Review Article

Screening for Frailty and Sarcopenia in Primary Care: Where are we now?

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ABSTRACT

Objectives: The aging of the global population and its associated challenges result in increased burden on our health care system. The policy of many countries is therefore becoming more focused on preventive programs for geriatric syndromes. Frailty and sarcopenia are two emerging syndromes that are usually overlooked and undertreated in clinical practice. Early identification of these conditions by primary care physicians, would postpone and even reverse the progression towards disability and other negative health outcomes. This narrative review aims to discuss and propose reliable and feasible screening tools for frailty and sarcopenia in primary care.

Methods: PubMed was searched (last search 1st of November 2018) looking for articles concerning screening for sarcopenia and frailty in primary care. Articles were considered relevant if they discussed or compared different screening tools for frailty or sarcopenia among community-dwelling older people within a primary care setting.

Results: Three widely used frailty models and three screening methods of sarcopenia are summarized. The applicability of these models and screening methods in primary care is discussed. Recommendations regarding the screening are formulated and the benefits of building a structured model based on preventive medicine are highlighted.

Conclusion: This review recommends screening for physical frailty and sarcopenia in primary care using the FRAIL and SARC-F questionnaires respectively. Involvement of home nurses in the screening and partnership with hospital specialists would optimize the care of older people and afford a significant and sustained advance in combating frailty and sarcopenia.

Key words: Frailty, sarcopenia, primary care, family medicine, screening tools

Introduction:

Population aging is a well-known worldwide phenomenon, primarily due to falling of fertility rates and longer life expectancy [1]. By 2050, people aged 60 years or more will encompass up to 19% of the population in Middle East and Northern Africa [2]. With this global population aging and the rising costs of health and social care, the strategy of many health systems is shifted towards focusing on health promotion and disability prevention among older people [3]. Disability exerts deleterious consequences on health systems because of its association with poor health outcomes such as hospitalization, institutionalization, increased home healthcare and higher health care expenses [4]. Among several chronic conditions that drive the disabling cascade, frailty and sarcopenia are receiving a lot of attention because of their high prevalence in older people, their association with poor health outcomes and the fact that both are potentially reversible provided there is early screening and intervention [5].

Frailty is defined as a state of vulnerability to poor resolution of homeostasis after a stressor event and is a consequence of cumulative decline in many physiological systems during a lifetime. This cumulative decline depletes homeostatic reserves until minor stressor events trigger disproportionate changes in health status [6]. The prevalence of frailty differs between studies due to different definitions of frailty [7]. In a recent systematic review including studies from the UK, the USA, Europe, Australia and Canada, the overall prevalence of frailty was 10.7% (95% CI 10.5% to 10.9%) in community-dwelling adults aged 65 and older; that prevalence was higher in women than in men and increased with age [7]. Frailty is associated with poor health outcomes such as loss of activities of daily living, falls, fractures, hospitalization and increased risk of premature mortality [8].

The concept of sarcopenia was first proposed by Irwin Rosenberg in 1989 to describe the age-related decrease of muscle mass [9]. In 2010 the European Working Group on Sarcopenia in Older People (EWGSOP) extended the definition of sarcopenia by adding muscle function to the former definition [10]. More recently, the Working Group (EWGSOP2) updated the original definition [11]. Sarcopenia is now defined as generalized and progressive skeletal muscle disorder that is associated with negative health outcomes including falls, fractures, physical disability, and mortality. The new definition advises the use of low muscle strength as the primary parameter of sarcopenia, since muscle strength is at present the most reliable measure of muscle function (Table 1).

Using the original definition of the EWGSOP, the reported prevalence of sarcopenia is up to 29% in community-dwelling older adults and up to 33% in long-term care populations [12]. Since nearly two decades, frailty and sarcopenia have been studied in parallel [5]. Due to their close relationship with the musculoskeletal system, frailty and sarcopenia largely overlap. They share a unique condition: impairment of physical function, which represents the primary stage of a process dragging the older patient towards functional deterioration and disabilities [5].

Despite their close relation, frailty and sarcopenia should be considered distinct entities, as frailty is more multifaceted than sarcopenia alone [13]. Recently, sarcopenia was recognized as an independent condition -code (M 62.84) in the International Classification of Disease, 10th Revision, Clinical Modification (ICD-10-CM) [14].

Diagnosing frailty or sarcopenia is challenging, particularly in an early stage. Clinical signs like general weakness, slow gait, low physical activity and loss of weight usually begin and progress insidiously, can be related to many illnesses, or are wrongly attributed to 'physiological aging'.

Primary care physicians are often confronted with complex geriatric problems in their daily practice. Inability to recognize geriatric syndromes like frailty and sarcopenia can elicit confusion and frustration among the physicians and their patients and might lead to insufficient care of these conditions [15]. Family physicians still have the privilege over other specialists to an early identification and treatment of geriatric syndromes, taking into consideration their patient-centred approach that allows them to understand patients' problems, preferences and experiences of illness [15]. In the primary care setting, practices are busy, consultation time is limited, and multidisciplinary services are mostly unavailable. Consequently, primary care physicians might face another obstacle in finding a simple, feasible, and accurate tool to identify geriatric syndromes.

In this narrative review we will discuss and compare the theoretical aspects and the clinical utility of different models of frailty and screening tools for sarcopenia. The aim of this review is to identify the best known and recent screening methods for these two syndromes in consideration of their applicability within primary care.

Table 1:. 2018 operational definition of sarcopenia [11]

Probable sarcopenia is identified by criterion 1. Diagnosis is supported by additional documentation of criterion 2. If criteria 1, 2, and 3 are all met, sarcopenia is considered severe.
1. Low muscle strength 2. Low muscle quantity or quality 3. Low physical performance

Methods

1. Search strategy

PubMed database was searched (last search 1st of November 2018) looking for articles concerning screening for sarcopenia and frailty in primary care. The first and the second author (ZK and SP) searched the initial database independently. Search was restricted to articles in English, Dutch and French. Frailty and sarcopenia were separately searched using predefined medical terms. First we used the terms ((frailty) AND ((primary care) OR (general practice) OR (family medicine))) AND ((screening tools) OR screening) looking for reviews relevant to screening for frailty in primary care. The second search was performed using the terms ((sarcopenia) AND ((primary care) OR (general practice) OR (family medicine))) AND ((screening tools) OR screening) looking for reviews relevant to screening for sarcopenia in primary care.

2. Selection criteria

Articles were considered relevant if they discussed or compared different screening tools for frailty or sarcopenia among community-dwelling older people within a primary care setting. Additional articles have been selected from the reference list of the included articles and lateral search. Papers were excluded if they focused on screening among institutionalized older people, those admitted to the hospital or patients during their stay in the emergency department. Articles concerning association of frailty or sarcopenia with a specific disease such as cancer, COPD and heart failure were also excluded. An overview of the study selection process is shown in (Figures 1 and 2).

Figure 1: Process of article selection concerning sarcopenia

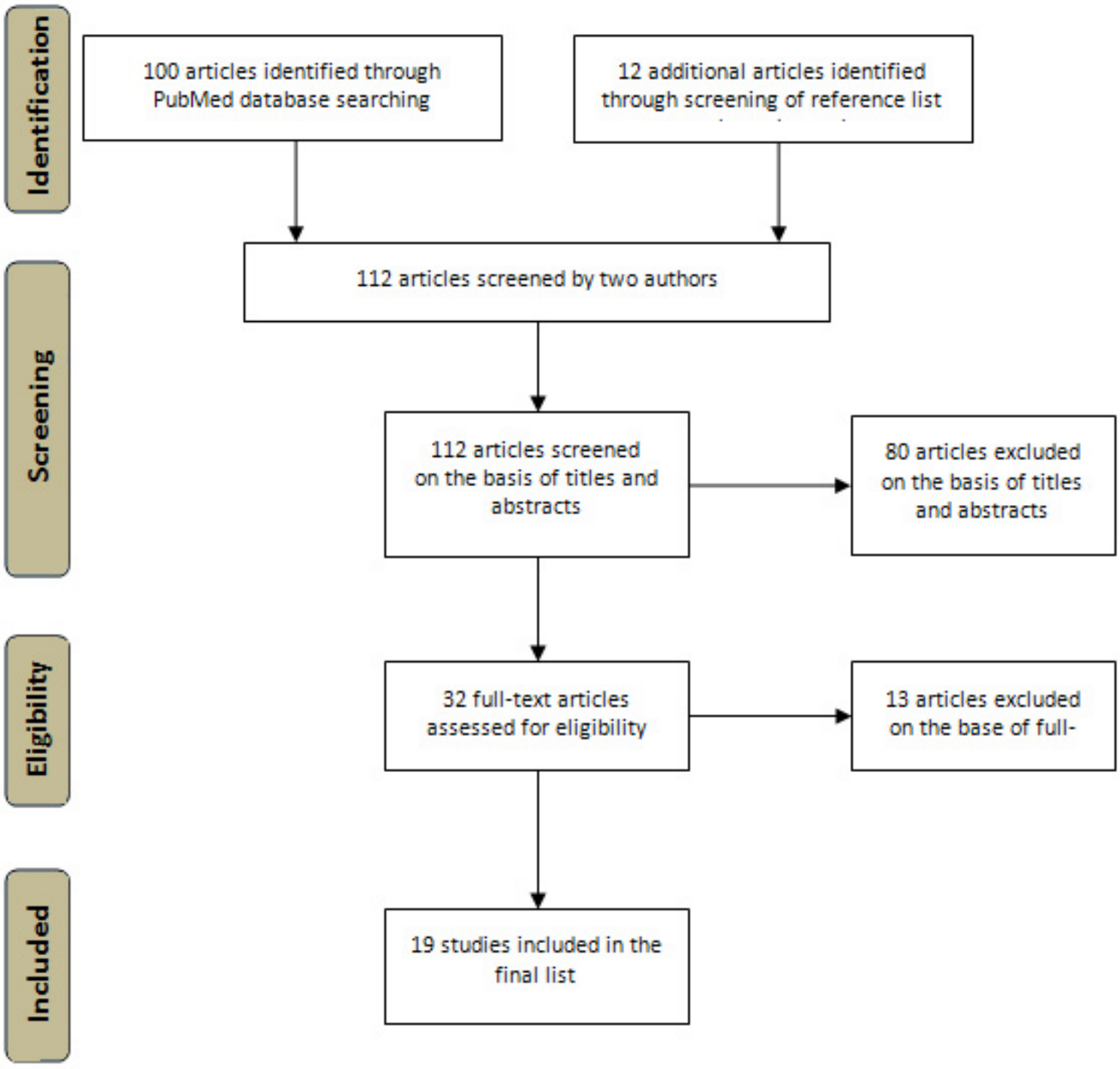
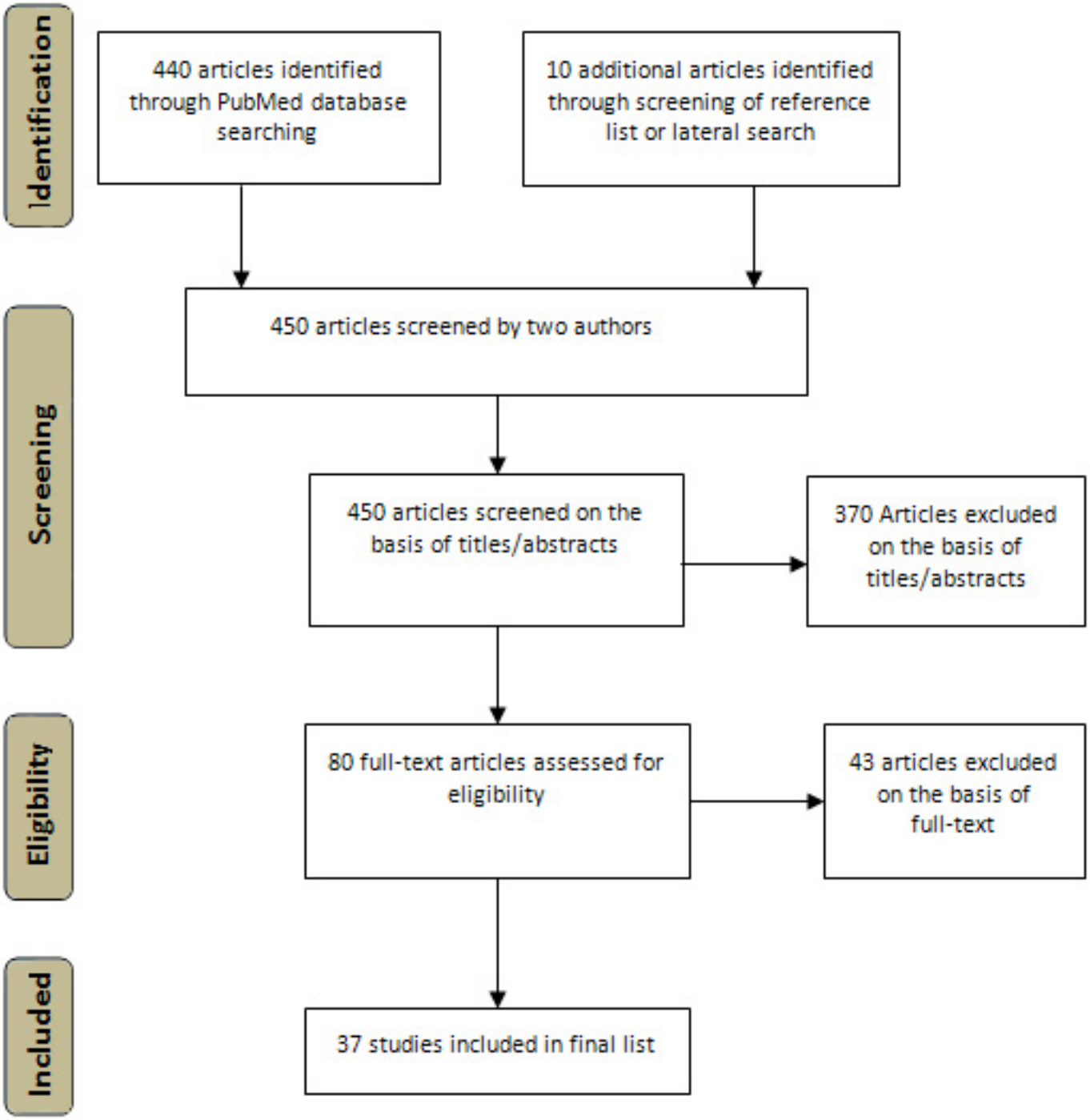


Figure 2: Process of article selection concerning frailty



Findings

1 Screening for frailty in primary care:

Over the last years, several models of frailty have been suggested to give a better understanding of the concept of frailty and to construct a number of assessment and screening tools to measure the frailty status of an individual [16]. Rockwood proposed three criteria for a successful definition of frailty [17]: content validity, construct validity and criterion validity. Content validity means that a successful frailty model should include multiple determinants, should be dynamic, supersede earlier definitions and could be broadly applied in different contexts. Construct validity in contrast, refers to whether the definition correlates with other measures of frailty, such as age, gender and disability. In the third criterion, criterion validity, the model should predict adverse outcomes including mortality.

Several models met most of these criteria. However, these models are not uniform; some are one-dimensional, focusing on physical aspects of frailty, others are multidimensional, and broaden the concept to include cognitive, psychological and social aspects. In addition, the tools derived from these models are also different. Where some rely on a self-report questionnaire, others rely on measurements using special tools. These differences are important to determine the suitability of the models that are to be used in primary care [16].

1.1 Frailty phenotype model

This model was operationalised by Fried et al using data from the Cardiovascular Health Study (CHS) [18]. In this model, frailty was standardized as a distinct clinical syndrome in which three or more of the following criteria were present: unintentional weight loss (10 lbs in past year), self-reported exhaustion, muscle

weakness, slow walking speed, and low physical activity; frailty is thereby not synonymous with either comorbidity or disability. This categorical model classifies people into three categories, being robust (none of the criteria), pre-frail (one or two criteria) or frail (three or more criteria). This frailty phenotype was independently predictive (over 3 years) of incident falls, disability in activities of daily living, hospitalization, and mortality in the Cardiovascular Health Study. Pre-frail status, showed an intermediate risk of these outcomes and an increased risk of becoming frail over 3-4 years of follow-up compared to those who were robust at baseline.

In clinical practice, assessment of deficits using this model requires one instrument (dynamometer) to assess muscle strength, a tape measure and a watch with a seconds hand to measure gait speed over 4 meters distance. The other parameters can be assessed by asking patients about weight loss, exhaustion and low physical activity.

A simple screening tool derived from the frailty phenotype model is the FRAIL scale. This 5-item questionnaire can be quickly administered by any healthcare provider or even by the patient (Table 2). FRAIL questionnaire correlates with instrumental activities of daily living, gait speed and grip strength [19].

1.2 The cumulative deficit model

In this model, frailty is understood as an 'at risk' state that results from age-associated accumulation of deficits [20]. In contrary to the frailty phenotype model in which deficits can be specified, the deficits in this model come in many forms and represents a variety of health problems or injuries that are not fully recovered from. The more accumulated deficits a patient has, the higher the frailty level and risk of adverse outcomes becomes [20].

The Frailty index (FI) was introduced as a quantitative measure for the deficit model using data from the Canadian Study of Heath and Aging [21]. This frailty index encompasses a set of health deficits (symptoms, signs, disease classifications, functional impairments and laboratory abnormalities). It serves as an individual state variable, reflecting severity of disease and proximity to aging and mortality [21]. The original version of the FI include 70 items but shorter versions (such as 30 deficits) exist without major influence on the properties of the FI, which enables application in and comparison between different datasets [22]. The proportion of deficits present forms the patient's FI score, which can range from zero to one [21]. Some authors have questioned the validity of the FI in the primary care setting, due to its complexity and its discriminative ability [23]. Others have supported the appliance of FI in primary care relying on its ability to predict adverse health outcomes, to encompass all important frailty aspects and from the fact that routine health care data can be used to calculate FI score [6,20].

1.3 The multidimensional model

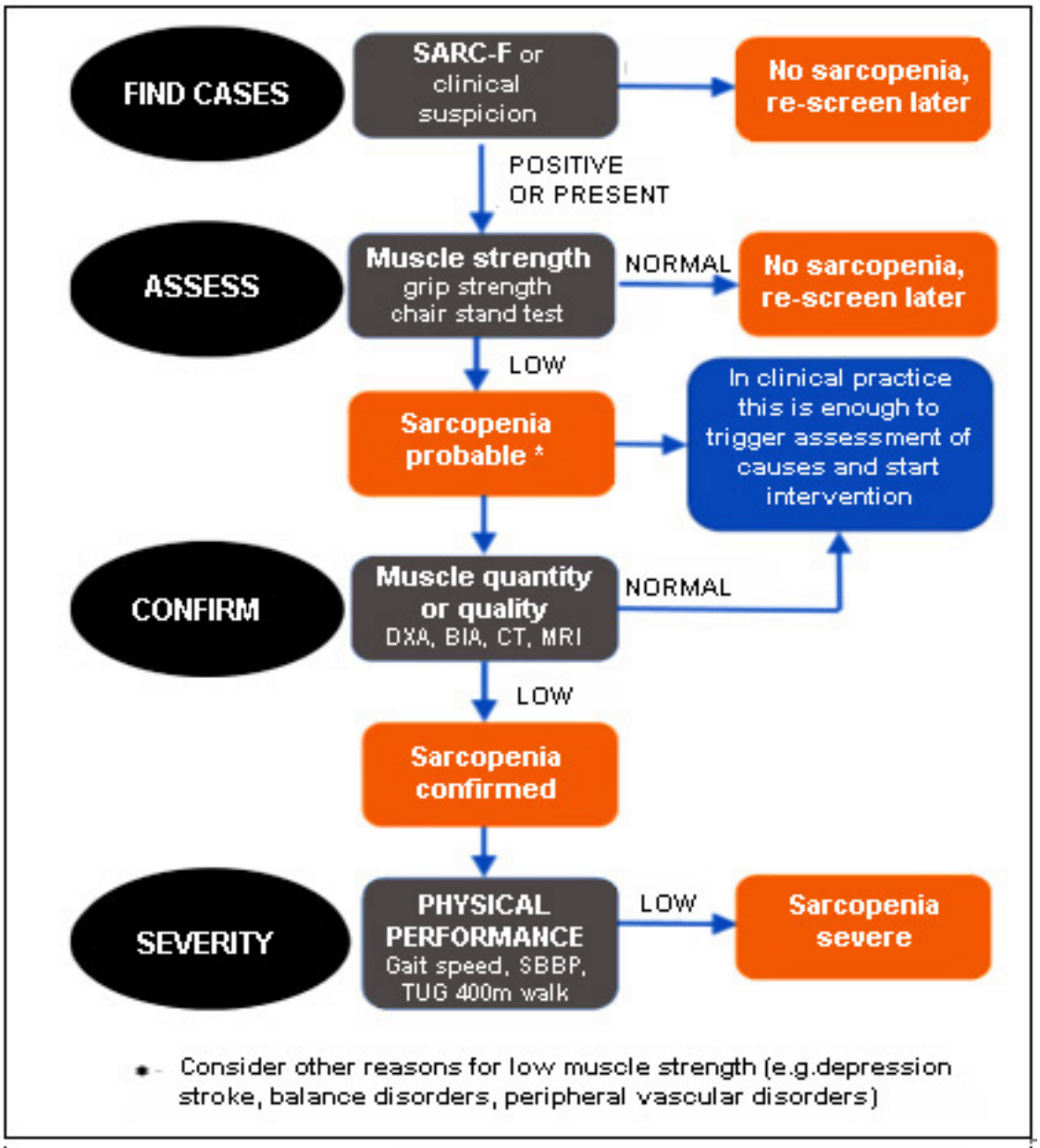
There is a long lasting discussion as to whether frailty should be restricted only to deficits in physical functions or if social and psychological aspects should be added as well. At present, there is a growing consensus among researchers and health care providers over the multidimensional approach of frailty [24]. To be applied in clinical practice, the multidimensional model needs an easy operational definition of frailty [25]. The Tilburg Frailty Indicator (TFI) is a self-administered questionnaire that was developed to demonstrate the multidimensional approach of frailty [26]. The TFI is mainly based on an integral conceptual frailty model [27], a model that illustrates the evolution of life course determinants and disease(s) towards frailty and disability. The TFI requires approximately14 minutes to administer and includes 15 components of frailty that refer to three domains of frailty (8 components refer to physical frailty, 4 to psychological frailty and 3 to social frailty) [26]. These 15 components also represent the TFI score (score 0-15). A total score of 5 or more is considered as a cut-off point to assess a patient as frail [26].

The Groningen Frailty Indicator (GFI) is another example of a screening tool based on the multidimensional model. The GFI is a 15-item screening tool that is widely used in clinical practice and can be used for both community-dwelling and institutionalized older people. It measures functional losses in many domains: the physical (mobility functions, physical fatigue, vision and hearing), the cognitive (cognitive dysfunction), social (emotional isolation), and psychological (depressed mood and anxiety). The range of the GFI total score is 0 to 15, with a score of 4 or more representing moderate to severe frailty [28].

Table 2: FRAIL questionnaire [19]

Component	Question
Fatigue	How much time did you feel tired during the last 4 weeks?(all of the time, most of the time= 1 point)
Resistance	Do you have any difficulty walking up 10 steps alone without resting and without aids?(yes= 1 point)
Ambulation	Do you have any difficulty walking several hundred yards alone and without aids?(yes= 1 point)
Illness	How many illnesses do you have out of a list of 11 total(5 or more= 1 point)
Loss of weight	Self-reported weight decline of >5% within 12 months (yes= 1 point)

Figure 3: EWGSOP2 algorithm for case-finding, diagnosis, and quantifying severity in practice. The steps of the pathway are represented as Find-Assess-Confirm-Severity or F-A-C-S [11]



2 Screening for sarcopenia in primary care:

The concept of sarcopenia as a muscle failure is better understood nowadays; however, there is still a gap between research findings and clinical practice [11]. It is not easy for primary care physicians to decide what parameters of sarcopenia to measure, how to measure them, what cut-off values to choose for diagnosis and treatment and how to follow up the results of an intervention [29].

A wide variety of tools are available for characterization of sarcopenia in practice and in research [11]. Recently, the EWGSOP2 has developed a new algorithm (Figure 3) for sarcopenia case-finding, diagnosis, and severity determination [11]. This algorithm is consistent with the updated sarcopenia definition, and practical to use in clinical settings.

Next, we will focus on the first step of the algorithm (case-finding) as this is the most relevant one to the primary care setting. Assessment of muscle strength, quantity/quality as well as quantification of severity of sarcopenia is considered beyond the scope of this article.

2.1 SARC-F questionnaire

This self-reported questionnaire was developed as a possible rapid screening test for sarcopenia [30]. SARC-F is an acronym made up by its five components: Strength, Assistance in walking, Rising from a chair, stair Climbing and Falls. Each component is scored from 0 to 2 points, giving a global score between 0 and 10 points. A score≥4 points is reported to be predictive of sarcopenia and poor outcomes and should thus be a trigger for a further assessment. The SARC-F questionnaire was recommended by EWGSOP2 as a way for patients to reflect on their perception of the ability or disability of lifting 10 pounds, walking across a room, rising from chair or bed, climbing a flight of 10 stairs and incidents of falls in the last 12 months. Three large studies - the African American Health (AAH) study, the Baltimore Longitudinal Study of Aging (BLSA), and the National Health and Nutrition Examination Survey (NHANES) - have

investigated the utility of SARC-F and concluded that the internal consistency and validity for detecting persons at risk for adverse outcomes from sarcopenia is good [31]. Because of its low sensitivity and high specificity, SARC-F is more useful to exclude sarcopenia and muscle function impairment [32].

2.2 Ishii screening test

The Ishii screening test is a method that estimates the probability of having sarcopenia using an equation-derived score based on three variables—age, grip strength and calf circumference [33]. This test could help to identify functionally independent older adults with sarcopenia who are good candidates for intervention. This test is suitable as a case-finding instrument in populations where sarcopenia is likely [34].

2.3 The red flag method

This method has been identified by the European Society for Clinical and Economic Aspects of Osteoporosis and Osteoarthritis (ESCEO) working group on frailty and sarcopenia [35]. With this method, awareness is generated among general practitioners about the clinical presentation of patients with particular regards to the physical manifestations of sarcopenia such as general weakness, slow gait or muscle wasting. Patients can also be asked about symptoms such as loss of weight, loss of muscle strength, loss of energy, falls, etc. If the screening detects any red flag suggesting the presence of sarcopenia (Table 3), patients should be referred for further assessment.

Discussion

This narrative review reveals that several models and tools can be utilized for the screening of frailty and sarcopenia in primary care medicine. While there is a recent agreement (at least among European countries) to use a self-reported questionnaire for screening for sarcopenia in clinical practice, there is until now still no consensus over which frailty model is the gold standard to be implemented as screening instrument in primary care. This is not unexpected, taking into consideration the multifaceted, multifactorial and complex nature of frailty compared to sarcopenia as being 'one organ failure'.

The multidimensional model might be theoretically preferred to reflect the holistic nature of frailty. However, cognitive, social and affective dimensions of frailty need a sophisticated multidisciplinary approach that goes beyond the capability of the primary care practitioner. The tools derived from the multidimensional model are too complex to be primary care friendly.

For example, the TFI has the most robust evidence of reliability and validity and has been the most extensively examined in terms of psychometric properties among 38 multidimensional frailty assessment instruments [36]. Even so, this tool requires approximately 14 minutes to administer which is longer than the average consultation time of the family physicians (10-12 minutes). Another study compared the multidimensional model represented by GFI to the deficit model represented by FI [37]. This study suggested using a two-step screening tool by combining the two models. Initial FI screening in routine healthcare data, followed by a GFI questionnaire for patients with a high FI score or otherwise at high risk was recommended to provide an optimal proactive primary care approach. Although the sequential two step screening approach is the most efficient to

Table 3: The Red flags proposed by (ESCEO) working group on frailty and sarcopenia

Clinician's observation	General weakness of the subject
	Visual identification of loss of muscle mass
	Low walking speed
Subject' s presenting features	Loss of weight
	Loss of muscle strength, in arms or in legs
	General weakness
	Fatigue
	Falls
	Mobility impairment
	Loss of energy
	Difficulties in physical activities or activities of daily living
Clinician's assessment	Nutrition
	Body weight
	Physical activity

personalized elderly care, using two complex models for a screening goal seems impractical in primary care.

In contrary, physical frailty represented by frailty phenotype model might be more suitable for screening purposes in primary care. Physical frailty indicators such as slow walking speed, exhaustion, weakness and weight loss can be objectively measured in clinical practice. In this regard, family physicians need an easy tool to approach these physical indicators. As De Lepeleire et al suggested, a simple heuristic tool as the first step, followed by a more comprehensive assessment as the second step, is what family physicians really need to use for frailty [38].

The FRAIL scale could be a promising first step screening tool for physical frailty, unlike the frailty phenotype which requires measured performance (walking speed, grip strength) or the FI which includes numerous items, typically 40 or more, and may include measured performance (e.g., cognition, physical performance). The FRAIL scale is short, interview based, simple to administer and interpret and has demonstrated validity so it may prove to be valuable for use in a busy clinic [39]. A recent study compared 4 frailty scales in the African American Health (AAH) cohort [39]. The FRAIL scale was compared to the Study of Osteoporotic Fractures (SOF) frailty scale, the phenotype-based Cardiovascular Health Study (CHS) frailty scale, and the comprehensive Frailty Index (FI). The FI and the FRAIL scale exhibited the strongest predictive validity for new disability and mortality. The FRAIL scale was good enough in prediction of new 3-year disability, 9-year disability and 9-year mortality.

Noteworthy, physical frailty is a preventable and manageable condition [13] that shows great overlap with sarcopenia. Sarcopenia is a major contributor to the development of physical frailty [11]. Patients who are suspected to be physically frail should be screened for sarcopenia.

Sarcopenia should be suspected by recognizing symptoms or signs that are relevant to muscular dysfunction such as general weakness, difficulty rising from a chair, falling and slow walking speed. If these clinical pictures are suspected, then screening should take a place.

The most available screening tests for sarcopenia have a very good specificity but low sensitivity [34]. An ideal screening test must exhibit rationally accurate sensitivity and specificity [40]. Tests with a high sensitivity are needed to promptly detect patients at risk of sarcopenia and refer them in the early stages to start with prevention and treatment. A recent study compared the psychometric properties of five screening tools for sarcopenia against five diagnostic definitions and found that the tool of Ishii et al had higher sensitivity than SARC-F regardless of the definition used [34]. Nonetheless, calculations required in the tool of Ishii might be time-consuming and complicated for general practitioners, which may limit its utility.

Screening for frailty and sarcopenia would help to construct a structured model based on preventive medicine, converting thereby the reactive care to proactive care [15,24]. In general, family physicians offer a lot of health services including treatment of acute self-limiting illnesses, follow-up of chronic diseases and screening of cancers and cardiovascular diseases. Thus they provide a continuity, coordination and comprehensiveness of care for their patients [41].

Elderly people who are severely frail or sarcopenic, have increased risk of complications and mortality if they undergo invasive interventions. In this case, family physicians can appropriately discuss the potential risks and benefits of these interventions with the patients and their family, make informed recommendations around preventive and screening programs, and, thereby, have the potential to decrease unnecessary hospitalizations or potentially harmful interventions [15]. The role of home nurses should not be ignored, and family physicians can share their knowledge with them so they can together speak the same language with the patients, families and friends and educate them about geriatric syndromes [42].

An integrated model based on alliance among health care providers in primary and secondary care is still recommended to optimize the care for seniors. Such a model enhances awareness for geriatric syndromes in the general public, promotes prevention programs and provides intervention before a traumatic event occurs. This has a positive impact on the 'aging in place' phenomenon by helping older people live autonomously in their favourable environment for as long as possible.

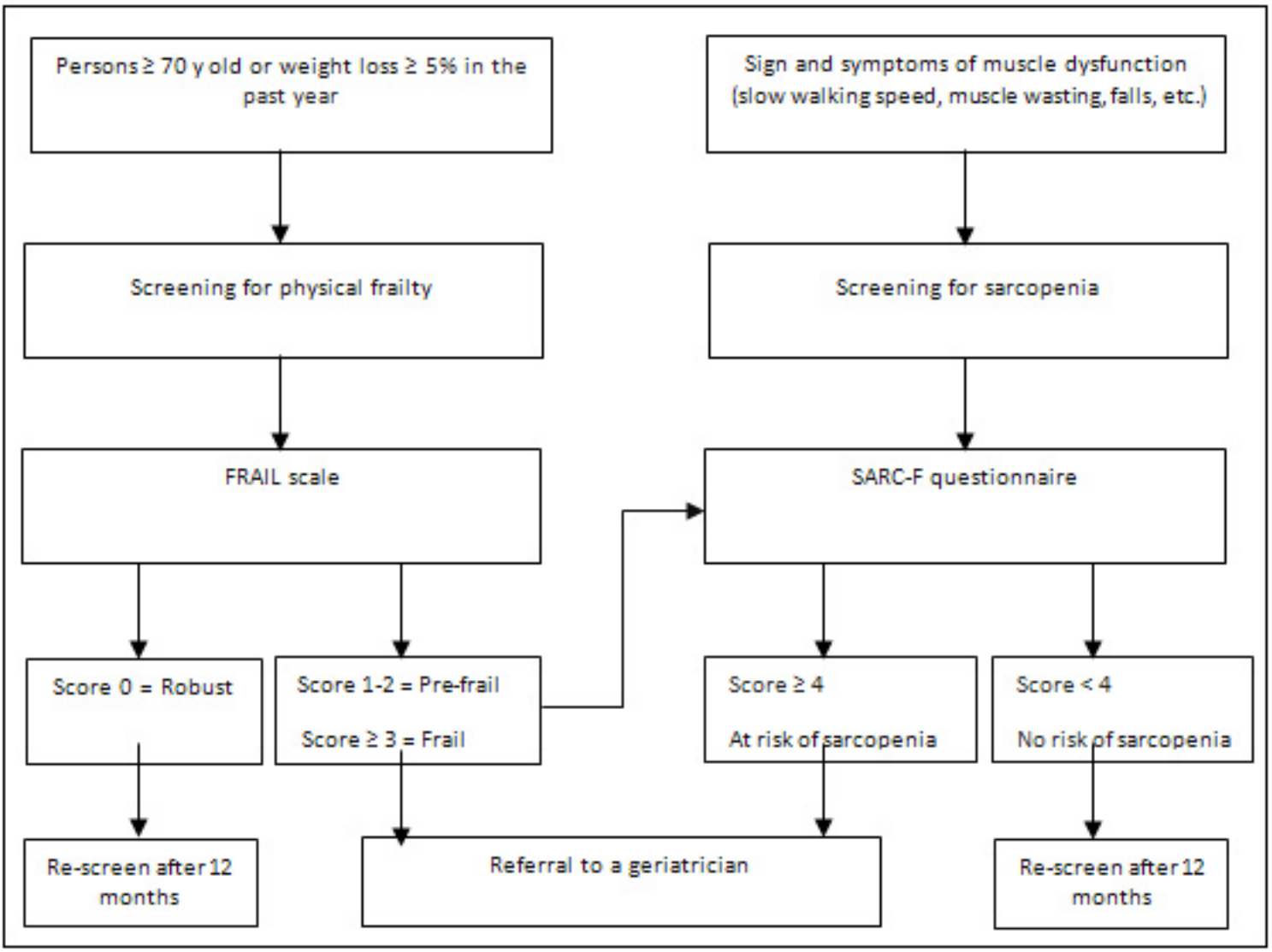
Recommendation

We thus recommend screening for physical frailty in persons 70 years or older [13]. Due to the overlap between physical frailty and sarcopenia, those who are pre-frail and frail should also be screened for sarcopenia before referral to a geriatrician. Patients with suspected muscular dysfunction should be separately screened for sarcopenia (Figure 4 - next page).

Conclusion

Primary care physicians have the opportunity and the responsibility to identify frailty and sarcopenia in their daily practice. Early detection of these conditions might postpone and potentially even reverse the evolution toward disability and other negative health outcomes. Screening for physical frailty seems to be more suitable for the primary care context compared to other aspects of frailty. Use of validated self-report questionnaires such as FRAIL and SARC-F appears to be the most appropriate elementary screening steps for physical frailty and sarcopenia respectively. Partnership between primary physicians, home nurses on one side and hospital specialists on the other side might importantly optimize the continuity of care and yield significant and sustained progress in combating frailty and sarcopenia.

Figure 4: Suggested algorithm for screening of physical frailty and sarcopenia in primary care



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