand the available psychometric testing completed and thereby the quality of tools developed, the Consensus-based Standards for the selection of health Measurement INstruments (COSMIN) Risk of Bias checklist was used.

For this project, keywords related to the study objectives and purpose include "frailty", "assessment tools", and "older adults" as well as related synonyms of each. Relevant studies were identified from MEDLINE, CINAHL, EMBASE, and PsycInfo electronic databases. The search strategy for MEDLINE is reported in Appendix D. Original works describing the development of frailty screening instruments, or subsequent works that contributed to the modification or adaptation of these instruments in some form, were included. Also included were articles describing the psychometric properties of these instruments. Study design was not an eligibility criterion because we sought a comprehensive snapshot of the current literature. Only English-language studies were included in this study. Study dates for inclusion were from inception of the database until December 31, 2018. A single independent reviewer completed the title-abstract screen of all identified articles and reference-checked any previous reviews of frailty screening tools identified. The selected articles then underwent a full text screening process against eligibility criteria, utilizing two independent reviewers. Once completed, reviewers resolved differences by consensus. Cohen’s kappa was calculated to determine the inter-rater reliability. The final number of included studies can be found in Figure 2: PRISMA flow chart.

Data were extracted from the final list of articles determined in previous steps into charts within an Excel spreadsheet by one researcher. Chart information was divided into two categories: logistical and study-related. Logistical information refers to organizational information including title of the study, authors, publication date, and database source. Study-related information refers to specific information required to answer study objectives. This information includes name of the frailty tool, reported psychometric properties of the frailty tool, and conceptual framework used. A second researcher reviewed charts to ensure no relevant information was missing.

Upon completion of data extraction, the COSMIN checklist was completed by two researchers who each completed the checklist independently. COSMIN provides a foundation for the rigorous assessment of measurement instruments and utilizes specific and defined concepts to allow for an understanding of the comprehensiveness, comprehensibility, and the - relatedness of items to the constructs being measured in these instruments (Mokkink et al. 2018). These latter items are problematic when considering frailty screening tools, where no “gold standard” exists, and tool development is based on conflicting frameworks (Mokkink et al. 2018; Rockwood, 2005). The COSMIN Risk of Bias checklist (boxes 3-10) focuses on the developmental quality of the tools by examining whether the frailty tools were developed in methodologically correct and rigorous fashion, thereby giving insight into the quality of the tool itself (Mokkink et al.

2018). The COSMIN Risk of Bias checklist assesses measurement properties across several domains, including structural validity, internal consistency, cross-cultural validity/measurement invariance, reliability, measurement error, criterion validity, hypothesis testing for construct validity, and responsiveness (Mokkink et al. 2018). Descriptions of properties measured by COSMIN are as follows:

- Structural validity: *Degree to which scores are an adequate reflection of frailty dimensions*
- Internal consistency: *Inter-relatedness amongst items*
- Cross-cultural validity/measurement invariance: *Performance of items on adapted instruments as compared to original versions*
- Reliability: *Proportion of total "true" variance in measurement*
- Measurement error: *Systematic and random error*
- Criterion validity: *Degree to which scores are an adequate reflection of the construct*
- Hypothesis testing for construct validity: *Degree to which scores are consistent with hypothesis*
- Responsiveness: *Ability to detect changes over time*

Following COSMIN guidelines, the lowest score from each rater was used to determine the final score, which indicates the quality of the work being examined and the psychometric testing completed for the tool (Mokkink et al. 2018). Ratings refer to how many aspects of the COSMIN Checklist (boxes 3-10) were able to be completed based on information provided within the study. There was potential for 12 ratings to be included within the seven boxes, which ranged from "very good" to "inadequate". A rating of "very good" would indicate the information to answer the question for the related construct was clearly provided. For example, COSMIN box six relates to reliability, and asks questions regarding patient stability, time interval, test conditions, intraclass correlation coefficient calculations (continuous scores), and kappa scores (dichotomous/nominal/ordinal scores). If the article describes the weighted kappa calculations sufficiently, identifying the weighting scheme and final score, then the article would receive a rating of "very good" in this component. The number of available ratings for each tool was tabulated from each article.

Results:

The systematic search identified 2213 studies on frailty screening tools from MEDLINE, CINAHL, EMBASE and PsycInfo to compare against inclusion criteria. Following a single reviewer title-abstract screen, 86 studies remained. One reviewer identified an additional 23 articles through reference checking, 21 of which were added to the full text review after title-abstract screening. This resulted in 107 studies for full text review, completed by two independent reviewers. Upon full-text review, 79 articles were included in the study. Figure 2 depicts the systematic search process. Level of agreement between the two reviewers was calculated using Cohen's Kappa, which indicated moderate agreement (k = 0.67). Cohen's Kappa calculations can be found in Appendix P.

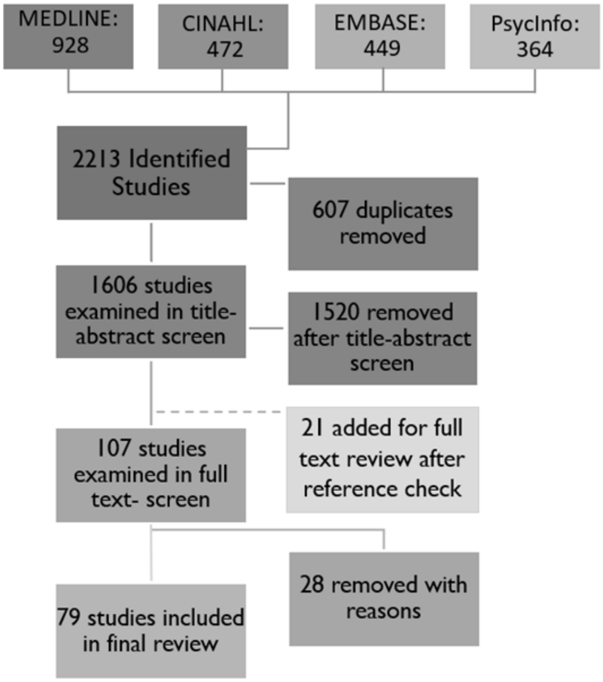


Figure 2: PRISMA flow chart for systematic search

Sixty-seven frailty screening and assessment tools were described within the 79 included articles. The Tilburg Frailty Instrument was the most frequently examined tool, with five identified studies describing its psychometric properties (Gobbens et al. 2009; Metzelthin et al. 2010; Daniels et al. 2012; Gobbens et al. 2017; Andreasen et al. 2015). Numerous other tools such as the Care Assessments Needs Score (Ruiz et al. 2018a; Ruiz et al. 2018 b), Canadian Study on Health and Aging Clinical Frailty Score (Rockwood et al. 2005; Davies et al. 2018), Comprehensive Frailty Assessment (De Witte et al. 2013a; De Witte et al. 2013b), EASY-Care Two step Older persons Screening (TOS) (van Kempen et al. 2013; van Kempen et al. 2014), Comprehensive Geriatric Assessment Frailty Index (CGA-FI) (Jones et al. 2004; Jones et al. 2005), Groningen Frailty Instrument (GFI) (Daniels et al. 2012; Metzelthin et al. 2010), Short Emergency Geriatric Assessment-modified (SEGAm) (Oubaya et al. 2014; Oubaya et al. 2017), and the Sherbrooke Frailty Questionnaire (SFQ) (Daniels et al. 2012; Metzelthin et al. 2010) were assessed in two articles, but most tools were only described in one study.

The number of frailty screening tools developed has increased substantially since 2006, rising from an average of one tool developed per year from 1990-2007 to an average of five tools

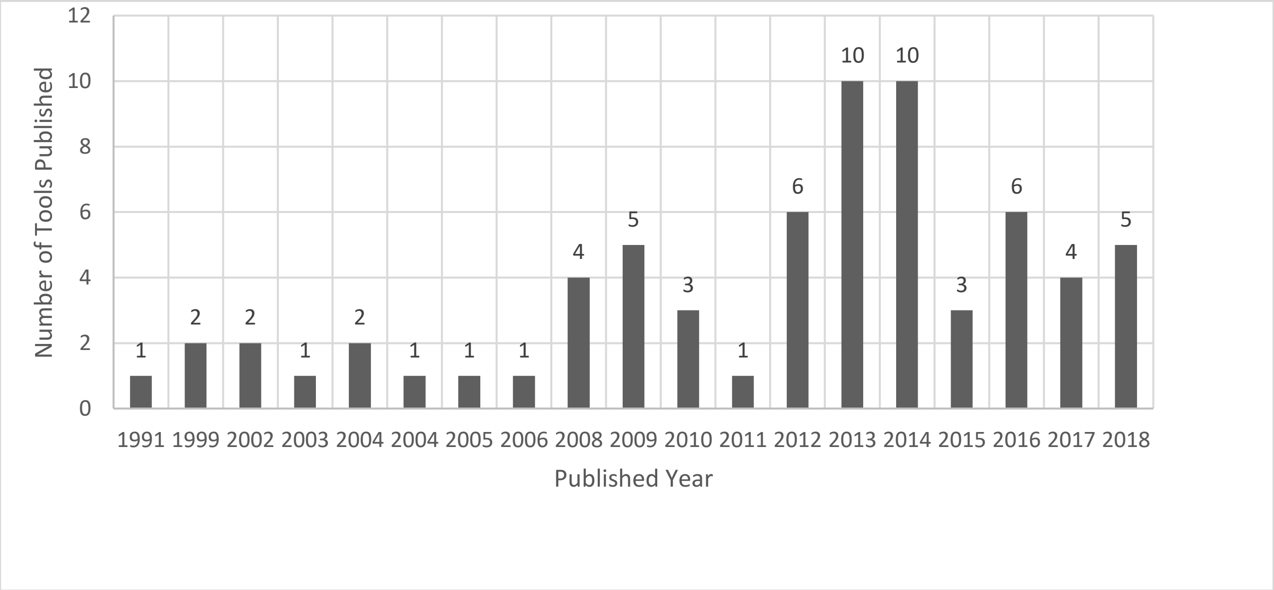


Figure 7: Frailty Tool Development 1990-2018

per year from 2008-2018. The years 2013 and 2014 saw a large increase, producing 10 tools each year that were identified within this search. Figure 7 represents the rate of tool development between 1990 and 2018.

We found that 9% of articles did not include any reporting of psychometric properties (n=6), while 9% did not report reliability or validity information (n=6). Of the articles that reported reliability and validity information, 43% of articles reported both reliability or validity information, while 3% of studies reported only reliability information (n=2), and 62% of studies reported only validity information (n=43). Several articles did not report information required for most components on the COSMIN checklist. The proportion of components not reported for each tool is shown in Appendix R.

The results of the COSMIN checklist indicates that of the 79 articles depicting 67 frailty screening tools, less than 50% of identified tools reported structural validity, internal consistency, reliability, comparison with a gold standard, and comparison before and after an intervention. More specifically, structural validity was reported in only 21 articles covering 19 different tools. Internal consistency was reported in 24 articles assessing 20 tools, while cross cultural validity was reported in 44 articles assessing 43 tools. Reliability was reported in 32 articles covering 29 tools. Measurement error was reported for 19 articles covering 18 tools, while criterion validity was reported for 41 articles covering 39 tools. Construct validity, broken into convergent validity and known group validity, was reported for 66 and 36 articles covering 59 and 32 tools respectively. Responsiveness was broken into four sub-components. The first is comparison with a gold standard, which was not reported for any tool, as no gold standard exists for frailty screening (Sutton et al. 2016). Comparison with another instrument, comparison between subgroups, and comparison before and after an intervention was reported for 68, 38, and 2 articles covering 60, 34 and two tools respectively.

Three articles depicting the Frailty Index based on Primary Care (FI-PCD) (Drubbel et al. 2013), the Self-Report Screening Instrument by Nunes et al. (2015), and the Tilburg Frailty Instrument (TFI) (Gobbens et al. 2009) had six components rated as “very good”, the highest rating within the COSMIN checklist. The Tilburg Frailty Index had the most information about psychometric properties available, missing only information on responsiveness categories (comparison with a gold standard, and comparison before and after intervention). The three most reported tools with regard to psychometric properties were the Tilburg Frailty Index, the Canadian Study on Health and Aging Frailty Index (CSHA FI), and the Edmonton Frail Scale, missing information on only two subcomponents. The Tilburg FI also had good assessments with the COSMIN checklist with the most “very good” and “adequate” ratings. The CSHA FI had four “very good” ratings, four “adequate” ratings, one “doubtful”, and one “inadequate” rating. The Edmonton Frail Scale had only one “very good” rating, five “adequate” ratings, and three “inadequate” ratings. SHARE-FI, SHARE-FI75+, and the British Frailty Instrument also had information for most psychometric properties, missing only three subcomponents of the COSMIN checklist. SHARE-FI had five ratings of “very good”, three of “adequate” and one of “doubtful” with the remainder not reported. SHARE-FI75+ has similar ratings, with four falling under “very good”, four under “adequate” and one as “doubtful”. The British Frailty instrument however, had slightly lower ratings with three “inadequate” ratings, two “adequate” and four “very good”. Convergent validity and comparison with another instrument were frequently reported in the included articles (n=66 and n=68 respectively). The least assessed psychometric properties were comparison to gold standard (n=0) and comparison before and after intervention (n=2). Full assessment of articles using the COSMIN can be found in Appendix P.

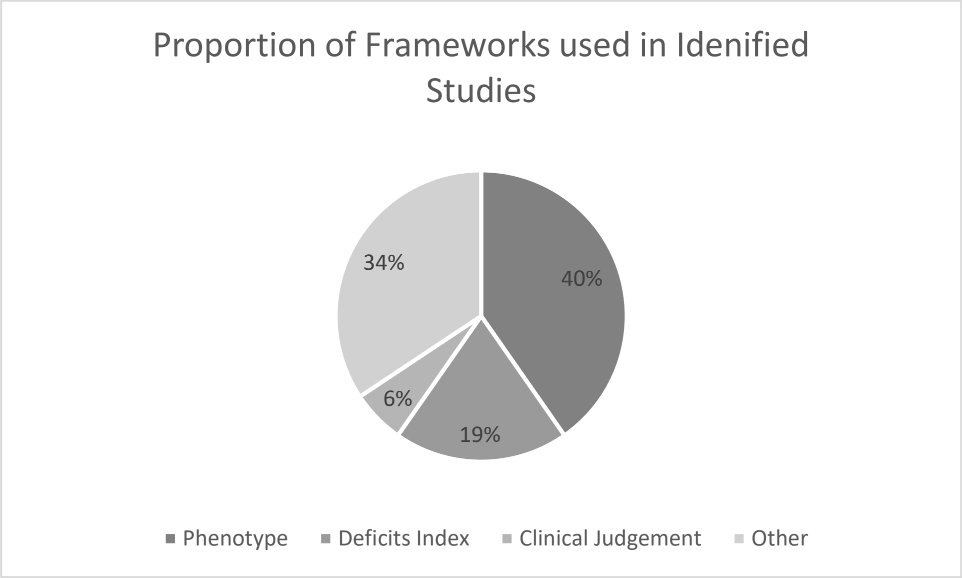


Figure 8: Frailty Tool Conceptual Frameworks

Of the tools identified, 40% (n=27) drew upon the frailty phenotype as the conceptual framework to motivate scale development. The frailty phenotype is based on Fried's criteria, which includes dysregulation in five core areas: weight (unintentional loss), energy, strength, speed, and physical activity (Morley et al. 2013). The 'accumulation of deficits' model was cited as the framework in 19% (n=13) of the tools. This model adds together a person's deficits to create a score (Lacas & Rockwood, 2012), with deficits including signs and symptoms of disease, diagnosed disease, disabilities and laboratory measurements (Rockwood & Mitinksi, 2007). Clinical judgement, described as physicians' assessment based on diagnoses and assessments related to variables associated with comorbidity (Rockwood et al. 2005), was cited by 6% (n=4) as the conceptual framework, and 34% (n=23) cited some other conceptual framework or model for frailty screening tool development. Figure 8 visually demonstrates the proportion of conceptual frameworks used in the identified tools.

Discussion:

Overall, the psychometric testing of the 67 identified frailty screening tools were not readily available or lacked enough evidence to provide a through appraisal of the developmental quality based on the COSMIN checklist. Despite many tools testing convergent validity, testing was not substantive enough to make thorough reliability and validity assessments, with under half of identified tools providing any information on reliability and validity. Thorough psychometric testing for tools is important. When limited information on psychometric properties is available generalisability of study results and conclusions that can be drawn is also limited (Sutton et al. 2016). Furthermore, when the evidence for the psychometric testing of a tool is insufficient, researchers clinicians and policy makers cannot be sure about the ability of a tool to accurately and consistently measure frailty. This could result in misclassification of people as frail or vice versa, resulting in frail or pre-frail individuals receiving care plans that are not relevant to their current health situation, and increase the risks of outcomes known to be influenced by frailty status such as falls, disability, hospitalization and mortality (Buckinx et al. 2015). Alternatively, individuals misclassified as frail who are fit may result in use of unnecessary resources, such as homecare, that could be better served for others who are at increased risks of adverse outcomes (Buckinx et al. 2015).

The Tilburg FI was the most tested tool with fairly good ratings on the COSMIN checklist, supporting results found in previous reviews (Sutton et al. 2016; Apostolo et al. 2017). Other tools that show promise include the SHARE-FI, Edmonton Frail Scale, and Frailty Index based on primary care data, as these tools had a higher prevalence of “very good” or “adequate” ratings, indicating that researchers have included appropriate methods and reported these outcomes within their assessment of tools. These tools may prove most useful for clinicians and researchers due to their more rigorous development and available information on psychometric testing. Tools that have more rigorous development and psychometric testing should reduce the occurrence of frailty misdiagnosis, helping to ensure those with the highest need obtain the resources and support required. While this review indicates if appropriate testing was completed, the quality of the results of this testing is not reported in this review. Future work should examine the quality of results presented in articles to provide a more thorough analysis of the identified frailty screening tools.

There has been a clear increase in the number of frailty screening tools developed and published, as can be seen from the spike from 37 articles identified in a previous systematic review by Sutton et al. (2016), to the 67 described in the present article only two years later. This increase in the number of tools reflects disagreement among researchers and clinicians on frailty conceptualizations (Sutton et al. 2016). Without agreement on the conceptualization of frailty, tools may continue to be developed alongside the evolving definition of frailty. There have been several calls for consensus on frailty (Morley et al. 2013), and with the increasing number of tools using various conceptual frameworks this need for consensus becomes more apparent. Researchers have indicated that routine frailty screening can improve outcomes for older adults, identify areas for intervention earlier, and overall improve quality of life (Mudge et al. 2018). Yet, with so many tools available, and with limited understanding of their psychometric properties, it becomes problematic to identify which tool is most appropriate in any one situation. Researchers should aim to agree on a frailty definition to assist with further evaluation, modification, or development of tools. Without consensus regarding the conceptualization and definition of frailty, it is likely more tools will continue to be developed that suit the needs or comfort levels of researchers as opposed to defined conceptualizations (Lacas & Rockwood, 2012).

While the conceptualization of frailty remains debated, existing frailty screening tools can be further evaluated to improve the understanding of their reliability and validity using the most up-to-date and frequently used conceptualizations of frailty to ensure tools are still relevant and useful for current practices. Previous research indicates that two prominent definitions of frailty are currently in use, the syndrome or phenotype approach and the accumulation of deficits model (Lacas & Rockwood, 2012). Frailty screening tools could be evaluated based on these two models to help identify the most appropriate tools and specify which tools may need modification or retirement based on these evaluations. Using the two most prominent definitions of frailty as a backbone for the evaluation of frailty screening tools may also provide an indication for which tools would be most appropriate in which healthcare settings. Future research should focus on identifying the best available frailty screening tool options for various clinical and research settings such as primary care settings, hospitals, long-term care, and self-report options based on the most prominent conceptualizations of frailty.

Rigorous search and screening methods were employed to identify relevant scales, and a well-developed checklist (COSMIN) was used to identify strengths and weaknesses in tool development and psychometric testing. However, the initial title-abstract screen of studies was completed by only one reviewer, which could introduce selection bias. Studies that examined frailty within specific sub-populations were excluded from this study, limiting the number of tools that were included in this review. For example, tools intended for cancer patients, cardiac patients, or psychogeriatric patients were excluded. One researcher completed reference checks on any previous systematic reviews identified in the systematic search process, but did not reference check all identified individual articles after the title-abstract screen. This could limit the scope of articles included and may have overlooked studies which extended testing of the psychometric properties of tools. However, the researchers employed a broad search strategy to identify articles, and believe the results are reasonable due to the large number of studies already identified, and the extensive list of frailty screening tools that were included in the current review.

The COSMIN checklist helped to identify whether important components were reported in the articles, but did not indicate if authors completed these components properly, or the strength of the results. The quality of the work may not be reflected in the quality of the reporting, and boxes 3-10 of the COSMIN checklist can only assess the latter. As an example, researchers were able to identify if an intraclass correlation coefficient (ICC) was sufficiently reported but did not report whether authors used the correct ICC. This was considered out of scope for this review, as it did not aim to report the quality of the psychometric properties, but rather how they existed within the current literature.

Conclusion:

This review provides insights into the increasing number of published frailty screening tools available. Authors observed an influx of screening tools published over the past decade. The review also identified and reported on the level and type of psychometric testing of these tools for which there is published data. It was noted that many tools are still missing significant information regarding psychometric properties. The Tilburg Frailty indicator remains one of the most reported frailty screening tools available, with good information available on its psychometric properties. Several tools show promising potential but require further review and testing in different clinical and research settings is required. Overall, the quality of tools and their appropriateness for use in various settings remains unclear and suggests a need for further examination.

Extended Discussion:

This study used a two-phase methodological approach to understand stakeholders perspectives on frailty screening, identify published tools for evaluation of frailty in older adults; identify domains assessed within frailty screening tools; understand the conceptual frameworks used for frailty screening tools; and report the quality of tool development, and the level and type of psychometric testing for these tools. Completion of the two methodological phases allows for comparison between stakeholder's perceptions of what domains should be included in frailty screening and what domains are included in frailty screening. Complementing this comparison, reporting the psychometric testing and conceptual frameworks used helps to provide insights into the quality of current frailty screening tools by outlining the amount of testing that has been completed.

The domain mapping results indicated that some screening tools were multifactorial in their assessment of frailty. Broadly speaking, over half of identified screening tools included all domains in some manner indicating a more holistic evaluation of frailty. The inclusion of holistic factors aligns with what stakeholders identified as important to consider within frailty screening. However, there are significant differences in how these domains are measured between tools. This is likely caused by the debate in how frailty is defined and conceptualized, resulting in an increased number of published tools to evaluate frailty based on researchers' stated conceptualizations. Currently, the most prominent conceptualizations of frailty are the frailty phenotype or syndrome, and the accumulation of deficits model (Lacas & Rockwood, 2012). Both models place focus on physiological components of frailty, but previous research has identified that frailty prevalence estimates increase when psychosocial components are included in evaluation (Lacas & Rockwood, 2012; Collard et al. 2012), and stakeholders in our study discussed the importance of including these components when evaluating frailty. Yet, results of the domain mapping indicate that there are many tools which do not evaluate holistic factors, the implication being that individuals may be misclassified as “fit” or “frail” when they are not. Individuals may require support in psychological or social aspects that are known to contribute to frailty (Levers et al. 2006) but not have access to these types of resources if they are not recognized, resulting in further decline.

Psychological factors related to frailty identified by stakeholders in this study primarily included cognitive impairment and mental health. The domain mapping results found that cognition and mental health were also the two most commonly included psychological factors in the frailty screening tools identified, demonstrating agreement between stakeholders and developed screening tools. Participants also described how psychological factors could be the triggering event that causes the onset of frailty, supporting previous qualitative work by Schoenborn et al. (2018). Cognition was described as influencing other domains of health such as physical or social domains due to the processing impairments that may be occurring. For example, cognitive impairment or mental health could result in social isolation or loneliness due to withdrawal from activities of pleasure. Loneliness was described by participants as being significant to overall health, a finding supported by Gale et al. (2017) who found loneliness was a significant predictor in the progression of frailty.

Participants also identified living alone as a risk factor for frailty, due to the increased risk of loneliness. The domain mapping results indicated that living alone was the most commonly included social component, followed by social status, social connections, and friend/family support. Living arrangements were described as influencing frailty when they did not align with the circumstances older adults wished to be living in, an important distinction from simply living alone. This could explain why Gale et al. (2017) only found a limited relationship between social isolation and frailty, which they measured by living alone, being unmarried, having less monthly contact with friends or family, and not being a member of community or other types of organizations. Each item measured in the social isolation score by Gale et al. (2017) may be not be an activity that aligns with the values of the person.

Physical components of frailty identified by stakeholder complemented the physical components most often identified in the literature and were included in all identified frailty screening tools. Stakeholders described functional capacity as it relates to physical strength, mobility, chronic or primary conditions, and the ability to self manage, which aligns with current literature on physical frailty (Sternberg et al. 2011), as well as domain mapping results which found almost all tools evaluated physical abilities. Falls were identified by both older adults and healthcare providers as a large concern which could lead to frailty. While Schoenborn et al. (2018) found that frailty was associated with a tendency for falling, falls were not described as an event that could lead to frailty contrary to what was found in this study. Other physical factors indicative of frailty that were identified in this study were nutrition and drug use as both influence the body's physiological or biological processes. Nutrition is accepted within the literature as affecting frailty in different ways such as through energy levels or nutritional deficiencies (Levers et al. 2006) and was evaluated in over half of the tools identified during the domain mapping activity. This study supports these findings; however, participants also outlined social aspects of eating that influence the quality and quantity of caloric intake. This result warrants further research to understand if the social aspects of eating could be better leveraged for vulnerable populations. Reduction of polypharmacy has been described as an area to help reduce frailty progression (Morley et al. 2013). Providers described specific concerns regarding polypharmacy for the frail population including negative side effects or contraindications related to falls or confusion. The number of prescriptions was often captured under medical conditions within the domain mapping activity, indicating the degree of polypharmacy.

Providers indicated that the implications of frailty with regards to their professional practice were not well articulated. Providers described a need for better guidelines and action items based on frailty risk scores. Providers understood that frailty was important but did not understand how it affected their current practices. They felt the risks of frailty needed to be more clearly articulated. Frailty has been linked to increased risk of overnight hospitalization, increased need for home care, institutionalization, falls, disability, and mortality (Buckinx et al. 2015). These identified risks require clear actions and make accurate and early identification important. Accurate identification means including holistic factors known to influence frailty, but also requires good psychometric testing of frailty screening tools to ensure they are valid and reliable. The results of the COSMIN Risk of Bias checklist indicate that the identified screening tools are missing information to properly assess if appropriate testing has been completed. As such reporting of psychometric properties is limited. This means that researchers, clinicians and policy-makers are limited in the generalizations that can be drawn and cannot make confident decisions about which tool to use in various settings (Sutton et al. 2016). The results of this study indicate that further psychometric testing is needed before firm conclusions about a “best available” frailty screening tool can be made. Specifically, tools need further reliability and validity testing that go beyond convergent validity, where researchers compare one tool to another.

This study has several limitations. First, although rigorous search processes were followed, only one reviewer engaged in title-abstract screening, introducing the risk of selection bias. PRISMA guidelines for systematic reviews were used wherever possible to try and mitigate the introduction of bias, as systematic reviews are considered the reference standard of literature reviews (Moher et al. 2015). Other review formats were considered, in particular a scoping review, but was decided against as preliminary work has already been completed which outlines a large body of research regarding frailty screening tools such as the review completed by Sutton et al. (2016). Additionally, scoping reviews do not typically complete a formal appraisal of articles as was completed using the COSMIN Risk of Bias tool (Grant & Booth, 2009). Given the multiple various objectives of this study, which used components of different methodologies, a full systematic review was not feasible nor appropriate. A critical review was inappropriate as well, as the aims of a critical review are to develop a framework or model which did not align with the goals of this study (Grant & Booth, 2009). Instead, systematic search and review methodology provided a rigorous framework while allowing for flexibility in analysis to ensure that all study objectives were met by using components from both a critical and systematic review (Grant & Booth, 2009).

A second limitation is that this review is not a full quality assessment of the tools and articles. This review reported the available psychometric testing and risk of bias but did not determine how good the quality of the psychometric properties was. For example, although this study reported if weighted kappa scores were included, and if the methods used were appropriately reported, it did not report the strength of the weighted kappa score. This limits the ability to understand the quality of the psychometric properties. However, the work completed does indicate that frailty screening tools often do not report adequate amounts of information relating to psychometric properties.

This study combined perspectives of several stakeholders across southwestern Ontario, capturing both rural and urban perspectives, providing a broad sampling of perspectives to compare against the domain mapping results. This study also identified a large number of frailty screening tools within the systematic search process, capturing over 30 additional tools beyond those identified in the previous review by Sutton et al. (2016). This provides a more accurate up-to-date representation of existing tools to the research and clinical communities. Identification of this many frailty screening tools also allowed for a broader evaluation of tools using the COSMIN Risk of Bias tool, as well as an opportunity to determine the frailty conceptualizations used within each tool.

This study supports the need for consensus on frailty. There is a demonstrated need for a consensus on the specific conceptualization and definition of frailty within research and clinical realms. Rockwood et al. (2005) noted that the indecision on frailty means it should remain an active area of inquiry and the plethora of research exploring factors which contribute to frailty since then indicates it has remained so (Levers et al.2006; Collard et al. 2012; Lacas & Rockwood, 2012; Gale et al. 2017). What may be needed now is for advocacy on a definition that best reflects results of current research so that frailty research can move forward more confidently, particularly with regards to frailty screening processes. Once a consensus is reached, the frailty screening tools which have been developed can be rigorously and confidently evaluated against specific criteria. This may help to reduce the number of tools that should be considered by retiring those which do not suit the frailty definitions or show weak psychometric properties. Future research should work towards consensus on frailty first, then psychometrically test available tools and examine which tools would be best suited for different clinical and research settings. This may not be feasible given the longstanding debate regarding frailty. However, tools should continue to be critically evaluated against the evolving definitions to ensure that frailty screening tools are reflecting the most up-to-date criteria and research findings.

Although literature has indicated frailty screening can assist with care planning (Rockwood, Theou, Mitinski, 2015), participants in this study were not clear about how. A previous review indicated that frailty tools are rarely used in clinical decision making with regards to care delivery and management (Buta et al. 2016). Research has identified that frailty screening may help with determining when a comprehensive geriatric assessment is required or assist with decision-making for more specific conditions such as diabetes through glycemic targets or blood pressure pharmacological treatments (Walston, Buta & Xue, 2018). However, without clear follow-up actions being known and available in various healthcare settings, screening for frailty is not ethical.

The implications of frailty remain important from an individual and system level standpoint. At an individual level, healthcare providers must ensure that frailty screening and interventions remain appropriate for patients. Future work should focus on developing clear action items for healthcare providers based on frailty risk scores so care planning teams can provide more individualized and effective interventions. These action items should reflect current research findings and be revisited by clinicians and researchers to ensure they remain relevant. From a system level standpoint, frailty research should continue to work toward establishing a consensus on the conceptualization and definition of frailty. Until consensus is reached, follow-up on current practices is necessary to ensure that practice and policy reflect the most up-to-date research.

Extended Conclusion:

The identification of 67 different screening tools available to evaluate frailty reflects the inconsistency in how frailty is conceptualized and defined. The tools identified used various conceptualizations in their development and were inconsistent in what factors were included in their evaluation. Stakeholders have identified multifactorial components that they feel should be included in the assessment of frailty, yet many tools are not addressing all aspects. Consensus is needed to start evaluating tools in a more rigorous manner, which will allow for better opportunity to define a gold standard and modify current tools to more accurately identify frail individuals.

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Appendices:

(A) Dynamic Biopsychosocial Model of Health

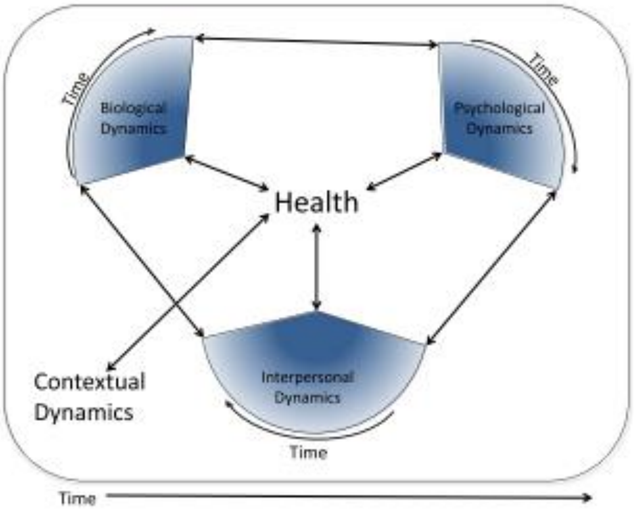


FIGURE 1 The dynamic biopsychosocial model of health. This model expands on the biopsychosocial model by incorporating a dynamic systems perspective and further clarifying social influences by applying Bronfenbrenner's theories of development. Each component of the model includes systems that reciprocally influence other dynamics in the model and also affect health. Social dynamics are divided into interpersonal factors and broader contextual dynamics (e.g., culture). Additionally, all dynamics change over time, and individual systems may ebb and flow in their level of impact on the individual's health (this ebb and flow is termed *centrality* and is represented by the blue shading in each wedge). The darker portions of the wedge include factors that are more central for the individual

Dynamic Biopsychosocial Model as described by Lehman et al. (2017) in their works titled: Rethinking the biopsychosocial model of health: Understanding health as a dynamic system

(B) Framework for Domain Mapping Exercise:

Biological Factors			
Individual Factors	Nutrition	Medical Conditions	Physical Abilities
Measurements of the person that are objective (age, sex, BMI, weight, ethnicity)	Nutritional habits including micro/macro nutrient deficiencies, unexpected weight loss/gain, appetite patterns, alcohol consumption, difficulty eating	Chronic conditions, primary conditions, and acute illness that affect the biological systems of the body, continence concerns, sleep patterns, hearing and vision concerns, polypharmacy, pain.	Functional capacity to complete Instrumental Activities of Daily Living (IADLs) or Activities of Daily Living (ADLs), risk of falls/falls history, strength, mobility, fatigue

Psychological Factors						
Self-perception	Cognitive Abilities	Emotional regulation	Motivational	Stress Appraisal	Behvaioural	Mental Health
Self-perceived health status, health attitudes, perceived health lifestyle	Cognitive impairment, dementia, Alzheimer's disease, memory concerns, thinking/ attention issues, communication concerns, worsening of decision makings	Loneliness, sadness, irritability, emotional isolation, mood	Pessimism, losing confidence, difficult starting activity, lost of interest in pleasure	Fears, feeling over-whelmed, response to stress, coping abilities	Substance use and abuse	Depression, anxiety, feeling unhappy, feeling rejected, feeling unworthy, psychiatric complaints

Social Factors					
Community	Living	Leisure	Social Status	Social connections	Family/Friend Support
Healthcare utilization, use of coordinated care services, neighborhood, public services, transportation	Living situation - alone, with spouse/ friend or family. Housing conditions. Housebound.	Ability to do leisure activities, withdrawal from activities	Socioeconomic status, financial status, education, social role, life events	Social network, people who are trusted, social vulnerability, change in social functioning	Family problems, social support, informal care

Contextual Factors			
Personal	Social	Temporal	Physical
Life goals and lifestyle, past experience, beliefs and expectations, attitudes, financial resources, other resources	Local culture - family, friends, work colleagues. General culture - laws, rights, duties, etc. Expectations, attitudes, resources	Stage in life- age and associated factors (family commitment/support, resources available, expectations, responsibilities, employment). Stage in Illness - time since onset, in context of natural history.	Actual environment, Peri-personal (clothes, aides, etc.) Local (house, larger equipment) Community (locality, transport). People as helpers

(C) Inclusion/Exclusion Criteria:

Inclusion Criteria:

- Explicitly discusses a screening or assessment method in identified to evaluate frailty
- Full text article available
- Aim of study was to discuss development or psychometric evaluation of screening tool for frailty in older adults
  - Psychometric properties of tool is discussed
    - Validity
    - Reliability
    - Reproducibility
- Purpose of tool is discussed
- Is original work towards development OR is subsequent work that describes modification or adaptation to tool

Exclusion Criteria:

- Study provided no indication of domains of screening or assessment tool, or no figures concerning psychometric properties
- Full text was not available
- Study did not refer to frailty screening, or synonyms used in practice to describe frailty screening
- Involves Animal studies
- Tool is used to evaluate frailty status in population with specific disease (cancer, diabetes, heart disease etc.)

(D) Search Strategy: MEDLINE

(screening or screen* or risk assessment or geriatric assessment or evaluation) AND (tool* or instrument* or survey* or questionnaire* or scale* or index or score or scores) AND (frail elderly or frail*) AND (validation or validate or develop* or reliability)

- ✓ Limit to English language
- ✓ Not conference abstracts.pt.

(E) Data Extraction Chart: Examples

Author(s)	**Title**	**Date of Publication**	**Source**	**Frailty defined:**	**Frailty Tool Discussed**	**Type of tool (questionnaire, scale, etc)**
Giovanni Ravaglia Paola Forti Anna Lucicesare Nicoletta Pisacane Elisa Rietti Christopher Patterson	Development of an easy prognostic score for frailty outcomes in aged	2008	Ravaglia et al. 2008	Frailty has been conceptualised as a physiologic syndrome characterised by decreased reserve and diminished resistance to stressors, resulting from cumulative decline across multiple physiologic systems during ageing, and placing older people at risk for death and other adverse health outcomes	9-item measure	Scale
Kenneth Rockwood, Karen Stadnyk, Chris MacKnight, Ian McDowell, Réjean Hébert, David B Hogan	A brief clinical instrument to classify frailty in elderly people	1999	Rockwood K, Stadnyk K, MacKnight C, et al. A brief clinical instrument to classify frailty in elderly people. Lancet. 1999;353(9148):205–6.	There is no broadly accepted definition or standard system for classification of elderly people who are at risk for adverse health outcomes	Brief Frailty Index	Frailty scale based on self-reported functional status, clinical assessment of cognition for dementia and cognitive impairment wiith no demetia

Shahrul Kamaruzzaman, George B Ploubidis, Astrid Fletcher, Shah Ebrahim	A reliable measure of frailty for Community dwelling older population	2010	Kamaruzzaman S, Ploubidis GB, Fletcher A, Ebrahim S. A reliable measure of frailty for a community dwelling older population. Health Qual Life Outcomes. 2010;8:123.	Latent vulnerability	British Frailty Index	Frailty score based on self report of health status, diseases, symptoms & signs, social and lifestyle indicators

Conceptual Framework/ Model used (Y/N)	**Conceptual Framework/ Model identified?**	**Who administers tool? (Patient/ Provider)**	**Psychometric Properties reported (Y/N)**	**Which psychometric properties are reported?**
No	N/A	Provider	Yes	Univariate associations between predictors and mortality were assessed using hazard ratios (HR) and the corresponding [95% confidence interval (CI)] from an unadjusted Cox proportional-hazards model. A risk scoring system was developed, assigning one point to each present predictor (the HRs of all selected predictors had similar magnitude) and summing the points assigned to each participant. Cox regression was used to assess the association between the score and mortality. Logistic regression was used to assess the association between the score of CSBA survivors and their 4-year risk of developing the following adverse outcomes
Yes	Geriatric Status Scale	Provider	Yes	Relative risks for death and institutionalisation and 95% CIs for each category of the frailty scale

Yes	General Specific Model	Provider	Yes	Factor Analysis with Exploratory Factor Analysis to explore the underlying factor structure of frailty indicators and develop the construct/hypothesis of fraitly and Confirmatory Factor Analysis to further test the latent structure. A Sensitivity analysis uing an unpaired t-test compared the mean difference between the complete case frailty score and the railty scores of the total population of women with missing fraitly indicators. Scree plot evaluated results of FA and both the Scree plot and the Kaiser-Guttman rule decided the number of factors to be retained for further analysis

Biological factors evaluated (Y/N)	**Which biological factors evaluated?**	**Psychological factors evaluated (Y/N)**	**Which psychological factors evaluated?**	**Social factors evaluated (Y/N)**	**Which social factors evaluated?**	**Important Outcomes from Study**
Yes	Age, gender, smoker, physical inactivity, 2 or more chronic medical conditions, 3 or more drugs used daily, sensory deficits, calf circumference, BMI, ADLs, IADLS, gait and balance	yes	Mini mental state examination, geriatric depression scale, pessimism about ones own health	Yes	Education years, living alone	Aside from frailty, the score also predicted risk of new admission to hospital, incident fractures, and incident new and worsening disability
Yes	Mobility, ADLs, continence of bowels and bladder,	Yes	Cognitive impairment, dementia	No	N/A	The frailty scale showed a dose-response relation between grades of frailty and subsequent institutionalisation

Yes	Physical ability, cardiac disease or symptoms, respiratory disease or symptoms, physiological measures, comorbidity, visual impairment	Yes	psychological problems (anxiety/depression/memory problems)	No	N/A	'Weighted' loadings form the basis for which indicator would be useful to include in a frailty measure. In both datasets, a majority of indicators represented by physical ability were ones that best explained frailty. This supports the theory that frailty is identified through characteristics directly related to physical function. This new measure provides more precise information than is currently recognized, of which cluster of frailty indicators are important in older people.

(F) Chart for Reporting results of Domain mapping Exercise:

Frailty Tool	Reference	Biological Factors				Psychological Factors							Social Factors						Contextual Factors			
		Personal Factors	Nutrition	medical conditions	Physical Abilties	Self- Perception	Cognitive Abilities	Emotional regulation	Motivation	Stress Appraisal	Behvaioural	Mental Health	Community	Living	Leisure	Social Status	Social connections	Family/ Friend Support	Personal	Social	Temporal	Physical
9 item measure	Ravaglia et al. 2008	1		1	1		1		1		1	1		1		1			1		1	1
Brief Frailty Index	Rockwood et al. 1999			1	1		1															
British Frailty Index	Kamaruzzaman et al. 2010			1			1					1									1	
CAN Score	Ruiz et al 2018 (a)			1																	1	
	Ruiz et al. 2018 (b)	1		1									1						1		1	
CGIC-PF	Studenski et al. 2004	1	1	1	1							1	1	1		1			1	1	1	1
Clinical Judgement Method	Brody et al. 2002		1	1	1		1							1							1	1
Clinical Frailty Scale	Rockwood et al. 2005			1	1		1							1								1
Comprehensive Frailty Assessment	DeWitte et al. 2013 (a)				1			1	1	1		1	1	1			1	1	1	1	1	1
	DeWitte et al. 2013 (b)																					
Continuous composite	Buchman et al. 2009	1			1																	

measure of frailty																						
CP-FI-CGA	Goldstein et al. 2015		1	1	1	1	1		1			1							1		1	1
CSHA-CFS	Cheng et al. 2010		1	1	1											1			1		1	1
EASY-Care	Jotheeswaran et al. 2016		1	1	1								1			1			1			
EASY-Care TOS	van Kempen et al. 2013			1	1		1	1				1					1	1		1	1	
	van Kempen et al. 2014																					
Edmonton Frail Scale	Dent et al. 2009		1	1	1	1	1	1						1				1	1	1		1
	Rolfson et al. 2006																					
Electronic Frailty Index	Clegg et al. 2016			1	1		1						1	1			1		1	1	1	1
Empirical Method Screening	Brody et al. 2002	1	1	1	1									1	1						1	1
Evaluative Frailty index for Physical Activity	de Vries et al. 2013			1	1		1	1	1	1		1	1	1	1			1	1	1	1	1
FI based on primary care data	Drubbel et al. 2013			1			1				1	1	1		1	1	1		1	1	1	1
FI-ARC	Burn et al. 2018		1	1	1		1	1			1	1	1		1		1		1	1	1	1
FI-CGA	Jones et al. 2005		1	1	1		1	1						1							1	1
	Jones et al. 2004																					
FI-ED	Brousseau et al. 2018		1	1	1	1	1	1		1	1	1						1	1	1		
FIFE	Tocchi et al. 2014		1	1	1	1									1				1			
FiND	Cesari et al. 2014		1		1				1		1								1			

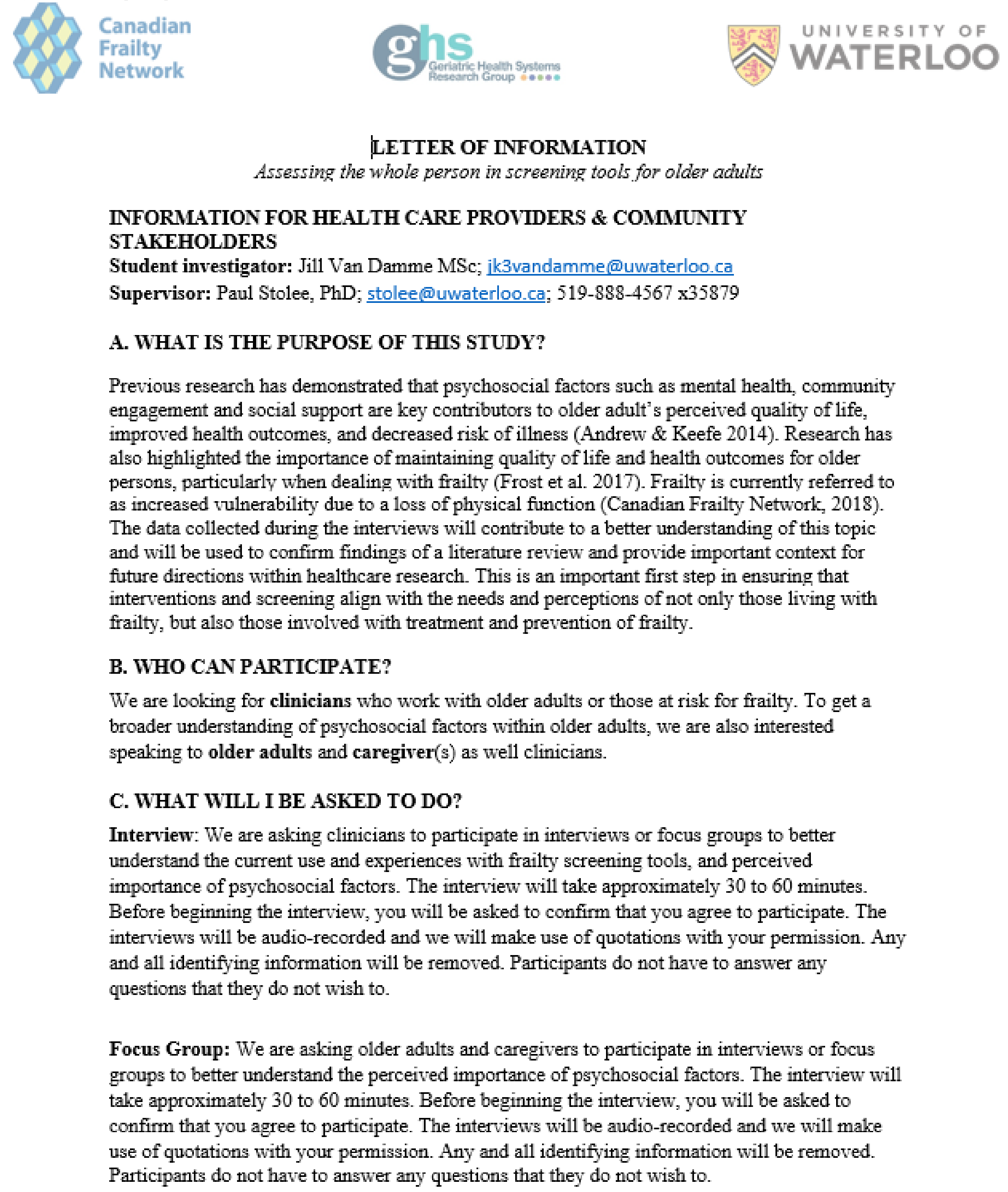
FRAIL-NH	Luo et al. 215		1	1	1						1								1		1	1
FRAILOMIC	Erusalimsky et al. 2015		1	1	1					1									1	1	1	
Frailty Index	Kanters et al. 2017			1	1		1	1	1		1	1							1		1	
Frailty Index	Searle et al. 2008	1		1	1			1	1		1	1									1	
Frailty Portal	Lawson et al. 2017	1	1	1	1		1					1								1	1	
Frailty Screening Tool	Doba et al. 2012	1	1	1	1		1					1									1	
Frailty Trait Scale	Garcia-Garcia et al. 2014	1	1	1	1		1					1					1			1	1	
FRAIL-VIG index	Amblas-Novellas et al. 2018		1	1	1		1					1					1			1	1	
FRESH-Screening	Kaja et al. 2016			1	1		1			1									1			1
Fried Frailty Index	Kim et al. 2014		1		1				1			1			1				1	1		
Gill Frailty Instrument					1																	
Functional Fitness Test	Rikli & Jones, 1999	1			1																	
Gait Speed	Castell et al. 2013	1		1	1	1	1							1		1			1		1	1
Gerontopole Frailty Screening Tool	Vellas et al. 2013		1		1		1							1								1
Groningen Frailty Index	Peters, et al 2012		1	1	1	1	1	1				1					1	1	1	1	1	1
	Daniels et al. 2012																					
	Metzelthin et al. 2010																					
	Daniels et al. 2012			1	1		1							1		1					1	1

Sherbrooke Postal Questionnaire	Metzelthin et al. 2010																					
INTER_FRAIL Study questionnaire	Di Bari et al. 2014			1	1		1							1								1
interRAI-Home Care Frailty Scale	Morris et al. 2016		1	1	1		1								1					1	1	
IVCF-20	Nunes de Moraes et al. 2016	1	1	1	1	1	1	1	1			1							1	1	1	
Kihon Checklist	Satake et al. 2016	1	1		1		1					1										
MCPS	Amici et al. 2008		1	1	1		1	1				1									1	
Modified Frailty Index	Saum et al. 2012		1		1																	
Paulson-Lichtenberg Frailty Index	Paulson & Lichtenberg 2015	1	1		1	1	1					1							1		1	
Physical Performance Battery	Chang et al. 2013	1	1	1	1									1		1					1	1
PRISMA-7	Raiche et al. 2008	1	1	1	1		1				1										1	
SEGAm	Oubayaa et al. 2014 Oubayaa et al. 2017	1	1	1	1	1	1	1						1					1		1	1
Self-administered Test	Amici et al. 2011		1	1																	1	
Self-report screening instrument	Nunes et al. 2015		1		1																	

Self-report screening instrument	de Souto Barreto et al. 2012	1	1	1	1	1								1		1			1		1	1
SHARE-FI	Romero-Ortuno 2013		1		1																	
SHARE-FI75+	Romero-Ortuno 2014		1		1																	
Short Physical Performance Battery	Da Camara et al. 2013				1																	
CHS Frailty Index	Kiely et al. 2009		1		1							1										
Study of Osteoporotic Fractures Index	Kiely et al. 2009		1		1							1										
Strawbridge Frailty Questionnaire	Matthews et al. 2003		1	1	1		1														1	
Targeted Geriatric Assessment (TaGA)	Aliberti et al. 2018		1	1	1	1	1					1						1	1	1	1	
FRAIL scale	Lopez et al. 2012		1	1	1																1	
Tilburg Frailty Index	Daniels et al. 2012	1	1	1	1	1	1	1		1		1		1		1	1	1	1	1	1	1
	Metzelthin et al. 2010																					
	Gobbens et al. 2017																					
	Gobbens et al. 2009																					
	Andreasen et al. 2015																					
Timed-up-and-go	Savva et al. 2013		1	1	1							1										
Topics-MDS	Lutomski et al. 2013			1	1		1	1						1								1

UEF-FI	Toosizadeh et al. 2017				1																	
VES-13	Min et al, 2009				1	1													1		1	
VES-HOS 2.0	Beckett et al. 2017	1		1	1			1				1			1					1	1	
Winograd Frailty Index	Winograd et al. 1991		1	1	1		1					1				1		1		1	1	
67	TOTAL:	20	43	50	63	13	37	16	9	6	9	29	8	19	8	11	9	9	29	21	43	26
% of all tools		30%	64%	75%	94%	19%	57%	24%	13%	9%	13%	43%	12%	28%	12%	16%	13%	13%	43%	31%	64%	39%
% of tools that include specific domain		30%	64%	75%	94%	27%	76%	33%	18%	12%	18%	59%	23%	54%	23%	31%	26%	26%	56%	40%	83%	50%

(G) Letter of Information



LETTER OF INFORMATION

Assessing the whole person in screening tools for older adults

INFORMATION FOR HEALTH CARE PROVIDERS & COMMUNITY STAKEHOLDERS

Student investigator: Jill Van Damme MSc; jk3vandamme@uwaterloo.ca
Supervisor: Paul Stolee, PhD; stolee@uwaterloo.ca; 519-888-4567 x35879

A. WHAT IS THE PURPOSE OF THIS STUDY?

Previous research has demonstrated that psychosocial factors such as mental health, community engagement and social support are key contributors to older adult's perceived quality of life, improved health outcomes, and decreased risk of illness (Andrew & Keefe 2014). Research has also highlighted the importance of maintaining quality of life and health outcomes for older persons, particularly when dealing with frailty (Frost et al. 2017). Frailty is currently referred to as increased vulnerability due to a loss of physical function (Canadian Frailty Network, 2018). The data collected during the interviews will contribute to a better understanding of this topic and will be used to confirm findings of a literature review and provide important context for future directions within healthcare research. This is an important first step in ensuring that interventions and screening align with the needs and perceptions of not only those living with frailty, but also those involved with treatment and prevention of frailty.

B. WHO CAN PARTICIPATE?

We are looking for **clinicians** who work with older adults or those at risk for frailty. To get a broader understanding of psychosocial factors within older adults, we are also interested speaking to **older adults** and **caregiver**(s) as well clinicians.

C. WHAT WILL I BE ASKED TO DO?

Interview: We are asking clinicians to participate in interviews or focus groups to better understand the current use and experiences with frailty screening tools, and perceived importance of psychosocial factors. The interview will take approximately 30 to 60 minutes. Before beginning the interview, you will be asked to confirm that you agree to participate. The interviews will be audio-recorded and we will make use of quotations with your permission. Any and all identifying information will be removed. Participants do not have to answer any questions that they do not wish to.

Focus Group: We are asking older adults and caregivers to participate in interviews or focus groups to better understand the perceived importance of psychosocial factors. The interview will take approximately 30 to 60 minutes. Before beginning the interview, you will be asked to confirm that you agree to participate. The interviews will be audio-recorded and we will make use of quotations with your permission. Any and all identifying information will be removed. Participants do not have to answer any questions that they do not wish to.

D. WHERE WILL THE STUDY TAKE PLACE AND WHEN?

The study will take approximately 1 year to complete from initiation of the project. Your participation will only require you to participate in an interview or focus group once, which will take approximately 30-60 minutes.

E. CAN I CHANGE MY MIND ABOUT PARTICIPATING IN THE STUDY?

You may withdraw from the study at any time up until the point of publication. If you wish to withdraw, you can let the interviewer know any time during the interview, or you can contact Jill Van Damme via email: jk3vandamme@uwaterloo.ca.

F. RISKS AND BENEFITS

There is potential risk to participation in this study. Risks pertain to the focus group participation. Although the researchers will keep your identity confidential and will ask others in the group to do so, there is no guarantee that the other will do so. If this is a concern, but you would still like to participate in the study, an interview can be organized instead.

You will not receive remuneration for participation in the study.

G. CONFIDENTIALITY AND DATA SECRUITY

Once all the data are collected and analyzed for this project, we plan on sharing this information with the research community through seminars, conferences, presentations, and journal articles. Your identity will be kept confidential. Your name will not appear in any report or publication resulting from this study. Any quotations used in reports from your interview will be referenced as anonymous.

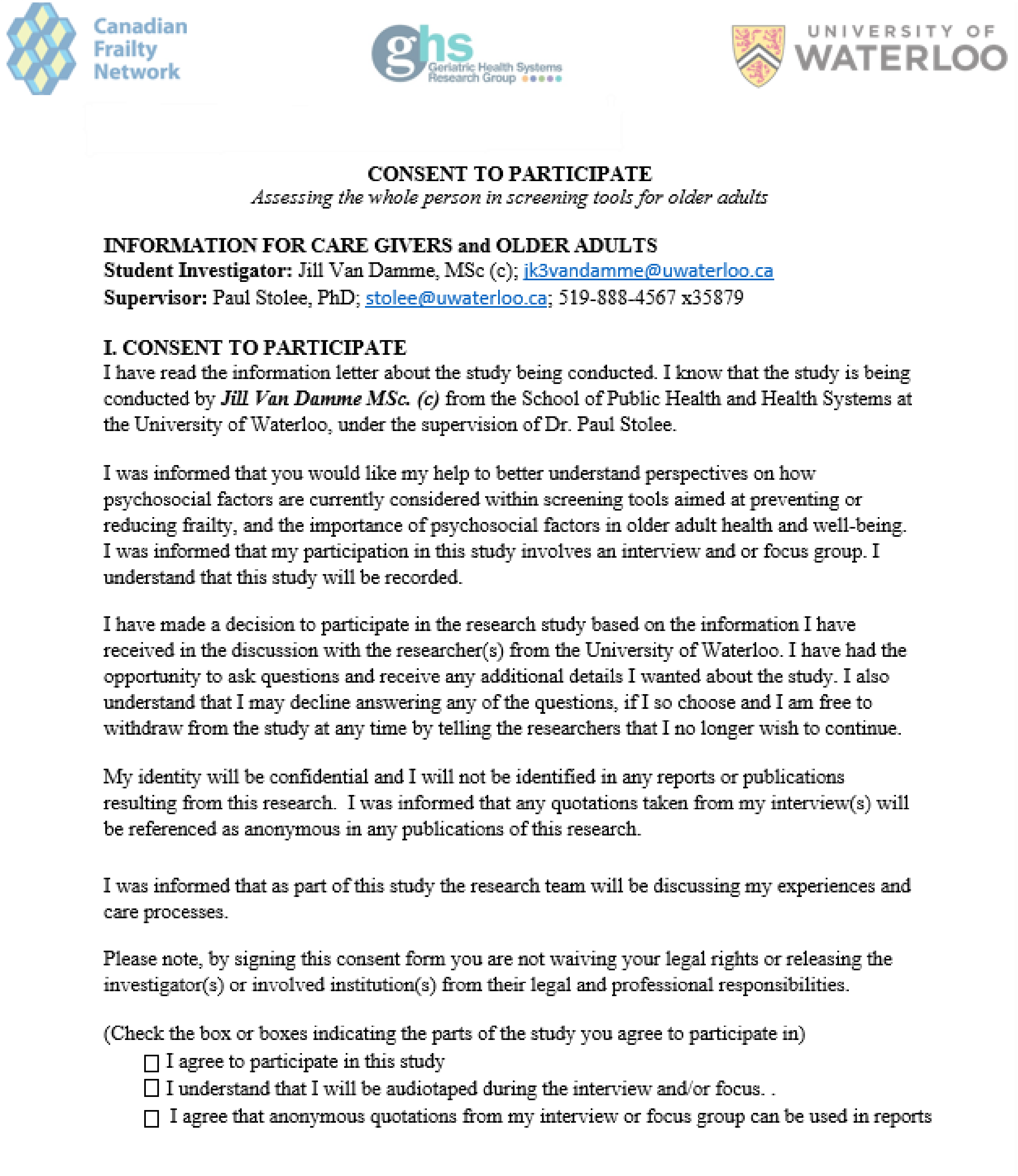
Data collected will be kept securely stored in a locked office for a minimum retention period of 5 years, and then confidentially destroyed. The answers to the interviews will be stored in a locked file cabinet, in a locked office, at the University of Waterloo for a minimum retention period of 5 years. After 5 years, any written notes from the interview will be confidentially shredded and electronic files will be erased after a minimum retention period of 5 years. Only members of the research team who have signed a confidentiality agreement regarding information collected during the study, will have access to the study data.

H. QUESTIONS

If at any time you have questions about the proposed research, please contact the Supervisor: Paul Stolee, PhD, School of Public Health and Health Systems, University of Waterloo, Waterloo, Ontario, 519-888-4567 ext. 35879, stolee@uwaterloo.ca or Student Investigator: Jill Van Damme, MSc. (c) School of Public Health and Health Systems, University of Waterloo, Waterloo, Ontario, 226-787-0619, jk3vandamme@uwaterloo.ca

This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee (ORE #23037). If you have questions for the Committee contact the Chief Ethics Officer, Office of Research Ethics, at 1-519-888-4567 ext. 36005 or ore-ceo@uwaterloo.ca.

(H) Consent Forms



CONSENT TO PARTICIPATE

Assessing the whole person in screening tools for older adults

INFORMATION FOR CARE GIVERS and OLDER ADULTS
Student Investigator: Jill Van Damme, MSc (c); jk3vandamme@uwaterloo.ca
Supervisor: Paul Stolee, PhD; stolee@uwaterloo.ca; 519-888-4567 x35879

I. CONSENT TO PARTICIPATE

I have read the information letter about the study being conducted. I know that the study is being conducted by ***Jill Van Damme MSc. (c)*** from the School of Public Health and Health Systems at the University of Waterloo, under the supervision of Dr. Paul Stolee.

I was informed that you would like my help to better understand perspectives on how psychosocial factors are currently considered within screening tools aimed at preventing or reducing frailty, and the importance of psychosocial factors in older adult health and well-being. I was informed that my participation in this study involves an interview and or focus group. I understand that this study will be recorded.

I have made a decision to participate in the research study based on the information I have received in the discussion with the researcher(s) from the University of Waterloo. I have had the opportunity to ask questions and receive any additional details I wanted about the study. I also understand that I may decline answering any of the questions, if I so choose and I am free to withdraw from the study at any time by telling the researchers that I no longer wish to continue.

My identity will be confidential and I will not be identified in any reports or publications resulting from this research. I was informed that any quotations taken from my interview(s) will be referenced as anonymous in any publications of this research.

I was informed that as part of this study the research team will be discussing my experiences and care processes.

Please note, by signing this consent form you are not waiving your legal rights or releasing the investigator(s) or involved institution(s) from their legal and professional responsibilities.

(Check the box or boxes indicating the parts of the study you agree to participate in)
- ☐ I agree to participate in this study
- ☐ I understand that I will be audiotaped during the interview and/or focus. .
- ☐ I agree that anonymous quotations from my interview or focus group can be used in reports

Participant Name: ______________________________ (Please print)

Participant Signature: ______________________________

Witness Name: __________________________________ (Please print)

Witness Signature: ________________________________

Date: ______________________________

When this study is completed, we will write a summary of the results. Would you be interested in receiving a copy?

☐ YES, please e-mail me a summary of the results. My e-mail address is:

____

☐ NO, I do not wish to receive a summary of results

This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee (ORE #23037). If you have questions for the Committee contact the Chief Ethics Officer, Office of Research Ethics, at 1-519-888-4567 ext. 36005 or ore-ceo@uwaterloo.ca

CONSENT TO PARTICIPATE

Assessing the whole person in screening tools for older adults

INFORMATION FOR CLINICIANS

Student Investigator: Jill Van Damme, MSc (c); jk3vandamme@uwaterloo.ca
Supervisor: Paul Stolee, PhD; stolee@uwaterloo.ca; 519-888-4567 x35879

I. CONSENT TO PARTICIPATE

I have read the information letter about the study being conducted. I know that the study is being conducted by ***Jill Van Damme MSc. (c)*** from the School of Public Health and Health Systems at the University of Waterloo, under the supervision of Dr. Paul Stolee.

I was informed that you would like my help to validate findings of a literature review conducted. I understand that you would also like my help to better understand perspectives on how psycho-factors are currently considered within screening tools aimed at preventing or reducing frailty, and the importance of psycho-social factors in older adult health and well-being. I was informed that my participation in this study involves an interview or focus group. I understand that this study will be recorded.

I have made a decision to participate in the research study based on the information I have received in the discussion with the researcher(s) from the University of Waterloo. I have had the opportunity to ask questions and receive any additional details I wanted about the study. I also understand that I may decline answering any of the questions, if I so choose and I am free to withdraw from the study at any time by telling the researchers that I no longer wish to continue.

My identity will be confidential and I will not be identified in any reports or publications resulting from this research. I was informed that any quotations taken from my interview(s) will be referenced as anonymous in any publications of this research.

I was informed that as part of this study the research team will be discussing my experiences, and referral and care processes.

Please note, by signing this consent form you are not waiving your legal rights or releasing the investigator(s) or involved institution(s) from their legal and professional responsibilities.

(Check the box or boxes indicating the parts of the study you agree to participate in)

- ☐ I agree to participate in this study
- ☐ I understand that I will be audiotaped during the interview or focus group
- ☐ I agree that anonymous quotations from my interview or focus group can be used in reports

Participant Name: ______________________________ (Please print)

Participant Signature: ______________________________

Witness Name: __________________________________ (Please print)

Witness Signature: ________________________________

Date: ______________________________

When this study is completed, we will write a summary of the results. Would you be interested in receiving a copy?

☐YES, please e-mail me a summary of the results. My e-mail address is:

____

☐NO, I do not wish to receive a summary of results

This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee (ORE #23037). If you have questions for the Committee contact the Chief Ethics Officer, Office of Research Ethics, at 1-519-888-4567 ext. 36005 or ore-ceo@uwaterloo.ca.

(I) Feedback Letter

FEEDBACK LETTER FOR PARTICIPANTS

Assessing the whole person in screening tools for older adults

Dear Participant,

I would like to thank you for your participation in this study entitled Assessing the whole person: examining how psychosocial factors are currently considered within frailty screening tools. The purpose of this study is to better understand how these factors are considered in tools aimed to prevent or reduce frailty, and how older adults, care-givers, and clinicians perceive its importance.

The data collected during interviews will contribute to a better understanding of this topic and will be used to inform researchers and policy makers on how to better meet the needs of older adults.

Please remember that any data pertaining to you as an individual participant will be kept confidential. Once all the data are collected and analyzed for this project, we plan on sharing this information with the research community through seminars, conferences, presentations, and journal articles. If you are interested in receiving more information regarding the results of this study, or would like a summary of the results, please provide your email address, and upon completion of this study (approximately August 2019), I will send you the information. If you have any questions about the study, please do not hesitate to contact myself or my supervisor by email or telephone as noted below.

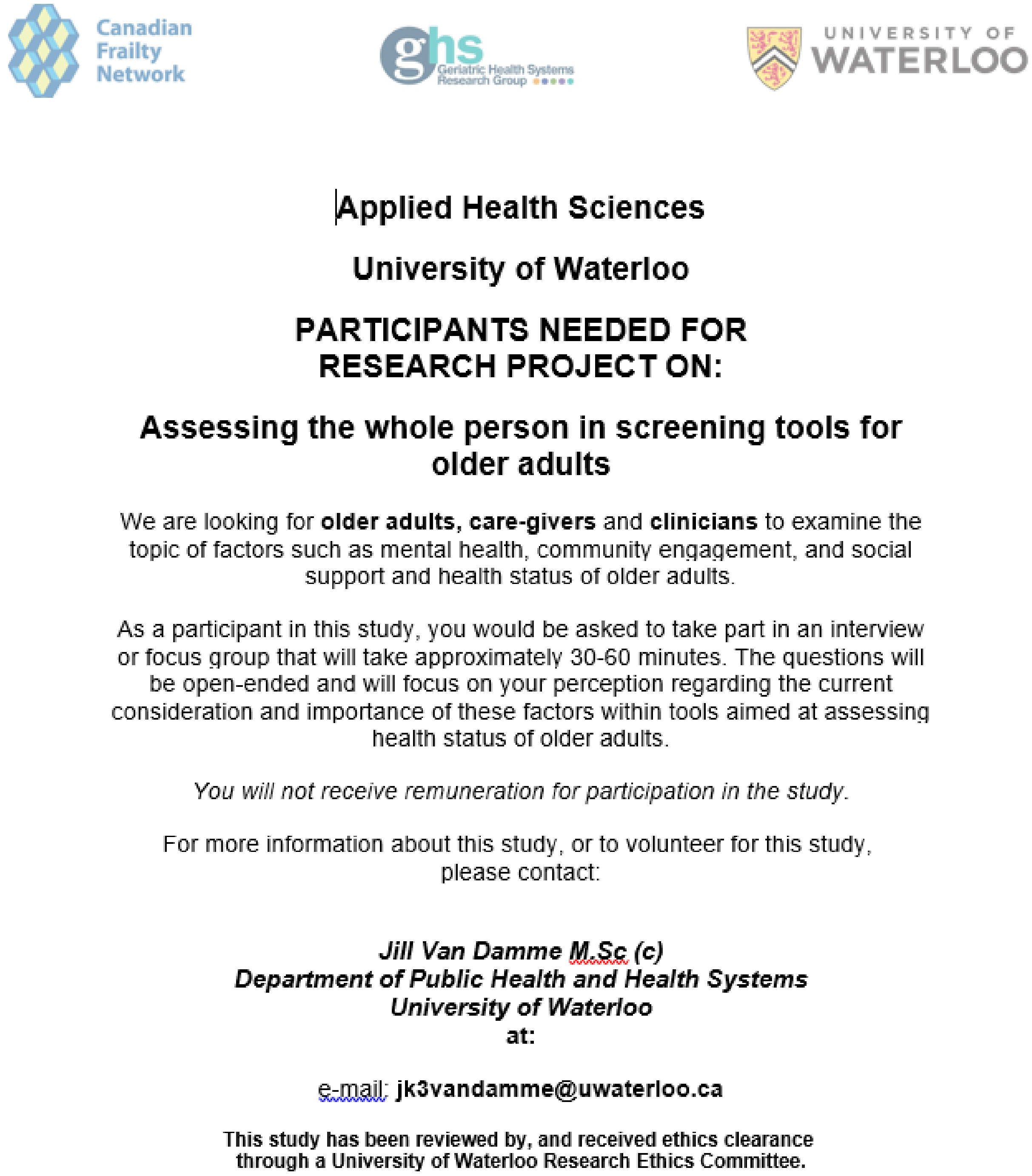
This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee (ORE #23037). If you have questions for the Committee contact the Chief Ethics Officer, Office of Research Ethics, at 1-519-888-4567 ext. 36005 or ore-ceo@uwaterloo.ca.

Sincerely,

Jill Van Damme (Student investigator)
University of Waterloo
School of Public Health and Health Systems
Email: jk3vandamme@uwaterloo.ca
Website: https://uwaterloo.ca/geriatric-health-systems-research-group/

Dr. Paul Stolee (Faculty supervisor)
University of Waterloo
School of Public Health and Health Systems
Email: stolee@uwaterloo.ca
Phone: 519-888-4567 x35879

(J) Recruitment Poster:



Applied Health Sciences

University of Waterloo

PARTICIPANTS NEEDED FOR RESEARCH PROJECT ON:

Assessing the whole person in screening tools for older adults

We are looking for **older adults, care-givers** and **clinicians** to examine the topic of factors such as mental health, community engagement, and social support and health status of older adults.

As a participant in this study, you would be asked to take part in an interview or focus group that will take approximately 30-60 minutes. The questions will be open-ended and will focus on your perception regarding the current consideration and importance of these factors within tools aimed at assessing health status of older adults.

You will not receive remuneration for participation in the study.

For more information about this study, or to volunteer for this study,
please contact:

Jill Van Damme M.Sc (c)
Department of Public Health and Health Systems
University of Waterloo
at:

e-mail: **jk3vandamme@uwaterloo.ca**

This study has been reviewed by, and received ethics clearance through a University of Waterloo Research Ethics Committee.

(K) Email to gatekeepers

Study Recruitment Email – for Gatekeepers

Assessing the whole person in screening tools for older adults

Dear Gatekeeper,

My name is Jill Van Damme, and I am a Master's student working under the supervision of Dr. Paul Stolee at the University of Waterloo School of Public Health and Health Systems.

We are looking for participants for a study on how factors such as mental health, community involvement, and social supports (often referred to as psychosocial factors) are considered within tools aimed are preventing or reducing frailty in older adults. To engage potential participants we are asking for permission to post a recruitment poster in your space.

I would like to assure you that this study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee.

Researchers will not associate your office or any identifying factors with any information that is collected from participants recruited through your space. All personal information you provide will be considered confidential, you will not be identified by name in any report or publication resulting from this study.

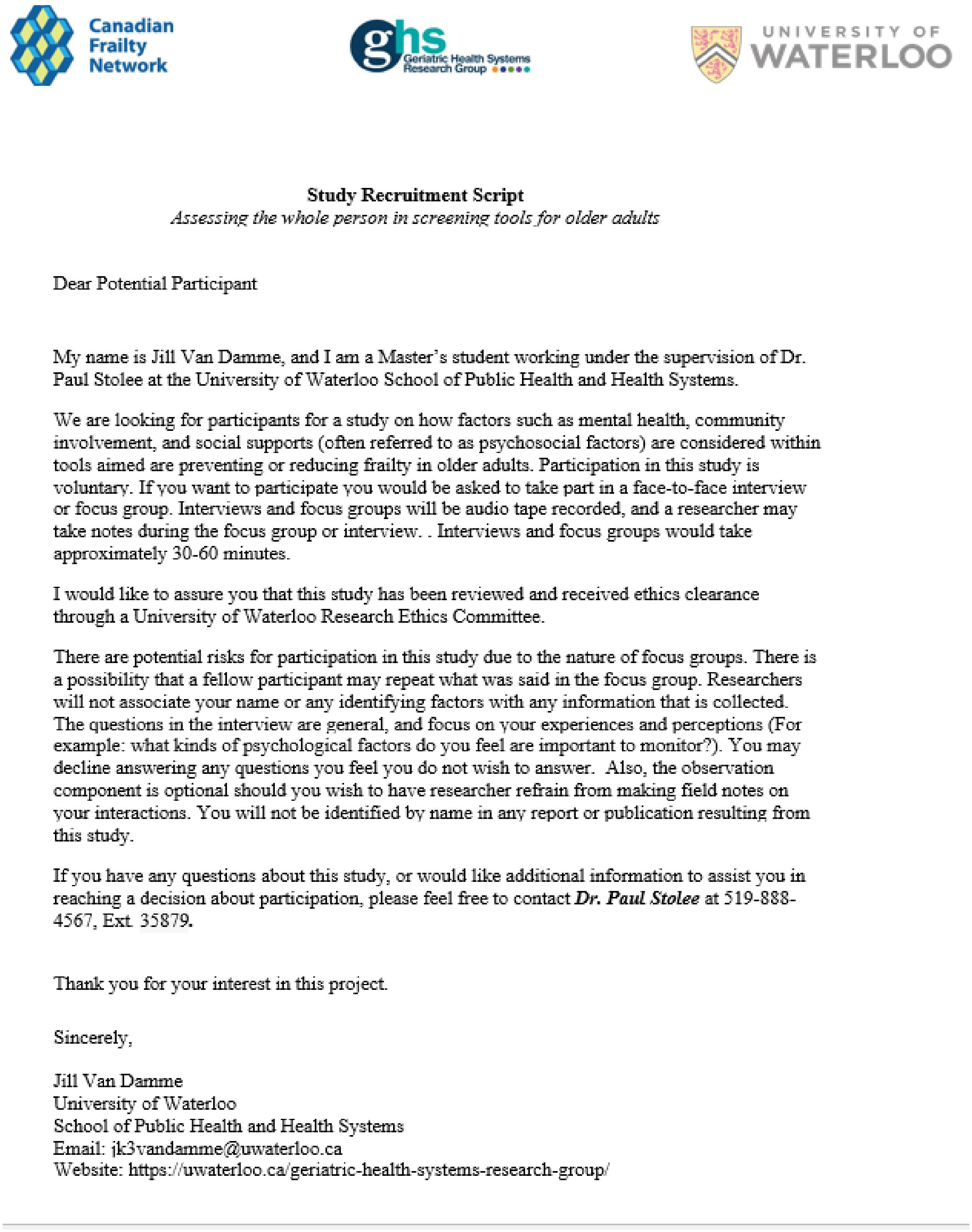
If you have any questions about this study, or would like additional information to assist you in reaching a decision regarding the posting of a recruitment poster in your space, please feel free to contact myself at jk3vandamme@uwaterloo.ca, or my supervisor ***Dr. Paul Stolee*** at stolee@uwaterloo.ca or 519-888-4567, Ext. 35879.

Thank you for your consideration.

Sincerely,

Jill Van Damme
University of Waterloo
School of Public Health and Health Systems
Email: jk3vandamme@uwaterloo.ca
Website: https://uwaterloo.ca/geriatric-health-systems-research-group/

(L) Recruitment Script:



Study Recruitment Script

Assessing the whole person in screening tools for older adults

Dear Potential Participant

My name is Jill Van Damme, and I am a Master's student working under the supervision of Dr. Paul Stolee at the University of Waterloo School of Public Health and Health Systems.

We are looking for participants for a study on how factors such as mental health, community involvement, and social supports (often referred to as psychosocial factors) are considered within tools aimed are preventing or reducing frailty in older adults. Participation in this study is voluntary. If you want to participate you would be asked to take part in a face-to-face interview or focus group. Interviews and focus groups will be audio tape recorded, and a researcher may take notes during the focus group or interview. . Interviews and focus groups would take approximately 30-60 minutes.

I would like to assure you that this study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee.

There are potential risks for participation in this study due to the nature of focus groups. There is a possibility that a fellow participant may repeat what was said in the focus group. Researchers will not associate your name or any identifying factors with any information that is collected. The questions in the interview are general, and focus on your experiences and perceptions (For example: what kinds of psychological factors do you feel are important to monitor?). You may decline answering any questions you feel you do not wish to answer. Also, the observation component is optional should you wish to have researcher refrain from making field notes on your interactions. You will not be identified by name in any report or publication resulting from this study.

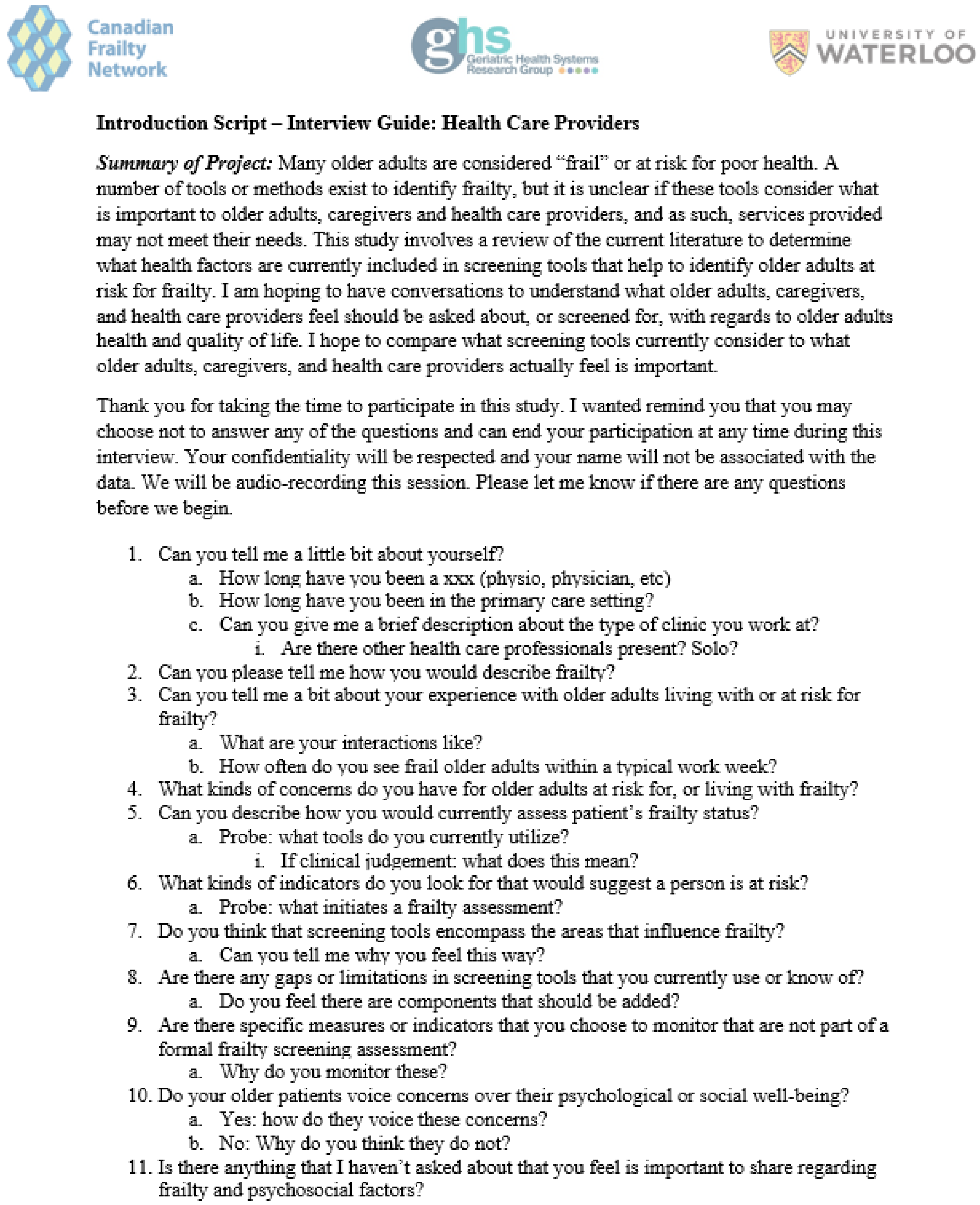
If you have any questions about this study, or would like additional information to assist you in reaching a decision about participation, please feel free to contact ***Dr. Paul Stolee*** at 519-888-4567, Ext. 35879**.**

Thank you for your interest in this project.

Sincerely,

Jill Van Damme
University of Waterloo
School of Public Health and Health Systems
Email: jk3vandamme@uwaterloo.ca
Website: https://uwaterloo.ca/geriatric-health-systems-research-group/

(M) Qualitative Interview Guides:



Introduction Script – Interview Guide: Health Care Providers

Summary of Project: Many older adults are considered "frail" or at risk for poor health. A number of tools or methods exist to identify frailty, but it is unclear if these tools consider what is important to older adults, caregivers and health care providers, and as such, services provided may not meet their needs. This study involves a review of the current literature to determine what health factors are currently included in screening tools that help to identify older adults at risk for frailty. I am hoping to have conversations to understand what older adults, caregivers, and health care providers feel should be asked about, or screened for, with regards to older adults health and quality of life. I hope to compare what screening tools currently consider to what older adults, caregivers, and health care providers actually feel is important.

Thank you for taking the time to participate in this study. I wanted remind you that you may choose not to answer any of the questions and can end your participation at any time during this interview. Your confidentiality will be respected and your name will not be associated with the data. We will be audio-recording this session. Please let me know if there are any questions before we begin.

1. Can you tell me a little bit about yourself?
    a. How long have you been a xxx (physio, physician, etc)
    b. How long have you been in the primary care setting?
    c. Can you give me a brief description about the type of clinic you work at?
        i. Are there other health care professionals present? Solo?
2. Can you please tell me how you would describe frailty?
3. Can you tell me a bit about your experience with older adults living with or at risk for frailty?
    a. What are your interactions like?
    b. How often do you see frail older adults within a typical work week?
4. What kinds of concerns do you have for older adults at risk for, or living with frailty?
5. Can you describe how you would currently assess patient's frailty status?
    a. Probe: what tools do you currently utilize?
        i. If clinical judgement: what does this mean?
6. What kinds of indicators do you look for that would suggest a person is at risk?
    a. Probe: what initiates a frailty assessment?
7. Do you think that screening tools encompass the areas that influence frailty?
    a. Can you tell me why you feel this way?
8. Are there any gaps or limitations in screening tools that you currently use or know of?
    a. Do you feel there are components that should be added?
9. Are there specific measures or indicators that you choose to monitor that are not part of a formal frailty screening assessment?
    a. Why do you monitor these?
10. Do your older patients voice concerns over their psychological or social well-being?
    a. Yes: how do they voice these concerns?
    b. No: Why do you think they do not?
11. Is there anything that I haven't asked about that you feel is important to share regarding frailty and psychosocial factors?

Introduction Script- Interview Guide: Care Givers and Older Adults

Summary of Project: Many older adults are considered "frail" or at risk for poor health. A number of tools or methods exist to identify frailty, but it is unclear if these tools consider what is important to older adults, and as such, the services provided may not meet their needs. This study involves a review of the current literature to determine what health factors are currently included in screening tools that help to identify older adults at risk for negative health outcomes. I am interested in screening that is done within primary care settings (e.g. care that is provided by your family doctor and other health care professionals). I am hoping to have conversations to understand what older adults, caregivers, and health care providers feel should be asked about, or screened for, with regards to older adults' health and quality of life. I hope to compare what screening tools currently consider to what older adults, caregivers, and health care providers actually feel is important.

Thank you for taking the time to participate in this study. I wanted remind you that you may choose not to answer any of the questions and can end your participation at any time during this interview. Your confidentiality will be respected and your name will not be associated with the data. We will be audio-recording this session. Please let me know if there are any questions before we begin.

1. What are some topics you feel are important to discuss with health care providers related to health or quality of life?
    a) Probe: medications, health conditions, social supports, recreational activities

2. Why do you feel these topics are important to discuss with your primary care provider?

3. How often do your care providers initiate conversations that capture a variety of these topics and important issues?
    a. What topics or conversations happen most often with your providers?
    b. What do you wish your health care providers would ask more about/or focus on more closely?

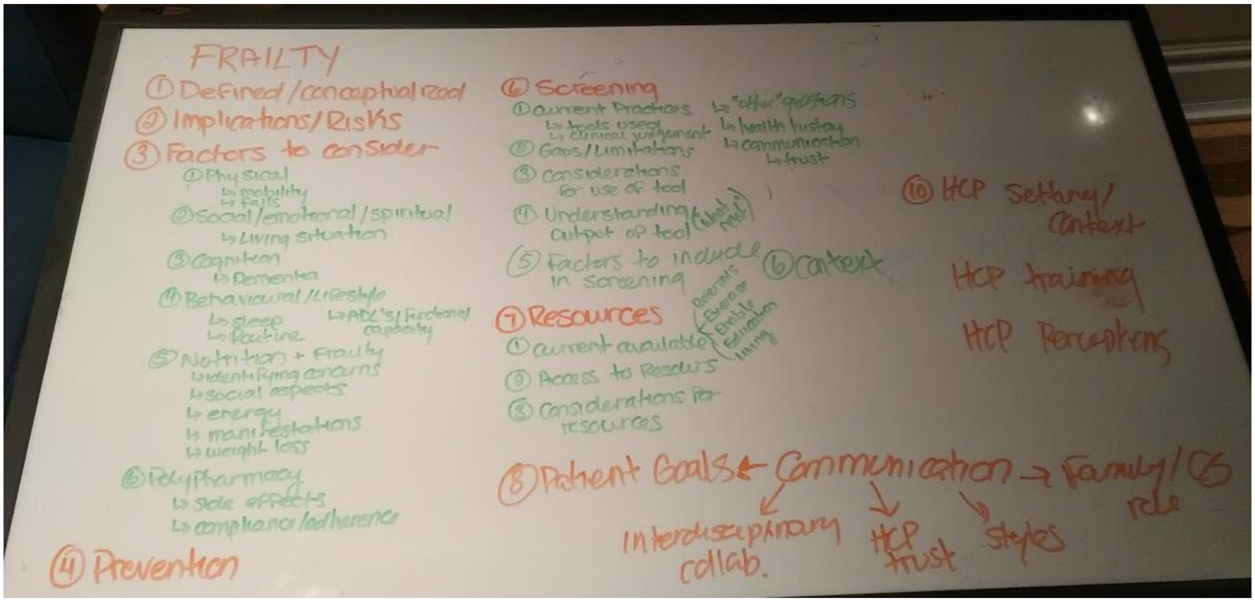
4. What does the word "Frail" or "being frail" mean to you?
    a. Probe: How would you describe frailty?

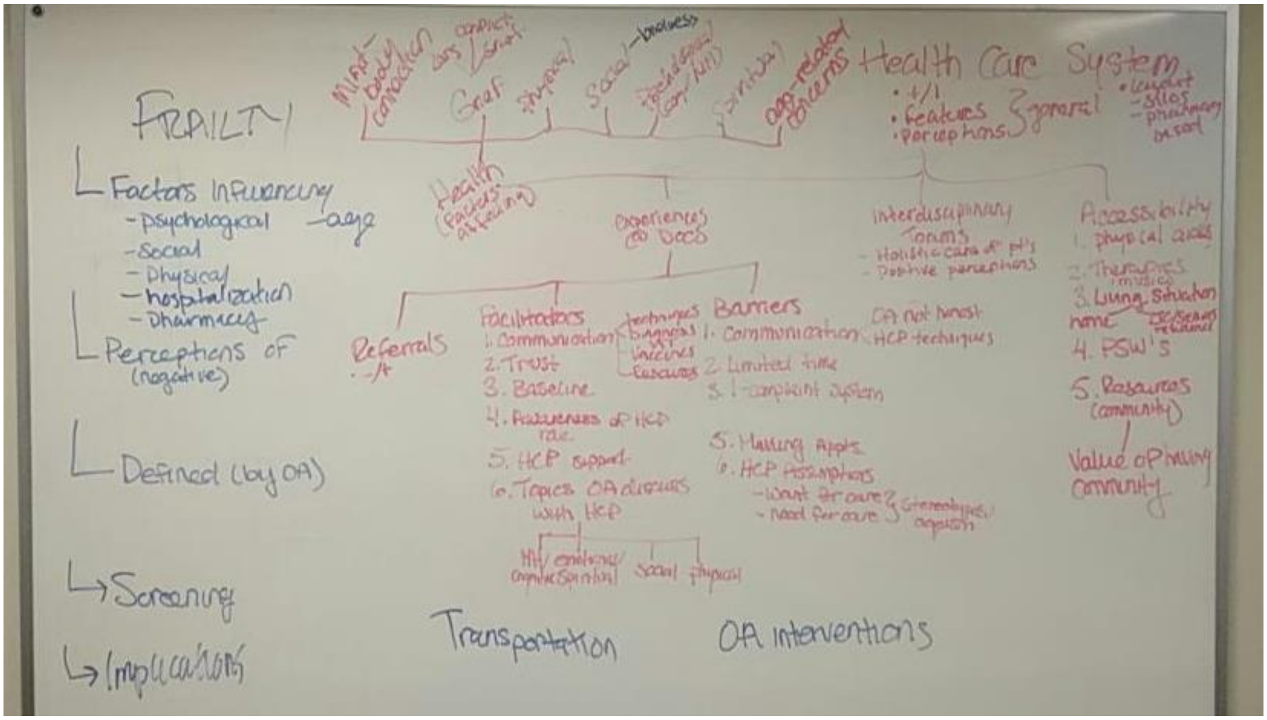
5. What things do you think would make a person or older adult frail?
    a. Probe: What signs or symptoms would you say contribute to frailty?

6. How do you feel these factors should be monitored to reduce or prevent frailty in older adults?

7. Is there anything that I haven't asked about that you feel is important to share related to our discussion today?

(N) Qualitative Analysis: Whiteboard brainstorming





(O) Summary of Inductive Thematic Analysis

Theme	Explanation	Quotes
Definitions and Conceptualizations of Frailty	Frailty was described as a multifactorial, dynamic syndrome that could elicit multiple areas of compromise. Compromise could include physical deconditioning, withdrawal from activities of interest or pleasure, mental health concerns, or cognitive decline. Frailty was described as a change in ability to self-manage due to some kind of compromise. Frailty was also described as influenced, but not determined, by age. Stakeholders also identified that frailty is often the result of some triggering event. An event that could trigger the onset of frailty was often described as physical, such as a fall or illness, but could be social or psychological such as loneliness or death of a loved one. Frailty was also described as vulnerability, inability to achieve desired level of functioning, and something that could occur in different health domains such as physical, emotional, spiritual, social or cognitively. Older adults overall did not appreciate the term “frail”. Frail was associated with extreme dependency, end-of-life, physical deterioration, and negative connotations. Often frailty was linked with physical components because it is a visual or observable marker of health.	HCP: “*You know, that’s what makes you frail is that if you have multiple areas of compromise then they can kind of become amplified in the face of a challenge.* HCP: *“I like that concept of homeostenosis where there is just not a lot of flexibility in the physiologic, social and the whole system right. So that person is much more likely to have a decompensation from a particular insult.”* HCP: *“I see frailty as a um I mean, I see it as a syndrome of sorts, a condition that yeah is on a spectrum.”* OA: *“Frail I just wanted to point I think frail is a condition that one can go in an out of”* HCP: *“I see people who are 85 and robust and are not frail what so ever and I see people who are 72 or 65 or 60 and are very frail adults.”* OA*: To me frailty is not necessarily in elderly or old age.”* HCP: *“I think that then predisposes, people become more vulnerable, putting them at greater risk for not being able to live independently, take care of themselves and have a, you know morbid decline.”* OA: *“Extreme vulnerability because frail can be used in many ways.”* OA: *“Well basically to me its not being able to achieve a certain level, be that mental, physical, or anything else* OA: *“Ya and you can be frail in one and not another (I: Sure) you know you can have uh from a number of reasons you could have osteoporosis and have frailty physically but be mentally just as alert as a tack.”* HCP*: “Right so it is usually multifactorial frailty, that’s what makes it significant.”* OA*: I think part of the problem is with the definition of frailty. I agree with what [participant] is say about, it’s generally, as soon as you say it you think physical.* OA*: Ya you don’t think about the other aspects. (*OA*: and also you think negative)* OA: *get rid of the frail term”.*

		OA*: “Frail strike me as end of life, frail on your last footing as it were.”*
Physical Factors Contributing to Frailty	Physical factors contributing to frailty often encompassed functional capacity. This was related to physical strength, mobility, and ability to self-manage. Factors that contribute to one’s ability to self-manage, remain mobile, and maintain strength included chronic or primary conditions, injury or pain. Falls were also an important consideration to physical frailty. Falls was often considered a “triggering events” that initiates the onset of frailty. Falls were described as a result of physical weakness, vision concerns, balance issues, or some other primary condition. Falls were thought of as being a major health risk that could change trajectory of health status quickly. Falls could happen when completing everyday activities such as bathing or going up or down steps. The context of a fall was identified as helpful to understanding what next steps should be. Sometimes falls were a result of an acute condition such as a urinary tract infection or a cold. Sleep was also identified as being important to consider with frailty. The quality and quantity of sleep can influence fatigue levels, concentration, and other cognitive abilities.	HCP: *“Well what I generally look at is I look at their physical condition and I’ll also look at their primary conditions so do they have diabetes, do they have kidney failure.”* HCP*: “Another one is using changes in mobility. So going from, the person who walks in and then they walk in with a cane and then they walk in with a walker and then they walk in in a wheelchair…But when people transition to a wheelchair...that’s a sign that things are going downhill you know.”* OA*: “It’s hard to keep moving when your muscles and joints hurt.”* HCP*: “I think the physical health piece kind of is like an indication of how well someone is able to take care of themselves.”* OA*: “Coping with bathing for instance, stepping into a bathtub or even a shower. Negotiating basement steps at home”* HCP*: “Yeah when I hear that someone is falling I get worried about that.”* OA*: “So yeah absolutely falls risk is a huge thing (OA2: “Oh it’s terrible that can change everything”) problems with vision too, tripping over things…”* HCP*: “I want to know the circumstances of the fall, I get, I do a lot of, if they can tell me, you know when, how recent, or has there been multiple, inside outside … was there a pattern cause is there something else going on there that is predisposing you to falling. Are you tripping on your foot or are you blacking out?”* *OA: “a lot of seniors don’t get a lot of REM sleep. They sleep, but they wake, they sleep, they wake, they sleep they wake, and they need that REM sleep…and REM sleep is where the body rebuilds itself.”* *HCP: “basically [they were] getting up for meals and then not doing any physical activity during the day and then wanting to go to bed at 8 o’clock at night and sleep right through until 7AM and they are wondering why that is not happening.”*

Nutritional influences on Frailty	Nutrition was linked to several aspects of frailty included social, physical, and cognitive. Nutritional influences on physical frailty included malnutrition, hydration, continence issues and weight loss. Healthcare providers also linked nutritional issues to energy levels or fatigue, which influences not only a person’s ability to concentrate but other cognitive abilities as well. Nutrition also linked to social aspects and the rituals of eating. With decreased palates older may not enjoy eating the same way, or if they have moved they may not have access to the kinds of foods that are important to them.	HCP*: “I mean I think nutritional deficiencies are a big part of frailty”* OA*: “…not eating, malnutrition, not eating properly.”* HCP*: “Well for energy one, if they aren’t eating well, taking in enough fluids they are not going to, they are going to complain of even more fatigue.”* HCP*: “Chances are if they don’t eat enough too, I mean quite commonly people are struggling with constipation, they aren’t push food through...”* HCP*: “You know, if they’ve lost more than five percent of body weight, kind of in the last five years that’s a flag to me that you know somethings going on.”* HCP*: “the social piece whether they live alone or not can certainly tie in with um yeah the nutritional piece.”* HCP*: “You know and a lot of it is people want to eat their cultural foods too right. If something changes and they’re not getting their usual noodles or whatever then that could be a problem.”*
Pharmaceutical Influences on Frailty Status	Polypharmacy was identified, primarily by healthcare providers, as a factor contributing to frailty. Pharmaceutical interventions were described as needing serious consideration when prescribing for older adults. This was in part due to side effects and contraindications for this age group. Polypharmacy was also a concern with regards to adherence and compliance. Taking medications at incorrect times can have unintended side effects. Alternatively, not taking them at all can increase the risks of adverse events like a fall or medical event. Pharmacists were identified as a possible resource to help patients understand medications and possible side effects, but if medications aren’t being taken properly they won’t always elicit therapeutic benefits. Often providers assume	HCP*: “But we see it all the time that we see side effect from pills even the ones that they are taking correctly”* HCP*: “The research that I read is no one should be on more than five meds and you shouldn’t have anymore than three meds in one category.”* HCP*:”A lot of everything is a risk/benefit. So in medication, you know we can say do you want this medication but what would happen if we gave the mediation what are the potential side effects? What is going to be the therapeutic benefit? What is the burden of taking a medication you know ... People don’t want to take pills or they don’t want to take another pill, so that’s something to consider.* OA*: “I really like that pharmacists are more involved now in medications…they take much more time telling you “okay now this is going ya know, its got side effects”,* HCP *:”if we assume that someone is adhering to something than we are going to make changes based on that but if a person is not even taking the medication to begin with, increasing the dose isn’t going to be helpful.”*

	compliance and make changes to care based on these assumptions, when a presenting concern could be due to current medication routines.	
Cognitive Factors Contributing to Frailty	Cognition was considered a broad factor that contributed to frailty. Cognition was largely linked with mental health status and cognitive impairment. Cognition influences one's ability to organize and self-manage through maintaining routines, engaging with interventions, and having the motivation or cognitive ability to complete tasks of daily living. Mental health was identified as a significant concern across all stakeholders, and described as one of the geriatric giants by healthcare providers. Depression and anxiety impacts many older adults, and can be perpetuated by increased experiences of loss in the older adult cohorts. Loss in many forms can contribute to mental health status including loss of a person, function, ability, or health. Participants described the importance of identifying these issues, but also how difficult it can be. Identification of more understated mental health concerns may require patients to be more forthcoming with information about how they are feeling as signs and symptoms can be very subtle.	HCP*: "It just gets in the way of everything and kind of throws a monkey wrench into any kind of a plan that we would do with prevention. Not completely but eventually and sort of invariably it can complicate things."* OA*: "There is also um mental frailty as people develop a dementia."* OA*: "sometimes people as they get older they have a tendency towards chronic depression will sink into that depression and that makes them withdraw and furthermore lonely."* HCP*: "cognition just gets in the way because its that same story about the needing to exercise but not really having the drive and not really having the organization and not really having the recall and the ability to learn to make that happen."* HCP*: "I guess even just like neurologically our brain depends on habits and routines to keep us doing things and if you think about in older adulthood I mean cognitive decline is not necessarily always the case … but often times that piece is there as well."* HCP*: Well its really important… they're second highest group of depression and they have the means to carry it out so you always want to, and again they are losing friends constantly so depression is you know one of the major geriatric giants essentially."* OA*: "All seniors, [loss is] chronic because it's a part it's a natural part of life. No one escapes it. But we are not aware of the depth that it goes to as we get older and it only starts getting out as we get older with the increase in our losses and awareness of our losses. Losses in illness, in physical abilities, they are all loses that create grief and if we cannot identify what it is we are dealing with then it can lead to anxiety, depression."* OA*: "I think that in general is probably the hardest for doctors to diagnose [is] mental health… I think one of the most difficult aspects of mental health with regard to seniors are the very subtle areas of so called age related issues… loneliness, isolation, abandonment, depression on a low level relatively low level but chronic, ongoing, that must be [difficult*

		for] doctors to know what to do with. The patient isn't serious enough psychologically be sent to a psychiatrist or psychologist and yet they are not recovering."
Social Influences on Frailty Status	Social influences on frailty included living arrangements. Living alone was considered to increase risk of frailty, as it could lead to loneliness, feelings of depression or anxiety, and withdrawal from the community. Living arrangements should, when possible, align with where that person chooses to be. Transitioning into different living situations can cause undue harm when clients are not mentally ready. Living arrangements are often dictated by the safety status of the person, where transitions to new arrangements were necessary to ensure the well-being of the patient. This can be difficult if the cost of living is higher than what patients are able to afford, be that in nursing or assisted living situations, or even their own homes with implementation of homecare. Social factors contributing to frailty also included loneliness. Being lonely was linked to depression and anxiety, and could cause individuals to withdrawal resulting in failure to thrive. Loneliness was considered an important factor to look for when assessing overall health and frailty. Loneliness was also affected by loss or change in a partner or loved one. Loss and loneliness was described as a triggering event that could increase frailty status or risk and was linked to cognitive abilities as well.	HCP*: "Um well people who live alone typically are higher risk for um, you know that can be more of a risk factor for frailty then someone who doesn't live alone."* HCP*: "I think a persons' ability to safely be at home or where they prefer to. I always get a little bit frustrated too when people say everyone wants to stay at home, not everybody does right. So I get frustrated when people say oh no we are going to advocate, nobody wants to go to a nursing home nobody wants to go to a retirement home. Well they do, some people do because they feel that they don't have anyone else. But the person and where they want to be and where their preference is to be to me that's whats more important."* HCP*: "Now the cost of them staying in these retirement homes is more than people can afford to pay."* HCP*: "I think I'm going to have this person that has this big problem …because you know they are failure to cope or failure to thrive. When physically they have the capability to do it they just chose not to….And you do see that a lot where people just withdraw right. So then you see the weight loss, you see the unkemptness, you see all those things and its all from one thing and its they chose to do it.* I: *Right, so its providing the support in a way to support that person socially or emotionally or psychologically so that they are able to thrive on their own again* HCP*: Prop up that one pillar that's missing so they can complete all the other ones because the other ones aren't the problem it's the one pillar that is the barrier.* HCP*: "we have clients that just they are lonely, they don't really want to get better or they may be, they just show signs of needing someone to talk to a professional person."*

		OA*: I think when people are lonely they don't want to, well they want to interact with other people but they don't have the opportunity uh and then that affects them physically because they sort of sit and vegetate and the less you move, the more physically…or your own spiritual health I think that's important."* HCP*: "it could be a social insult so if they lose a partner or a partner becomes disabled or something like that or if there is a transition that is another sort of insult."*
Frailty Screening: Current Practices	Providers described their current practices when meeting new patients within their roles. Many described how they use their own methods to determine the functional ability of clients, often based on more formal screens, but modified to suit their unique situational needs. Providers also identified that formal screening tools may be too time consuming to complete, which is why uptake is low when not mandated. Providers also described how helpful a home visit can be to accurately assess a patient. Homecare visits can often indicate how well a person is functioning within their own home through visual observations of the state of the home and how the person can guide a provider throughout the home. Home visits can also give insights into nutritional concerns by simply looking inside a patient's fridge. Providers also identified the importance of understanding how their patients perceive their own health status. This can act as a method of triangulation, comparing their visual assessment, with the answers to their formal or informal screening questions, with the perspective of the	HCP*: "we do ask questions about how they get around in their home…How do they get along in their home, do they have grab bars, do they have access to transportation, what do they do for exercise? They basically have a functional level scoring when they are assessed by myself and their anywhere from very low to high functioning. So I put them in a category, the very low um clients are ones that I'm going to follow a little more closely because they just don't have access…but I don't necessarily assess them in any kind of survey."* HCP*: "Uh I mean I'll ask them but I also, usually say do you mind if I have a look in your fridge? Um yeah cause I've looked in fridges and there is almost nothing in the fridge whatsoever. And if they say they make their own meals, um okay so what might they, maybe they are making some instant stuff."* HCP*: "I want to know their perspective of how their doing in their own home you know are they independent with their ADLs, their IADLs and as part of that piece"* HCP: "*I mean starting with uh things like just you know taking a history and looking at their environment…"* HCP: "*Or it could be that somebody's really seems really frail and everyone's like well he's 90 this is normal for 90 of course he's 90 and then you find out actually no this person was working, this person was playing golf, this person was driving a carpool, you know like this is different."* HCP*: "If they smoke, if they have a lower education, so those are just kind of some things I might ask about"*

	patient. If there is a disconnect between how well a person appears to be doing and how that person feels they are doing, further investigation could be required. A large part of how providers currently assess patients is through a patient history. Understanding a patient's history can indicate when a change has occurred that may need addressing. Health history can also indicate areas of risk. Providers identified lifestyle habits that would influence frailty risk as questions they would ask when discussing health history. These habits included things like smoking, alcohol consumption, and education levels as well. Often current screening practices involves the use of clinical judgement. Clinical judgement was referenced as being developed over time with exposure and experience, as well as through mentoring. Some providers felt that clinical judgement could sometimes override a formal assessment, and lead to further investigation for a patient in spite of results, but was also described as something that should not be relied on.	HCP*: "When you've been working long enough and you've seen enough people over the years, you can sense it. No not sense it that's not the right word. But you are observing things that are, you know they are going to be at risk for in the future."* HCP*: "You can't take the short cuts…you don't know what you don't know."*
Frailty screening: Current Practices (tools in use)	Current screening tools identified during interviews included the Assessment Urgency Algorithm (AUA), Clinical Frailty Scale(CFS) InterRAI tools, seniors fitness test (SFT), short physical performance battery (SPPB), gait speed, sit-to-stands, and balance tests. Providers liked that the AUA included a question about caregiver stress as this was described as an important concern. The CFS was described as easy to use due to the pictures. Providers had conflicting feelings about interRAI tools; with some describing	HCP*: "I mean that's one thing I would say about the AUA is it asks about caregiver, how stressed are they? You know. That's an important question."* HCP*: "Well I find [the CFS] easy to use because it gives you those descriptors and it even has the little picture so its pretty easy to put someone on a frailty scale I think.* HCP: "*Um well the one thing that I don't really like about [interRAI] is there is questions about the family members, about their perceptions. I think it is a good thing but its not a great thing because again a lot of times you get family members that disconnected."*

	concerns about how subjective, the tool was while others voiced appreciation over the inclusion of caregiver stress. Providers also voiced concern over the inclusion of caregiver’s perception of patient’s status, which could introduce bias or inaccurate information. Providers discussed how often family members or caregivers may be out of touch with the actual status of the patient. Tools that looked more obviously at physical components, such as the SFT, were praised due to the normative data that allowed for easy comparisons. The SFT was also described as a positive tool for test-retest scenarios to observe if interventions were effective, and could be modified to suit the patient’s abilities. The SPPB was also used to assess frailty, but providers indicated it was not as sensitive to change as other tools. Standardized gait speed testing was also considered a good indicator of frailty, but could be difficult to administer depending on setting. Sit-to-stand testing was considered important to include in assessments as well, as it provided a good indicator of leg strength, and a functional movement pattern. Some providers also added a balance test to assessments, describing it as a good indicator of falls risk. Providers have identified falls risk as a contributing factor to frailty, and one provider voiced surprise that it was not included in formal assessments like the SFT or SPPB.	HCP: *“You know what I mean the RAI is perception. So you’re going to ask them how they perceive them, and then I’m going to put in my note how I perceive them with my physical assessment skills… I mean I look at every little thing to say every little key that I can think of when I see you to see how you’re managing at home. So if you’ve got like really wrinkled clothes on and you tell me that you’re in the best of shape and your hair is all standing up and you smell like pee and poo I’m going to be like eeeee.”* HCP: *“So [the SFT] is what I use for their baseline fitness level, and that’s what I’ll retest when their finished their six months with us.”* HCP: *“I look at a six minute walk test. If they can’t do a six-minute walk test they can do a two-minute walk test. So senior fitness test uses the six-minute walk test but I might modify that and do a two minute walk test if they just cant”* HCP: *“I use [the SPPB] to help me figure out where they should exercise, but I find I have originally retested clients when I started using it and I find its not extremely sensitive to change.”* HCP: *“If I can do a standardized gait speed test I’ll do that depending on if I’m in a house I often can’t cause there isn’t a stretch that I can accurately do an objective test.”* HCP: *“Up and down from a chair five times can you do that? Can you even do it once? You know without using your arms? I mean that’s a huge one right indicating lower extremity strength…”* HCP: *“Because it’s a very important tool, it’s a very important sorry, thing to assess because, and I’m really surprised that its not part of the senior fitness test, but it is definitely an indicator of fall risk.”*
Frailty Screening: Context	Providers identified the importance of understanding the context in which frailty screening takes place. Many assessments are currently completed in emergency room settings,	HCP: *“A person is going to look a little bit frailer in the emergency department when they come in if it’s a medical condition that brought them in.”*

	where an individual is likely already experiencing decreased function. Understanding where screening has taken place, the context of why a screen was initiated, and understanding the current state of the patient in this situation can shed light on the output of the tool. Providers also described the impact of inconsistent screening. If screening is completed inconsistently, it does not always provide useful or accurate information.	HCP*: "Again when you're doing, as I like to call it one offs, its hard to really get an accurate picture. It gives you a snap shot but it doesn't give you the video so to speak. It gives you this picture in this time but it doesn't let you know how it got to this point."*
Frailty Screening: Concerns	Provider's main concern with frailty screening was a lack of understanding about what the results mean. Providers agree that identifying frailty was important, but screening is ineffective at articulating the implications of a score. Results should provide more meaningful information for patients. Compliance or consistency in frailty screening was considered another area of concern. Providers discussed how there is no consensus on which tool is best, and as a result if screening is even implemented in a healthcare setting they are not always using the same tool. This can complicate things when a person moves or is referred to a different clinic. Consistency within institutions was also identified as a concern, as currently there is no real consequence for not completing screening. Providers also describe how compliance in screening does not always mean patients are receiving the best care. Some providers felt that the time it took to assess a persons frailty risk is time that could have been used more effectively helping patients.	HCP*: "I think in summary really, I think its an area that's important but I guess I can't repeat it enough times frailty is important you can identify but its what are you going to do with the information that you gain."* HCP*: "[They should be] meaningful for the patient, not just for the hospital, not just for the regulatory body, for the patient. Like why are we doing all of this?"* HCP*: "Some hospitals do it, some hospitals don't. So then again you have the problem whereas or if they come from a different region."* HCP*: "And [institutions] are never going to put as we call it teeth behind to make you do it. Like so if you don't do your normal assessments like your vital signs or something, you're going to get a talking to because they have a computer that check up on you…this person didn't have vital signs for you know 12 hours and their a level two. You know what I mean, that stuff is all in the computer and they can just look right away. I: Right and that is going to have some consequences … HCP: Oh absolutely"* HCP*: "Yeah and then some auditor comes by and says oh your compliance with screening is 90%. Like that's great (I: Great but what does that) but if yeah. But instead of doing that if you could've spent that three minutes saying you know what can I do to help and really saying you know just really finding out what's important. I don't know."* HCP: "*I keep on getting the one offs…I see and sometimes screen them a six which is the highest number saying that they basically can't, they're not functioning at home (I: Right) and you look at the person and they are*

	Providers identified concerns with the accuracy of current screening tools as well. As screening is most consistently completed in emergency settings where patients often feel more vulnerable, providers were unclear how accurate an output the tool would provide. Accuracy was also a concern when discussing what frailty screening tools currently include in evaluation. Providers felt mainly physical aspects of frailty were evaluated in current tools, missing other risks commonly observed within their healthcare settings. In particular, providers felt cognitive, social, and emotional components were often missed in current tools.	*walking and talking and the reason their not functioning at home is because they are sad."* HCP*: "Well I don't think they ask about, I don't think they really pull in a lot of the, they don't pull in a lot of what I see the cognitive risks, social risks, that kind of, what I would call the psychosocial stuff."* HCP: "*It is certainly missing though, in my opinion, the cognitive, emotional component, which is a big deal. It's a huge deal."*
Frailty Screening: Recommendations	Providers outlined several recommendations for frailty screening, mainly the need for more consistency. Consistency is required in how frailty is approached, the tool used, the timing of screening, and what any next steps would encompass. Similarly, tools that are used must have good inter-rater reliability to ensure bias is reduced and an accurate representation of patients is produced. Tools need to be quick and easy to administer, which may help compliance and uptake of their use. Providers described how you often can't identify problems if you don't have a tool to track them. The timing of screening was another big recommendation. Providers felt that screening should be completed routinely to better identify concerns earlier. Routine screening may use a team approach, requiring better information sharing practices amongst allied health professionals. Older	HCP*: "Right, so…trying to figure a way that you could train or provide the structure or the support so that those things could be done more consistently. But you're still going to have, because it's a subjective measure you're still going to have some variances"* HCP*: "But the problem you've got, I think we've got nine different nurses, so you've got nine different nurses with nine different opinions doing it nine different ways."* HCP*: "…if there was one that was say, to the point. Not brief but, not overly (I: Extensive?) yeah."* HCP*: "And the problem is people don't pick up on those deficits unless you use the tool."* HCP*: "It should be done on a Q4 month basis or Q3 month basis because it is a very limited amount of time and what it does is it gives us a baseline…"* HCP*: "And it would be nice to say oh I see she scored a three here she scored a four here she scored a five here she scored a six here look at the progression. What did we miss?"*

	adults discussed their support for the use of interdisciplinary teams within their health. Older adults also identified that many health concerns related to frailty may be better suited to other members of a care team such as a physiotherapist, nurse, or social worker. This provides promising insights that older adults would likely support using allied health professionals to support frailty management as well.	OA*: "this is where, you know, these clinics that some doctors have set up, are an excellent idea. Because you've got a dietician, you've got a physiotherapists, you've got an occupational therapist, you know you've got all these people, and so you know the doctor can call on all these people for extra assistance.* OA*: it seems to me that a lot of this is more ideally suited to one or two other members of the care team, be it a nurse a social worker or whatever… you can't just ignore the doctor, he's at least going to have to push it out to somebody in that instance.*
Frailty Screening: Factors that should be included in screening	Providers identified the importance of having a baseline for screening. Baseline screening can give insights as to which facets of health providers should be paying more attention to. Providers described the importance of having more holistic tools to monitor frailty in order to provide patients with the appropriate type of resources and support required to thrive on their own again. Providers discussed the importance of assessing functional abilities such as mobility, strength, and level of independence. Pain was also identified as important, as it can often be a limiting factor in mobility and level of independence. Pharmacy was considered an important aspect that should be included in frailty screening as well. Providers discussed the importance of assessing the risks and benefits of prescribed medications, as many have adverse side effects and contraindications for older adults. Nutrition was also identified as important to include in frailty screening. Nutritional deficiencies and reduced caloric intake have been linked to unintentional weight loss, fatigue, and even falls risks.	HCP*: "So if you are going to support them, you're going to have to be addressing different things and you should be evaluating it at the beginning so you know what the concerns are uh things you need to be paying attention to (I: what the baseline is) yeah what the baseline is showing for this person."* HCP*: "Right, so its providing the support in a way to support that person socially or emotionally or psychologically so that they are able to thrive on their own again"* HCP*: "Okay well I'd say for mobility stuff I'd definitely be doing um gait speed and like a timed sit to stand. Those would be big ones I would be doing and grip strength. But for sure the first two. And is that for overall strength, you know lower extremity strength is linked to your ability to lift independently, you know that type of thing."* HCP*: "Pain, if they have any pain, I mean I always ask about if there is any discomfort that is limiting you…"* HCP*: "A lot of medication recommendations though, I think in people who are frail is a risk/benefit."* HCP*: "So when I get into an objective assessment, you know I ask about their weight cause that's something I certainly will pick up on and be aa a flag for me so has your weight been stable, has your weight changed in the last year, if it has how much has it changed?"* HCP*: "one of the things that frustrates me is when there is no cognitive screening…I'm big on cognitive screening…I don't care if they're here for a non-cognitive reason. I want to know what their cognition is like because*

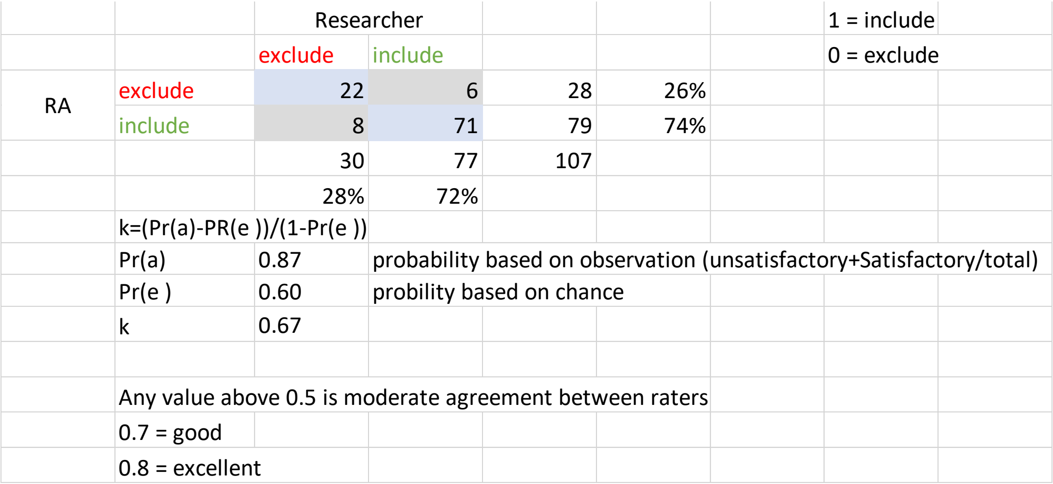
	Psychological aspects of health, such as mood, mental health, feeling safe in environments, and cognitive abilities were also described as important for frailty screening. Providers described frustration at a lack of cognitive screening currently being completed, particularly as cognition can influence health in many different ways.	*maybe they are here because their falling and maybe that's because a person is taking a blood pressure pill twice a day instead of once a day and maybe that's because they have dementia."*
Provider Experiences with Frail Older Adults	Providers discussed experiences with frail older adults within their practice. Providers all identified having frail older adult patients, but one provider commented that when they started to screen more routinely, patients were not as frail as what they had assumed. However, providers discussed that patients often over-estimate their abilities. Older adults discussed this as hiding certain health related concerns from providers. Providers identified that one way they felt older adults did this was through the use of humour. Humour was often used to cover up concerns, providing a response to the question asked without providing a real answer. Providers also described how patients could get defensive about their health status. Providers used strategies to build trust to facilitate more honest and forthcoming responses. Older adults supported this, commented on the importance of building a trusting relationship with providers. Many providers believed this defensiveness was out of fear. Providers felt that older adults were fearful of being forced to do something they weren't ready to, like move to new living arrangements, or stop activities they enjoy. Providers also identified their role in providing information to older adults. Older adults often	HCP*: "Cause we kind of found, I actually remember when we were gathering everybody like how many were frail I was kind of surprised at how many…I'm not seeing people that are as frail as I think they are but that was an average"* HCP*: "Functionally looked great, had a sense of humor [that] covered everything up."* OA*: "It seems like a lot of the issues come from not wanting to admit somethings wrong."* HCP*: "I think probably more probing. What I found is again if you get into a certain structure in how you ask questions I kinda gage when I see somebody whether their going to be as forthcoming or not"* OA*: "And make them feel comfortable with you and they will start sharing.* HCP*: "They don't like to share and much of that is because they don't want you to know that their not doing well for fear of going into a home."* OA*: "And there are also a lot of people who are afraid to go into anything else because a lot of situations are not good..."* HCP*: "kind of wanting to know where they are at yeah compared to other seniors in their age group. Like is this normal, is this worse? You know what can I expect? I think those are the broad things"* OA*: "you want to know sort of how it would affect your physical health and how it would progress that you would maybe ugh, you'd want to like do, manage things for yourself as long as you could* HCP*: "they want to know where they are at like what stage they are at, and then they want to know how to plan ahead to an extent."* OA*: "Well and also to know that these things are available. A lot of seniors … just are not familiar… if you're not aware of all the services…".*

	asked providers about how their health status compared to their peers, but also about their current conditions. Many wished to understand the prognosis and what to expect, and how to best plan ahead for what may come. Older adults described this as well, identifying their desire to understand the progression of their diagnosis. Many described the importance discussing the resources that are available with providers, as many are unfamiliar. Building a positive and trusting relationship between patient and provider is important for successful treatment and management.	
Routine and its Influences on Frailty	Routine, and more specifically a change in routine, was described as a way to identify frailty related concerns. Routine was described as changing when health concerns arise, and this can help provide context to concerns such as sleep, nutrition, mobility, and the overall engagement on an individual. Routine can indicate how well a person is managing their day-to-day lives including the management of other factors identified as influencing frailty risk. Routine can indicate how well a person manages finances, medications, and social engagements. Routine was identified as giving older adults purpose, and deviation from routine may indicate cognitive or other mental health concerns. Routine ensured that patients are managing various aspects of their own lives. It can provide broader context to older adult concerns.	HCP*: "she was like pretty robust, strong lady but because of her vision loss she isn't able to cook as much its difficult for her. Because of that she doesn't mobilize as much and then shes getting older and there is sickness and what not that come into play. So something like that right its important to know because that impacts (I: All sorts of thing) how one does all their day-to-day occupations.* HCP*: "they are often housekeeping type things like exercise,* socialization, *food security, planning ahead like all that kind of stuff, seeing a doctor, seeing a nurse you know. And then the productivity piece is like how are they cleaning their homes, how are they getting around in the community, cooking meals, preparing meals, managing their medication, managing their finances."* HCP*: "basically [they were] getting up for meals and then not doing any physical activity during the day and then wanting to go to bed at 8 o'clock at night and sleep right through until 7AM and they are wondering why that is not happening."* HCP*: "Whether its something like for example brushing your teeth and showering and what not. Its not something, it can bring enjoyment to our lives but more so we do it because it has to get done and then once those things are done it allows us space to do other things in our life that are enjoyable and meaningful to us."*

	Routine also includes understanding a person's communication style, and frequency of communication with others. Communication can influence the support network older adults have, and issues may go unnoticed by family, friends, or healthcare providers if individuals don't have the capacity to communicate effectively.	OA*: "and also when you're frail like, communicating with other people whether its family or friends, like uhm, well like say on a telephone… (I: can become more difficult?) OA: yeah."*
Frailty Implications and Risks	Frailty was described as influencing overall health status, often related to more complex health concerns. Participants identified that when health status has dropped, it is difficult to get back to the level of functioning they were at beforehand. A decrease in health status could be due to surgery or other strenuous modalities, or a triggering event like an illness or fall. Recognizing the impact that surgery, illness, or falls may have on health status can influence patients choices for the types of interventions they would like to engage with. Some felt that living with their current condition was safer than risking surgery and the implications that can have on health status. Another described how some patients are just ready to be in a wheelchair and don't wish to work towards using a walker or cane. Frailty was also described with regards to its influence on mental health and psychological concerns. Frailty can perpetuate the mind-body link with concerns like depression, where someone may not have the ability to be more mobile, and is also struggling mentally to find motivation to engage in positive health behaviours. Older adults also linked frailty to an increased risk of elder abuse. Abuse was described as a serious	HCP*: "Yeah and then the other factor that you find is as frailty goes up the common medical conditions that you've lived with all your life become worse..."* HCP*: "studies show that when you have that drop off most people don't get back to even the level that they were at."* OA*: "they don't recommend I understand…because they know that its no picnic when you… have surgery and when you're over 80 your recovery is a lot slower if at all so yeah know…ugh you might be better off just living with what you have."* HCP*: "[Family] want them to you know get out of the wheel chair and start walking again…which is a great goal absolutely that would reduce their frailty levels but in order to, for some frail individuals especially with cognitive impairment, in order to have a sustained upgrade of mobility it would mean a lot of work. Maybe that person what they are really telling you is 'I'm ready for the wheelchair. You know like I don't want to do the work like I'd prefer to do other things'."* HCP*: "Lets say for example there is a frail older adult with a co-occurring diagnosis of depression or some type of mood disorder that in itself is a barrier but the frailty can just be another barrier to add to that or a challenge um where someone has difficulty for example like picking up their groceries and cooking in addition to like lacking the initiation or wanting to do that."* OA*: "One of the risks when people are frail I think too is senior abuse (agreement) it's a big issue."*

	issue that may not be reported accurately as participants described how it can be hard to identify due to cognitive impairment or side effects of pharmaceuticals on judgment and memory. Participants described a need to be more proactive in frailty prevention to mitigate some of these risks. Providers described a desire to identify frailty and associated risks earlier, and treat concerns collaboratively with patients and other providers are appropriate. Preventative medicine was described as a cost-savings, saving the healthcare system money in the long term, but needing an influx in funding to start this process may prove difficult.	HCP*: “So again proactive my famous term is being proactive not reactive because anytime you’re reactive you’ve already lost because you’re behind.”* HCP*: “frailty is just another one now that is getting a lot more recognition of the importance of kind of paying attention to maybe early warning signs, early red flags and planning and bringing in multiple disciplines to manage them.”* HCP: “*But it’s a problem in medicine that we don’t do a good job of. We don’t do a good job at the preventative medicine that could save us a whole host of money.”* OA*: “because if you can keep seniors healthy longer its much cheaper for the healthcare system (yeah, that’s true) plus the fact that then we’re a happier lot! (laughter)”*

(P) Cohen Kappa calculation



		Researcher					1 = include
		exclude	include				0 = exclude
RA	exclude	22	6	28	26%		
	include	8	71	79	74%		
		30	77	107			
		28%	72%				
	k=(Pr(a)-PR(e))/(1-Pr(e))						
	Pr(a)	0.87	probability based on observation (unsatisfactory+Satisfactory/total)				
	Pr(e)	0.60	probility based on chance				
	k	0.67					
	Any value above 0.5 is moderate agreement between raters						
	0.7 = good						
	0.8 = excellent						

(Q) COSMIN Results

Frailty Assessment Tool	Study References:	Structural validity	Internal consistency	Cross-cultural validity	Reliability	Measurement error	Criterion validity	Construct validity		Responsiveness			
								Convergent validity	Known groups validity	Comparison with gold standard	Comparison with other instruments	Comparison between subgroups	Comparison before and after intervention
9 item frailty measure	Ravaflia et al. 2008	0	0	0	0	0	0	0	0	0	0	0	0
Brief Frailty Instrument	Rockwood et al. 1999	0	0	0	0	0	0	0	0	0	0	0	0
British Frailty Instrument	Kamaruzzaman et al. 2010	4	1	3	1	1	0	4	4	0	3	4	0
Care Assessment Need Score (CAN score)	Ruiz et al. 2018 (a)	0	0	0	0	0	0	3	4	0	3	4	0
	Ruiz et al. 2018 (b)	0	0	0	0	3	4	3	4	0	3	4	0
Cardiovascular Health Study Frailty Index (CHS FI)	Kiley et al. 2009	0	0	3	1	0	0	3	3	0	3	3	0
Clinical-Functional Vulnerability Index -20 (IVCF-20)	Nunes de Moraes et al. 2016	0	2	0	0	3	4	4	0	0	3	0	0
Clinical Global Impression of Change in Physical Frailty (CGIC-PF)	Studenski et al. 2004	0	0	0	1	0	0	0	0	0	0	0	0
Clinical Judgement	Brody et al. 2002	0	0	3	0	0	4	3	0	0	3	3	0
Chinese Canadian Study of Health and Aging Clinical Frailty Scale Telephone Version (CSHA-CFS TV)	Cheng et al. 2010	0	0	1	0	0	4	3	3	0	3	3	0
Canadian Study on Health and Aging	Rockwood et al. 2005	3	3	3	2	1	4	3	4	0	4	4	0

Clinical Frailty Scale (CSHA CFS)	Davies et al. 2018	0	0	2	3	3	0	3	3	0	4	4	0
Care Partners-Frailty Index-Comprehensive Geriatric Assessment (CP-FI-CGA)	Goldstein et al. 2014	0	3	3	0	0	4	3	0	0	3	0	0
Comprehensive Frailty Assessment	De Witte et al. 2013 (a)	4	4	0	0	0	0	0	0	0	4	4	4
	De Witte et al. 2013 (b)	4	4	3	3	0	4	0	3	0	3	3	0
Continuous Composite Frailty Measure	Buchman et al. 2009	0	3	3	0	0	0	3	0	0	3	3	0
EASY-Care Two step Older persons Screening (TOS)	van Kempen et al. 2013	0	0	0	0	0	0	0	0	0	0	0	0
	van Kempen et al. 2014	0	0	0	3	0	3	4	4	0	4	4	0
EASY-CARE Independence scale (IS)	Jotheeswaren et al. 2016	0	4	3	0	0	0	4	0	0	0	0	0
Reported Edmonton Frail Scale	Hilmer et al. 2009	3	0	0	3	1	1	4	4	0	4	4	0
Edmonton Frail Scale	Rolfson et al. 2006	1	3	3	1	1	4	3	4	0	3	3	0
Electronic Frailty Index	Clegg et al. 2016	4	0	3	0	0	4	4	0	0	3	0	0
Empirical Method	Brody et al. 2002	0	0	3	0	0	4	3	0	0	3	3	0
Evaluative Frailty Index for Physical Activity	de Vries et al. 2013	1	0	1	2	1	1	3	0	0	3	0	0
Frailty Index (Primary Care Data)	Drubbel et al. 2013	0	3	4	2	0	4	4	4	0	4	4	0
Frailty Index -ARC	Burn et al. 2018	0	0	4	0	0	0	3	0	0	3	0	0
Frailty Index - CGA	Jones et al. 2004	0	0	3	1	0	4	3	0	0	3	3	3
	Jones et al. 2005	0	0	0	0	0	4	3	2	0	3	2	0
Frailty Index - Emergency Department (FI-ED)	Brousseau et al. 2018	0	0	3	0	0	4	3	0	0	3	0	0
Frailty Index for Elders (FIFE)	Tocchi et al. 2014	0	4	4	3	3	0	0	0	0	0	3	0
Frail Non-Disabled Instrument (FiND)	Cesari et al. 2014	0	0	0	4	0	4	4	0	0	4	0	0
FRAIL Scale	Lopez et al. 2012	0	0	4	0	0	0	0	0	0	0	0	0
FRAIL-MDS	Luo et al. 2015	0	0	0	0	0	0	3	0	0	3	0	0
FRAILOMIC	Erusalimsky et al. 2015	0	0	0	0	0	0	0	0	0	0	0	0
Frailty Index (CLSA)	Kanters et al. 2017	3	0	4	0	0	4	4	4	0	3	4	0
Frailty Index (Yale Precipitating Events Cohort)	Searle et al. 2008	0	0	0	1	1	4	0	3	0	3	0	0
Frailty Screening Tool	Doba et al. 2012	4	0	3	0	2	4	0	3	0	0	3	0
Frailty Trait Scale	Garcia-Garcia et al. 2014	4	0	0	0	0	4	3	4	0	3	4	0

FRAIL-VIG Index	Amblas-Novellas et al. 2018	4	2	3	0	0	4	4	0	0	4	0	0
FRESH-Screening	Kajsa et al. 2016	0	0	0	0	0	4	4	0	0	4	0	0
Fried Frailty Index	Kim et al. 2014	0	0	3	3	3	0	3	4	0	3	4	0
Functional Fitness Test	Rikli et al. 1999	0	0	1	3	0	4	3	3	0	3	3	0
Gait Speed	Castell et al. 2013	0	0	4	0	0	0	3	0	0	3	0	0
Gill Frailty Index	Kim et al. 2014	0	0	3	3	3	0	3	4	0	3	4	0
Gerontopole Frailty Screening Tool (GFST)	Vellas et al. 2013	0	0	0	0	0	0	3	0	0	3	0	0
Groningen Frailty Instrument	Daniels et al. 2012	0	0	3	0	3	4	3	0	0	4	0	0
	Metzelthin et al. 2010	0	4	0	3	0	0	4	3	0	3	0	0
INTER-FRAIL	DiBari et al. 2014	3	0	3	0	0	4	4	0	0	4	0	0
InterRAI Homecare Frailty Instrument	Morris et al. 2016	3	4	0	0	3	0	3	0	0	3	0	0
Kihon Checklist	Satake et al. 2016	0	0	0	0	0	4	3	0	0	3	0	0
Marigliano-Cacciafesta polypathological Scale (MCPS)	Amici et al. 2008	0	0	0	0	0	4	4	0	0	4	0	0
Modified Frailty Index	Saum et al. 2012	0	0	4	3	0	3	4	4	0	4	4	0
Paulson-Litchberg Frailty Index	Paulson et al. 2015	0	0	3	0	0	0	3	0	0	3	0	0
Physical Performance Battery (PPB)	Chang et al. 2013	0	0	3	3	0	0	3	3	0	3	3	0
PRISMA-7	Raiche et al. 2008	0	0	0	0	0	4	4	0	0	4	0	0
Short Emergency Geriatric Assessment - modified (SEGAm)	Oubaya et al. 2014	4	4	3	4	0	0	4	3	0	0	4	0
	Oubaya et al. 2017	0	0	3	0	0	0	0	0	0	4	0	0
Self-administered test	Amici et al. 2011	0	0	0	0	0	0	3	0	0	3	0	0
Self-Report Screening Instrument	Nunes et al. 2015	3	4	3	0	0	4	4	4	0	4	4	0
Self Report Screening Tool	de Souto Barreto et al. 2012	0	0	0	0	0	0	3	0	0	3	0	0
Self- Assessment Gronigen Frailty Index	Peters et al. 2012	3	2	0	0	0	0	4	3	0	3	3	0
SHARE -FI	Romero-Ortuno et al. 2013	3	4	3	2	0	4	4	3	0	4	4	0
SHARE-FI75+	Romero-Ortuno et al. 2014	3	4	3	2	0	4	3	3	0	4	4	0
Sherbrooke Frailty Questionnaire	Daniels et al. 2012	0	0	3	0	3	4	3	0	0	4	0	0
	Metzelthin et al. 2010	0	4	0	3	0	0	4	3	0	3	0	0
Strawbridge Frailty Questionnaire	Mattews et al. 2003	0	4	0	0	3	0	1	1	0	1	1	0

Study of Osteoporotic Fractures Frailty Index (SOF-FI)	Kiley et al. 2009	0	0	3	1	0	0	3	3	0	3	3	0
Short Physical Performance Battery (SPPB)	de Camara et al. 2013	0	0	1	3	0	4	4	0	0	4	0	0
Targeted Geriatric Assessment Tool (TaGA)	Aliberti et al. 2018	0	0	0	4	0	4	3	0	0	3	0	0
Tilburg Frailty Instrument	Daniels et al. 2012	0	0	3	0	3	4	3	0	0	4	0	0
	Metzelthin et al. 2010	0	4	0	3	0	0	4	3	0	3	0	0
	Gobbens et al. 2009	4	4	0	1	3	4	4	4	0	3	4	0
	Gobbens et al. 2017	4	4	0	1	0	0	3	3	0	3	3	0
	Andreason et al. 2015	0	0	0	0	0	0	0	0	0	0	0	0
Timed up-and-go	Savva et al. 2013	0	0	4	0	0	4	3	3	0	3	3	0
TOPICS-MDS	Lutomski et al. 2013	0	0	0	0	0	0	3	0	0	3	0	0
Upper Extremity Function Frailty Index (UEF-FI)	Toosizadeh et al. 2017	0	0	4	0	0	4	4	0	0	4	0	0
Vulnerable Elders Survey -13	Min et al. 2009	0	0	3	0	0	0	3	3	0	3	3	0
Vulnerable Elders Survey -Health Outcomes Survey 2.0	Beckett et al. 2017	0	0	0	0	0	0	3	0	0	3	0	0
Web-based screening tool (Frailty Portal)	Lawson et al. 2017	0	0	0	0	0	0	0	0	0	0	0	0
Winograd Frailty Index	Winograd et al. 1991	0	0	0	3	0	0	0	0	0	0	0	0

(R) COSMIN Ratings per Article