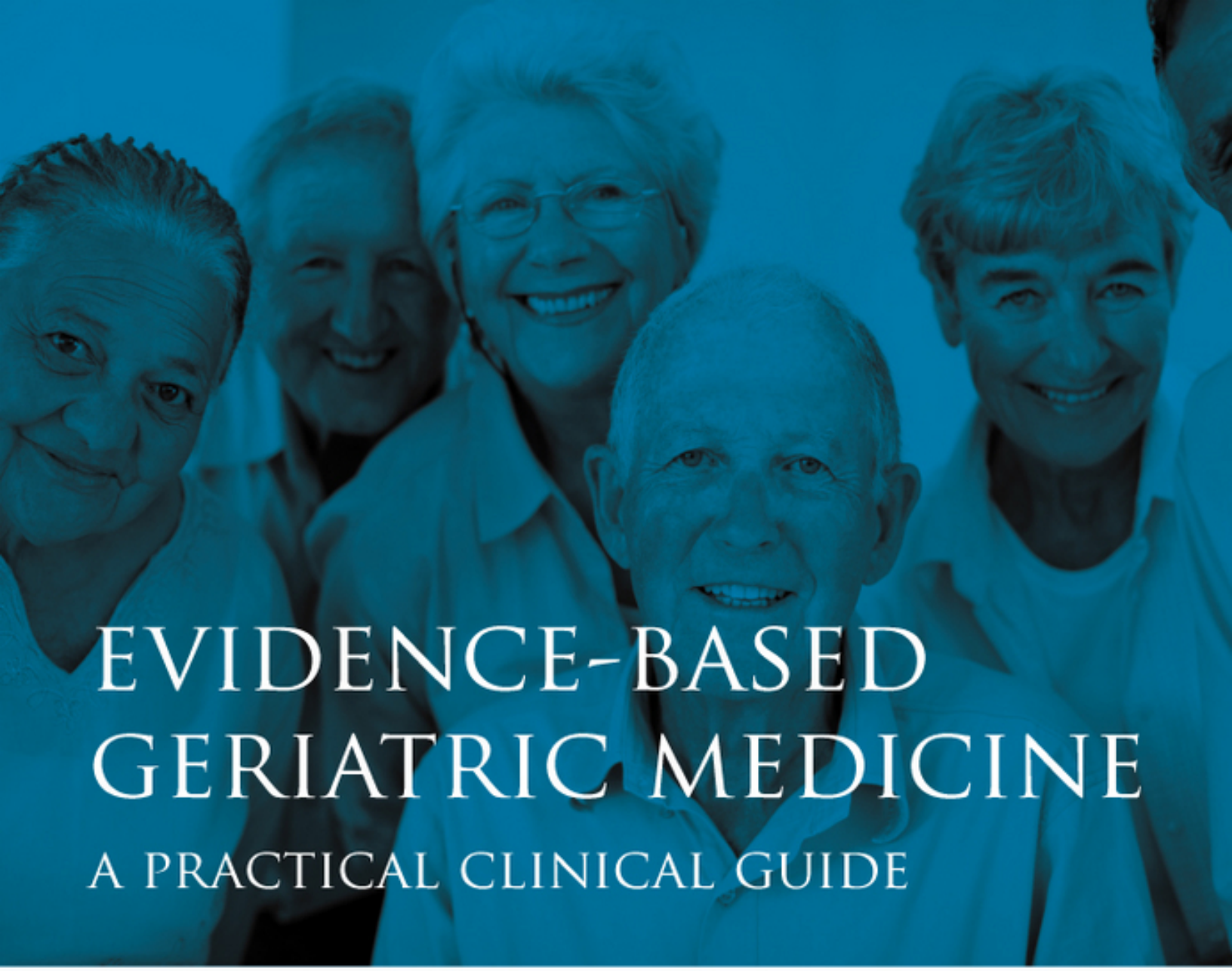

EVIDENCE-BASED GERIATRIC MEDICINE

A PRACTICAL CLINICAL GUIDE

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Foreword

Worldwide a major change in the population demographic is posing challenges to health care systems. In many countries the baby boom, that followed World War II and extended to the 1960s, will soon result in a substantial increase in the number of people over 65 years of age. Moreover, most countries including Canada, the United States and the United Kingdom have experienced a continuing increase in life expectancy, with an increase of approximately 1 year occurring every 5 years. These factors translate into a growing proportion of people aged 65 and older and these people will have many more years of life after attaining age 65. This situation is not unique to western countries; many developing countries will grow old before they get rich. For example, in 2000, 7% of China's population was ≥ 65 years old; by 2030 this will increase to 16%. As the proportion of older people increases, there is an increasing need for services targeted to care for older people, in particular to optimize the independence and vitality of those living in the community. There is an urgent need for health care professionals from all disciplines (aside from paediatrics!) to become comfortable with caring for this population. This book will address this demand and provide a resource for health care professionals to provide evidence-based care for older patients.

Evidence-Based Geriatric Medicine, a Practical Guide focuses on bringing together 2 critically important issues in health care – evidence-based practice (EBP) and care of the older patient. Interest in EBP has grown exponentially since the coining of the term in 1992, from 1 MEDLINE citation in that year to more than 75000 hits in January

2012. Training in EBP has become a component of educational curricula for health care disciplines, patients and policy makers amongst others[1]. This growing interest arose from a number of realisations including: our inability to afford more than a few seconds per patient for finding and assimilating evidence[2] or to set aside more than half an hour per week for general reading and study[3]; and the finding that the gaps between evidence and practice (including underuse and overuse of evidence) lead to variations in practice and quality of care[4, 5].

To meet these challenges, this book focuses on providing an approach to care for older patients that is based on the best available evidence. An ideal evidence-based resource should use rigorous and transparent methods for seeking and appraising the evidence, and provide the evidence in a clinically useful format. The format of each chapter in this book includes questions that have been generated by clinicians while the content focuses on a systematic review of the evidence and provides the reader with the bottom line for their clinical practice. Finally, the book highlights the gaps in the evidence, which are targets for future research (we hope!).

Topics addressed in the book include assessing and managing the geriatric giants such as delirium, dementia, urinary incontinence and falls. The authors also tackle issues, such as elder abuse, that are often underappreciated in clinical care. And, the book includes discussion of the management of chronic diseases in the complex older patient which is useful information for any generalist clinician.

This book will be a resource for trainees and clinicians from various disciplines, worldwide. It addresses issues of global importance – promoting healthy aging and building capacity to care for older persons.

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CHAPTER 1
Function and frailty: the cornerstones of geriatric assessment

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Introduction

Older people are more likely to be ill than younger people, and most of the older people who are ill have more than one illness. Yet this is generally not what we teach medical students. Instead, reflecting the scientific tradition of reductionism from which real progress has been possible, medicine is generally taught on a “one thing wrong at once” basis, often with younger patients as prototype [1]. Consequently, many physicians have an ambivalent understanding about medicine and aging.

We discuss two main topics in this chapter. The first is frailty. Frail older adults often behave as complex systems that are close to failure. One aspect of acting in a complex system is that when the system fails, it will fail in its highest order functions first. For humans, these high order functions are divided attention, upright bipedal ambulation, opposable thumbs, and social interaction. Their failures are delirium, mobility impairment and falls, impaired function, and social withdrawal/abandonment. Another essential aspect of acting in a complex system is that any single act is likely to have multiple consequences. For example, the medication given in an evidence-based way to treat

inflammatory arthritis to allow mobilization, so as to comply with evidence-based exercises and to improve cardiac conditioning, might decrease heart function in a frail patient through fluid retention that precipitates heart failure. That is why the specialty of geriatrics has evolved dicta such as “start low, go slow”. This is not simply codified common sense, but a rational response to the patients’ complexity.

The second main topic that we discuss in this chapter is function. Functional impairment in an older adult is often characterized as a “sensitive but nonspecific” sign of illness. While true, it is an inadequate account of why it should have the iconic status of a “geriatric giant” [2], because medicine is replete with other sensitive but nonspecific signs, from chest pain to chapped lips. Intact functioning requires a lot to be right; compromised function can reflect a single cause (e.g., a catastrophic stroke), but commonly, in older adults, it reflects problems in more than one area. It is this “more than one thing wrong” aspect of functional impairment that makes it so useful as an overall sign of a patient's state of health.

Table 1.1 Contrasting the frailty phenotype and the frailty index

	Frailty Phenotype	**Frailty Index**
General	Five items: (1) weakness, (2) exhaustion, (3) reduced activity, (4) motor slowing, and (5) weight loss	Any set of items that are age associated, associated with adverse outcomes, do not saturate at some young age, and have <5% missing data.
Data collection	Usually must be prospective	Can be operationalized in many existing data sets
Number of items	5	Can be as few as 30, as many as 100; most often about 40–50
Is supported by a theory of frailty	Yes	Yes
Uses performance measures	Yes	Usually not
Uses disability items	No	Usually
Uses comorbidity items	No	Yes
Cross-validated	Extensively (>100 groups)	Somewhat (about a dozen groups)

	Frailty Phenotype	**Frailty Index**
Samples other than physical domains	Possibly (feeling of exhaustion)	Yes
Most common criticism	Covers too few domains	Includes too many items, especially disability and comorbidity
Animal model	Yes	Yes

Search strategy

Frailty

We searched PubMed for systematic reviews, meta-analyses, and practice guidelines published in the last 5 years in English for those aged 65 and older using the following search terms: “frailty,” “frailty index,” and “frailty phenotype.” This yielded 144 articles, 25 of which were narrative reviews and 21 of which were systematic reviews.

Functional assessment

We searched PubMed for systematic reviews, meta-analyses, and practice guidelines published in English with subjects 65 and older in the last 24 months using the following search terms: “activities of daily living” (ADL), “ADL,” “evaluation,” “measurement,” “assessment,” and “functional.” This yielded 50 articles, 13 of which were pertinent to the topic. Expanding the search to articles published in the last 5 years yielded 138 new articles, 15 of which were pertinent to the topic. We then searched related citations of the 28 articles selected. This yielded

four additional items. A total of 32 articles were reviewed in detail.

For this chapter, we graded relevant clinical studies using the US Preventative Task Force levels of evidence.

What is frailty?

Frailty is the variable susceptibility to adverse health outcomes, including death, of people of the same chronological age. Controversy in the definition of frailty arises in how frailty is best operationalized. Pending the results of an ongoing large meta-analysis [3], two frailty operationalization camps have arisen (Table 1.1). One group emphasizes a frailty phenotype [4]. Another emphasizes a frailty index, and states that susceptibility to adverse outcomes arises as a consequence of the accumulation and interaction of deficits, for which various phenotypes might exist [5,6].

The frailty phenotype

The frailty phenotype specifies five characteristics: (1) slowness, (2) weight loss, (3) impaired strength, (4) exhaustion, and (5) low physical activity/energy expenditure. A person is said to be frail if they have any three of these five characteristics. People who have only one or two of the characteristics, while still at an increased risk compared to people with none of the phenotypic characteristics, are said to be “prefrail.” People with none of the characteristics are said to be “robust.” A strength of this approach is that at least four of the items are measurable by performance and in that way, objective. It also offers some prospect of finding mechanisms that might be associated with development and progression of frailty. The phenotype definition has been extensively validated

and is reliably associated with an increased risk of death and with other adverse health outcomes.

The phenotypic view is well accepted, in that over a hundred separate groups have conducted studies which show that for almost any adverse outcomes and for many physiological ones, such as levels of proinflammatory molecules [7], hemoglobin [8], or sex hormones [9], female robust people have, on an average, the most favorable profile, frail people the least favorable, and “prefrail” people an intermediate profile.

Despite widespread use and consistency of results, the frailty phenotype has been criticized for misclassifying people who are clinically recognizable as frail [10]. In particular, some critics argue that the frailty phenotype includes *too few* items, and suggest the inclusion of some or all of the subjective perceptions of health status, cognitive performance, sensory or physical impairments, current health status needs, or appearance (as consistent or not with age) [11–13]. Some evidence supports the inclusion of cognitive performance, just short of dementia, to improve the predictive validity of the phenotypic approach [14,15].

Among people who criticize the frailty phenotype for including *too many* items, there is recent evidence to support the primacy of slow mobility among the five potential markers of frailty [16]. On the other hand, gait speed correlates only modestly with adverse health outcomes [17]. Moreover, a frailty definition based on only three items ((1) weight loss, (2) inability to rise from a chair, and (3) low energy) has been tested against the five-item phenotypic definition and found to perform comparably with respect to risk classification [18,19]. It is also established that obese people can be frail, even if they have not had weight loss [20].

Many authors hold that any operational definition of frailty should not include disability [21–23], although it is recognized empirically that the large majority of disabled older adults will be frail in the sense of either meeting the frailty phenotype [24] or in having an increased risk of adverse health outcomes [25]. Short of that, phenotypes other than the classic five-item phenotype are studied [18,19,26–28].

The frailty index

A contrasting view of frailty more broadly considers the items that could be counted to define someone as frail [6,29]. Typically, a large number of items (40 or more) are counted and combined in a so-called frailty index [30]. The only restriction on the items is that they should count as health deficits (i.e., be associated with adverse health outcomes), and increase in prevalence with age, at least into the ninth decade. For an individual, their frailty index score is the number of deficits that they have, divided by the total number of deficits considered (e.g., a person with 10 deficits out of 40 considered would have a frailty index score of 10/40 = 0.25). The frailty index shows many consistent properties, independent of its make up. Various frailty indexes have been constructed with as few as 31 items to as many as 100, including many ADLs or none, or using self-reported data or observer assessed/test/clinic data. Notwithstanding this variability in how the frailty index is constructed, in Western community-dwelling samples, the index generally increases at about 0.03 points per year, is highly correlated with mortality, and shows a characteristic pattern of change that can be modeled stochastically with the output conforming to a Poisson distribution [29]. There appears to be a limit to frailty, i.e., a proportion of deficits beyond which survival is not possible. That limit is at a frailty index value of

approximately 0.7 [31–35]. Whether that limit can be used to guide decisions about a patient's suitability for an elective procedure or therapeutic regimen has not been established yet.

The frailty index has been criticized as being too labor intensive for clinical use compared with the five-item frailty phenotype [36]. Although the few head-to-head comparisons of the value of the frailty index versus the frailty phenotype in predicting vulnerability to adverse outcomes appear to favor the former [34,37,38], more widespread testing within clinical settings is required.

As with the frailty phenotype, there is no uniformity of the frailty index yet. Some reports employ simple three- or five-item frailty indexes. These simpler indexes have ceiling effects and therefore, do not allow the potential property of a limit to be tested, nor can they show the same relationship with age as the more complex indexes [18,19].

Between the operational propositions of frailty, as three or five carefully defined “phenotypic” items and a frailty index that takes 30 or more items into account, are a large number of scales that classify risk based on ten or more items [39–41]. Nevertheless, scales that include age (however well they might characterize risk) [42–44] should be excluded as measures of frailty because frailty refers to differential susceptibility to adverse outcomes among people of the same age.

The frailty state is clearly dynamic, and while people can improve, the greater tendency is for frailty to worsen over time, especially as adverse outcomes accumulate [45,46]. The dynamics of frailty further complicates clinical decision-making.

Clinical bottom line

Frailty can be thought of in terms of a phenotype or as an index. The frailty phenotype specifies five characteristics: (1) slowness, (2) weight loss, (3) impaired strength, (4) exhaustion, and (5) low physical activity/energy expenditure. For a frailty index, typically a large number of items (40 or more) are counted and combined into a score. An individual's frailty index score is the number of deficits that they have divided by the total number of deficits considered.

Is this person frail?

The quickest answer to the question “Is this person frail?” is the response “What do you mean by frail?” The evidence suggests that a person will be susceptible to adverse outcomes if they conform to the frailty phenotype of slow, weak, thin, and exhausted, with reduced physical activity, especially if they have all five of these characteristics. Equally, a person will be frail if they have many things wrong with them, with a frailty index score of about 0.25 or higher. In both cases, the likelihood of susceptibility to adverse outcomes is empirically the case in presence of functional disability, and worsens as the extent of disability increases.

The fewest things that a person can have wrong with them, and be considered frail has not been established yet. The leading candidate appears to be motor-slowing in the absence of a single specific lesion to cause it [16], although risk can be classified without considering motor slowing [18,19]. Notably, low handgrip strength more than measures frailty or function predicted risk of treatment toxicity from cancer chemotherapy [47]. Low mood, or at the very least poor self-rated health, also seem to be important in defining frailty among people who otherwise might meet more restrictive criteria [28,48]. Although

people who have dementia will meet many frailty criteria, it is not evident that their risk is better understood by also calling them frail, as compared with staging their dementia [49,50].

Clinical bottom line

A person will be susceptible to adverse outcomes if they conform to the frailty phenotype. Equally, a person will be frail if they have a frailty index score of 0.25 or higher. In both cases, the likelihood of susceptibility to adverse outcomes is related to the presence of functional disability, with the greater the extent of disability, the higher the susceptibility.

What are ADLs?

Functional assessment allows goal setting and provides important information for measuring progress and estimating prognosis. Assessment of ADLs forms the cornerstone of functional assessment in older adults, because it offers a broad view of the impact of disability and disease on the patient and caregiver [51]. ADLs can be divided into two levels (Table 1.2): (1) Basic Activities of Daily Living (BADLs) refer to the tasks of self-maintenance (dressing, bathing, toileting, feeding, management of continence, and ability to transfer from a bed to chair and back), while (2) Instrumental Activities of Daily Living (IADLs) refer to those activities that foster independence in the community (managing finances and medications, shopping, housekeeping, meal preparation, and transportation). Impaired function is highly associated with but distinguishable from so-called geriatric conditions, such as dizziness and somatosensory impairment, with which it can exist in the absence of disabling chronic illness [52].

Table 1.2 Basic and instrumental activities of daily living

Basic Activities of Daily Living (BADL)	**Instrumental Activities of Daily Living (IADL)**
Feeding: Ability to consume food safely and with reasonable hygiene, including the ability to use utensils appropriately	Banking: Ability to carry out personal transactions and keep track of income and bills
Bathing: Ability to initiate and complete personal bathing, with or without the use of assistive aids	Transportation: Driving
Dressing: Ability to choose and don appropriate clothing	Cooking: Ability to prepare nutritionally appropriate meals
Toileting: Ability to initiate and complete mechanics of toileting with proper hygiene and manage any incontinence of bowel or bladder	Cleaning: Ability to maintain acceptable standard of cleanliness in own home.
Ambulation: Ability to transport with or without use of assistive aids including the ability to transfer self	Managing medications
	Shopping**:** Ability to select appropriate household needs

How do i assess ADLs?

Functional assessment generally relies on self-reported questionnaire, informant-based questionnaire, or direct observation. Self-reported questionnaires are of limited utility in dementia where insight is commonly affected,

while direct observation scales are time consuming. Therefore, informant-based or team-assessed questionnaires are most often used in the assessment of function (Table 1.3). One assessment seldom fits all, therefore, a variety of functional assessment tools have evolved and have been adapted for use in specific patient populations.

Functional assessment in people with dementia

Functional assessment is central to the evaluation of cognitive impairment. Functional decline is a core feature of all dementias (DSM-IV), is widely used as an outcome for treatment in dementia drug trials, and is an important prognostic marker for caregiver burden and institutionalization [53]. Consensus is lacking on how broad the functional assessment should be, and how to distinguish cognitive from noncognitive causes of functional impairment [54].

Functional assessment tools commonly used in dementia

Several functional assessment tools have been validated in Alzheimer dementia. The Lawton Brody Physical Self-Maintenance Scale (PSMS) and Activities of Daily Living Scale (IADL) are two subscales that assess BADLs and IADLs respectively, with descriptors for each domain that range from independence to complete dependence with resistive behaviors [55]. The subscales were originally validated together, but are often used separately in clinical practice. The subscales have several limitations. First, although the descriptors of function in each domain reflect degrees of functional impairment seen in dementia, neither scale allows the user to distinguish noncognitive reasons for the impairment. Further, although the source of information provided has been shown to have a significant

effect on the overall score [56], neither scale stipulates standards for the source of information.

Table 1.3 Some commonly used, nondisease specific, disability assessment tools

Scale Name	Scoring	Items	Clinical Setting
Barthel Index	0 (complete dependence) to 100 (independence in all items) (higher score is better)	Ten items measuring bowel and bladder function, transfers, mobility, and stairs (15-item versions also available)	– Well suited to patients who may begin bed-bound and improve from there – Comparatively more detailed mobility information aids responsiveness in hospital setting – Both floor and ceiling effects are notable
Physical Self-Maintenance Scale (PSMS)	Items scored 1–4 or 1–5 (higher score is worse)	Basic activities of daily living (BADL) items	– Commonly used in clinical geriatric settings – Especially helpful in dementia
Lawton Brody Instrumental Activities of Daily Living (IADL) Scale	Items scored 1–4 or 1–5 (higher score is worse)	IADL items	– Commonly used in conjunction with the PSMS
Disability Assessment in Dementia (DAD)	Items scored one point each for initiation, planning and performance (higher score is better)	40 items including IADLs, BADLs and leisure activities	– Used to assess function in patients with dementia
Functional Independence Measure (FIM)	Items scored on a seven-point scale (total scores range from 18 to 126) (higher score is worse)	18 items (5 measure cognition; 13 measure motor performance)	– Widely used in rehabilitation settings

The Lawton Brody IADL scale does not take into consideration the tasks that were not performed by the individual at baseline (traditionally women were scored on all eight areas of IADL function; while food preparation, housekeeping, and laundering were excluded for men). Despite these limitations, the Lawton Brody IADL scale is the most commonly applied questionnaire for dementia patients[57].

The Lawton Brody PSMS subscale evaluates the same six domains of BADL as the Katz index of independence in

ADLs [58]. While the PSMS is most often used in dementia, the Katz has been used in a wide variety of chronic illnesses. The Katz provides a dichotomous rating (dependent/independent) on a three-point scale of independence for BADL functions arranged in a hierarchical order (bathing being the highest). The PSMS includes a five-point rating scale for each of the same BADL domains. Two scoring methods have been described for the PSMS: one involves counting the number of items with any degree of impairment, while the other involves summing the severity score (1–5) of the impairment in each domain for an overall score of 6–30.

Functional assessment tools developed specifically for dementia

Most functional scales for dementia were developed for Alzheimer's disease, although some have been used in other cognitive syndromes such as Mild Cognitive Impairment (MCI) or Vascular Cognitive Impairment (VCI). A more detailed review of functional assessment scales that are used in clinical trials for dementia is presented elsewhere [53].

A recent systematic review evaluated the measurement properties of IADL scales in dementia [57]. The authors compared the content validity, construct validity, criterion validity, internal consistency, reproducibility, responsiveness, floor and ceiling effects, and interpretability of 12 scales for assessing function using IADLs. The authors found that the validation studies for most scales did not include sufficient information through which to assess and compare measurement properties, and none of the 12 scales included information for all measurement properties. Based on the limited information available, the Disability Assessment for Dementia (DAD) and the Bristol ADL (a scale that assesses 20 ADLs in

dementia [59]) scales received the best ratings, but further studies are required in order to make definitive recommendations about whether one scale is recommended for general use in dementia and the circumstances in which particular scales should be used (Level C evidence).

The DAD [60] was designed to assess treatment response and follow disease progression in community-dwelling patients with Alzheimer's dementia. The 40-item DAD includes IADLs, BADLs, and leisure activities and uses the characteristic hierarchical pattern of functional decline described in observational studies. The scale is unique in that it takes into account the proxy's perceived reason for the functional impairment, for example initiation, planning and organization, or ineffective performance. The DAD was developed and validated in English and French, and is not affected by age, education, or gender.

Function assessment in rehabilitation settings

In addition to providing information about progression, treatment response, and prognosis in dementia, functional assessment can be used in chronic disease and rehabilitation settings such as poststroke rehabilitation. Two commonly used scales include the Barthel Index and the Functional Independence Measure (FIM).

The Barthel Index [61] was originally developed as a ten-item ordinal scale, measuring function in the domains of ADLs, bowel and bladder function, transfers, mobility, and stairs. It has been modified to 15-item versions [62,63], which includes domains of cognition, socialization, and vision/visual neglect. The Barthel index has demonstrated good reliability and validity and has been shown to predict care needs, length of stay, and mortality [64]. The scale is most often administered by clinical observation but has

also been scored using self-report, which tends to result in higher scores in cases of cognitive impairment, acute illness, or older patients [65].

The FIM [66] is an 18-item ordinal scale (13 items measure motor function, while 5 items measure cognitive function) for measuring progress in rehabilitative programs. The scale is based on the Barthel Index. Each item is scored on a seven-point ordinal scale such that total scores range from 18 to 126, with higher scores denoting more functional independence. The FIM is proprietary (Uniform Data System for Medical Rehabilitation) and is used to report rehabilitation outcomes as part of large-scale data aggregation services.

Functional assessment in oncology

The majority of older cancer patients have some degree of frailty, functional impairment, and comorbid disease [67]. The interplay of these factors and the cancer may affect treatment tolerance and survival. A major challenge in the emerging field of geriatric oncology is determining the most appropriate treatment, with the best therapeutic ratio of survival/palliation and toxicity, taking into account the relative frailty of the individual. Scales to assess functional status have been developed for use in oncology, but these have not routinely taken frailty into account.

At present, the most consistent predictive clinical factor for treatment tolerance and survival is performance status (PS). PS is an ordinal scale that describes the overall functional limitations and severity of symptoms in relation to cancer. The two most commonly used scales for PS are the Karnofsky Performance Scale (KPS) [68,69] and the Eastern Cooperative Oncology Group (ECOG) scale [70]. The KPS is an ordinal scale to describe global function. The score is reported in increments of 10 with total scores

ranging from 0 to 100, a score of 100 being the best and a score of less than 50 denoting inability to perform self-care. The ECOG or Zubrod scale ranges from 0 to 4, with 0 indicating better function (corresponding to 90–100 on the KPS). Although the predictive validity for both scales has been consistently demonstrated, there is emerging evidence that a more comprehensive assessment, using tools such as the comprehensive geriatric assessment, and consideration of degree of frailty may help clinicians make better therapeutic decisions by providing insights into the interaction between aspects of fitness, frailty, and chemotherapeutic toxicity [71–73].

Clinical bottom line

There are a variety of functional assessment tools, all of which are designed to measure a patient's dependence in ADLs. The tool to be used depends on the purpose for collecting the information.

How can i prevent this frail older adult from declining in ADLs?

Prevention of functional decline in frail older adults is a priority area for research and public health, and the absence of disability has demonstrated consistent association with successful aging [74]. In 2004, the Interventions on Frailty Working Group published consensus recommendations on the design of randomized controlled trials for the prevention of functional decline and disability in frail older adults [75].

Systematic reviews addressing prevention of functional decline are limited and most are conducted on studies examining outcomes in particular patient settings.

Interventions for older hospital inpatients

Hospital admission is often a sentinel event in the natural history of frailty. Thirty to sixty percent of older adults develop new dependency in ADLs, following admission to hospital that can translate into increased mortality, prolonged hospital stay and readmission, poor quality of life, and need for institutionalization or increased care at home [76]. Factors influencing functional decline after hospital admission may be related to baseline health status or events that occur after admission [77].

An important component of any program designed to prevent functional decline is screening for those individuals at most risk. A recent systematic review found that older age, depressive symptoms, cognitive impairment, preadmission dependency in ADLs, and length of hospital stay were each predictive of functional decline following hospital admission [76].

The same review evaluated three screening instruments for postdischarge functional decline, the Hospital Admission Risk Profile (HARP) [78], the Identification of Seniors at Risk (ISAR) [79], and the Care Complexity Prediction Instrument (COMPRI) [80]. All three instruments have been tested in large populations, but their reliability, sensitivity, specificity, and predictive value were not described in the original studies, and they have not been compared with existing frailty measures. The specific items and outcome measures for each assessment tool varied, but components of successful assessments generally included the domains of comprehensive geriatric assessment (Level B evidence). A randomized controlled trial that evaluated the effectiveness of an intervention designed to reduce functional decline in frail hospitalized patients, screened using the ISAR, resulted in reduced rates of functional

decline but no effect on satisfaction, caregiver health, or depressive symptoms [81] (Level C evidence).

A second systematic review [82] evaluating six studies of five screening instruments (including the HARP and the ISAR) for identifying those at a risk of functional decline, 3–6 months after presentation to the emergency department, found considerable overlap in the domains and items of assessment in the screening instruments. The Inouye screening tool [83] had the highest sensitivity (88%), but the lowest specificity (54%) of all five instruments. The SHERPA (Score Hospitalier d'Evaluation du Risque de Perte d'Autonomie) [84] was the most accurate tool (AUC 0.734), but it has not been prospectively validated. The utility of the ISAR was limited by its reliance on self-report, with many participants unable to complete the screen independently. The Inouye tool was limited by the clinical expertise required to complete the items.

The most recent systematic review of screening tools for prediction of functional decline [85] is consistent with previous studies in its conclusion that further research is needed to overcome the lack of published data on reliability and validity of existing screening instruments in order to allow direct comparisons (Level C evidence).

Geriatric Evaluation and Management Units (GEMU) are specialized inpatient wards that provide multidisciplinary assessment, review, and therapy for frail older adults [86]. The GEMU model combines comprehensive geriatric assessment with management strategies including individualized care planning, rehabilitation, and discharge planning. A recent systematic review and meta-analysis [87] examined seven randomized controlled studies evaluating the effectiveness of the GEMU for mortality, institutionalization, length of stay, functional decline, and readmission. All studies used comprehensive geriatric

assessment and multidisciplinary team models. GEMUs differed in their admission processes (direct admission from home or emergency department or transfer from another hospital unit), definition of frailty, and ambulatory follow-up. Meta-analysis showed significant reductions in institutionalization at 12 months (relative risk (RR) 0.78; 95% confidence interval (CI) 0.66–0.92) and functional decline at discharge (RR 0.87; 95% CI 0.77–0.99), with a trend toward a reduction in 12-month functional decline (RR 0.84; 95% CI 0.69–1.03) but no reduction in mortality, readmission, length of stay, or institutionalization at 3 or 6 months (Level C evidence). The small number of studies evaluated precluded analysis of which patient characteristics had the most favorable effect on outcomes.

Interventions for community-dwelling older adults

Multicomponent interventions designed to prevent functional decline in community-dwelling older adults may be useful for short-term prevention of some adverse outcomes (Level B evidence).

Beswick et al recently evaluated the effectiveness of community-based complex interventions designed to preserve physical function and independence in older adults [88]. Studies (n = 89) were analyzed according to type of intervention (geriatric assessment of older people, geriatric assessment of frail older adults, community based care after hospital discharge, fall prevention, education, and counseling) and the outcomes examined included hospital and nursing home admission, physical function, and falls. Geriatric assessment of elderly people without selection for frailty (n = 28) increased physical function (RR −0.12; 95% CI −0.16 to −0.08) and decreased nursing home admission (RR 0.86, 95% CI 0.83–0.90), and falls (RR 0.76; 95% CI 0.67–0.86). When applied to populations

selected as frail (n = 24), geriatric assessment reduced the risk of hospital admission (RR 0.90; 95% CI 0.84–0.98) and improved physical function (RR −0.05; 95% CI −0.06 to −0.04). Interventions involving community-based care after discharge from hospital (n = 21) reduced the risk of nursing home admission (RR 0.77; 95% CI 0.64–0.91), but had no effect on hospital readmission. Interventions directed at fall prevention (n = 13) reduced the risk of falls (RR 0.92; 95% CI 0.87–0.97) and improved physical function (RR −0.25; 95% CI −0.36 to −0.13). This was the only intervention group that resulted in reduced mortality (RR 0.79; 95% CI 0.66–0.96). Interventions that focused on counseling and education (n = 3) increased the likelihood of improved physical function (RR −0.08; 95% CI −0.11 to −0.06).

A systematic review by Daniels et al [89] evaluated two nutritional interventions and eight physical exercise interventions designed to prevent disability in community-dwelling frail older adults. Nutritional interventions and single component physical exercise programs were not associated with reductions in disability. Three trials using multicomponent long lasting high intensity physical exercise programs were associated with reductions in disability, expressed as less difficulty with BADLs and IADLs, with effects persisting at 9 and 12 months in two of the three trials. Subgroup analysis suggests that those with severe frailty did not benefit from intervention as compared to those with mild or moderate frailty. These conclusions are congruent with a contemporary systematic review of physical exercise training in frail older adults [90].

Home visitation programs may provide an effective model by which to deliver multidisciplinary care for the prevention of functional decline in older adults (Level B evidence). A meta-analysis evaluating 18 randomized controlled trials of home-visit programs [91] found a

reduction in nursing home admission (RR 0.66; 95% CI 0.48–0.92) in trials involving nine or more visits. Reductions in functional decline were noted in trials that used multidimensional assessment and follow-up (RR 0.76; 95% CI 0.64–0.91), and trials that were directed toward healthier populations (RR 0.78; 95% CI 0.64–0.95). A mortality benefit was evident in patients >77.5 years (RR 0.76; 95% CI 0.65–0.88).

Interventions for long-term care residents

Although most research has been focused on community-dwelling older adults living at home or during acute hospital admission, a recent systematic review examined the effectiveness of physical rehabilitation for frail adults in long-term care [92]. Forty-nine trials were identified, most of which involved 30 minutes of intervention (usually exercise) for 12 weeks. Residents with cognitive impairment were excluded from 34 of the studies. Twelve of the 49 studies assessed longer term outcomes. Nine studies showed functional improvements, while 34 studies showed reduction in activity restriction, most commonly related to improvement in walking (Level B evidence).

Clinical bottom line

Prevention of functional decline in frail older adults should be a priority for hospitals, long-term care facilities, and in the community. It is important to screen an older patient's risk for decline at the time of admission to hospital. Multicomponent preventative interventions appear to be of variable effectiveness

Chapter summary

Frailty can be thought of in terms of a phenotype or as an index. The frailty phenotype specifies five characteristics: (1) slowness, (2) weight loss, (3) impaired strength, (4) exhaustion, and (5) low physical activity/energy expenditure. For a frailty index, typically a large number of items (40 or more) are counted and combined into a score. An individual's frailty index score is the number of deficits that they have, divided by the total number of deficits considered. A person will be susceptible to adverse outcomes if they conform to the frailty phenotype. Equally, a person will be frail if they have a frailty index score of 0.25 or higher. In both cases, the likelihood of susceptibility to adverse outcomes is related to the presence of functional disability, with the greater the extent of disability, the higher the susceptibility.

There is a variety of functional assessment tools designed to measure a patient's dependence in ADLs. Different tools may be appropriate in differing clinical settings, and can be used to assess prognosis, along with rehabilitation potential and progress.

Prevention of functional decline in frail older adults should be a priority for hospitals, long-term care facilities, and in the community. It is important to screen an older patient's risk for decline at the time of admission to hospital. Multicomponent preventative interventions appear to be of variable effectiveness.

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