

# Frailty in Older Adults Using Pre-hospital Care and the Emergency Department: A Narrative Review



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DOI: <http://dx.doi.org/10.5770/cgj.15.27>

## ABSTRACT

### Background

Older adults use more health-care services per capita than younger age groups and the older adult population varies greatly in its needs. Evidence suggests that there is a critical distinction between relative frailty and fitness in older adults. Here, we review how frailty is described in the pre-hospital literature and in the broader emergency medicine literature.

### Methods

PubMed was used as the primary database, but was augmented by searches of CINAHL and EMBASE. Articles were included if they focused on patients 60 years and older and implemented a definition of frailty or risk screening tool in the Emergency Medical Services (EMS) or Emergency Department setting.

### Results

In the broad clinical literature, three types of measures can be identified: frailty index measures, frailty scales, and a phenotypic definition. Each offers advantages and disadvantages for the EMS stakeholder. We identified no EMS literature on frailty conceptualization or management, although some risk measures from emergency medicine use terms that overlap with the frailty literature.

### Conclusions

There is a paucity of research on frailty in the Emergency Medical Services literature. No research was identified that specifically addressed frailty conceptualization or management in EMS patients. There is a compelling need for further research in this area.

**Key words:** frailty, Emergency Medical Services, frail elderly, aged

## INTRODUCTION

Older adults are the chief users of Emergency Medical Services (EMS),<sup>(1)</sup> but we have paid little heed to understanding their special needs.<sup>(2)</sup> Older patients use emergency services at higher rates, require more resources once in the emergency department (ED) and are more likely to experience adverse health outcomes compared with younger patients.<sup>(3)</sup> A mechanism to identify those at higher risk for adverse outcomes may lead to improvements in care.

Although older age groups use EMS at disproportionately higher rates,<sup>(1,4)</sup> paramedic training has changed little to meet the specific needs of this older demographic. Moreover, there has been very little alteration in how EMS systems are organized, with agencies initially established to provide care for major trauma and cardiac arrest victims.<sup>(5)</sup> The ability of EMS to cope with the influx of frail older patients may be reaching a limit, and unless changes are made in its organization, it seems inevitable that care provided to the older adult will suffer.

Older patients are a heterogeneous group due to multiple medical and social factors. Dichotomizing older patients as fit or frail may serve to optimize pre-hospital care. The term “frailty” is often employed in the medical literature, including emergency medicine, and is widely recognized as a state of vulnerability or decline in physiological reserve.<sup>(6)</sup> A definition of frailty should integrate biological, clinical, social, psychological, and environmental components, while also reflecting the multi-system impairment that is intrinsic to this concept.<sup>(6)</sup> Frailty is common with prevalence estimates of 40% or more in those aged 80 and older.<sup>(7,8)</sup>

Geriatric interventions provided in the community setting have been shown to reduce ED utilization over relatively short intervals, likely due to improved continuity of care and access.<sup>(9)</sup> The utility of geriatric interventions applied in the ED have demonstrated mixed results;<sup>(9)</sup> however, the evidence suggests benefits may be derived from targeting interventions towards high-risk clients.<sup>(10)</sup> Although a focus on frailty might usefully inform care provision in the pre-hospital and ED settings, the concept has received little attention to date.

Frailty measurement is controversial.<sup>(11,12)</sup> Three approaches can be discerned: rules-based approaches such as the frailty phenotype,<sup>(13)</sup> clinical frailty scales based on clinical judgment,<sup>(14)</sup> and the Frailty Index based on deficit count.<sup>(15-19)</sup> (Table 1) Some describe frailty as a medical syndrome,<sup>(13)</sup> while others believe that it is derived from the accumulation of age-related changes over time.<sup>(15)</sup> While this will be a particular challenge for defining frailty in emergency services, it is also the case that the special needs in the emergency setting—not just for reliable and valid measures, but for feasible measures that can be used rapidly—usefully will resolve some of the more esoteric considerations that are often at play in the debate about frailty measurement. Regardless, adverse outcomes are more common in those who are considered frail.<sup>(11)</sup> In fact, data from the Medicare Current Beneficiary Survey confirmed that the Rockwood-Mitnitski Frailty Index was a robust predictor of serious adverse events (death, nursing home admission, hospital admission) in the first 30 days following an older individual's visit to the emergency department.<sup>(20)</sup>

## Objectives

The primary objectives of this review were: 1) to identify measures of frailty used by Emergency Medical Services; and 2) to describe frailty measures used in Emergency Medicine. We limited our discussion to the pre-hospital and ED environments, with their unique time, resource, and system constraints.

Here, we undertook a narrative review of the EMS and emergency medicine literature to understand how the concept of frailty is being applied, which measures have been validated for use in this population, and what can be recommended.

## METHODS

### Search Strategy

The concept of frailty in the EMS/ED literature was reviewed by identifying primary literature where measures of frailty were implemented or clinically applied. For the purposes of this review, databases (PubMed, EmBase, and CINAHL) were screened between the years 1990 and 2009. The search terms (MeSH and text) included aged, geriatric assessment, frail elderly, frail\*, health services research, outcome assessment/screening, geriatric combined with either emergency medical services or emergency service. This search strategy was informed by hand searches of bibliographies, review of conference abstracts, and contact with colleagues.

English language articles were included in this review if they focused on patients 60 years and older and implemented a definition of frailty or risk-screening tool in the EMS/ED setting. In our desire to be liberal with inclusion criteria, 60 years and older was chosen as this is sometimes used as the population of interest in emergency medicine literature on aging. The risk screening tools may be proxy markers of frailty so were included in this research. Studies were excluded if

TABLE 1.  
Common definitions of frailty from the geriatric medicine literature with associated positive and negative attributes that may have an impact on their use in the pre-hospital setting

<i>Frailty Definition</i>	<i>Components</i>	<i>Grades of Frailty</i>	<i>Authors</i>	<i>Measurement</i>	<i>Pros/Cons</i>
Phenotype/ Rules-Based Approach	Performance on five variables	Robust: no problems Pre-frail: one or two problems Frail: three or more problems	Fried <i>et al.</i> <sup>(13)</sup>	Clinical Performance-based measures	Pros: Performance based, easy to apply  Cons: floor effect for some variables (immobile patients)
Frailty Index (e.g., Rockwood-Mitnitski Frailty Index)	Deficit count or proportion of potential deficits that a person has accumulated	Range: 0-1.0 Empirical cut-off: <0.25 (robust/ pre-frail) ≥0.25 (frail) 0.67 (99% upper limit of FI)	Mitnitski <i>et al.</i> <sup>(15)</sup>	Comprehensive Geriatric Assessment  Population-based data (survey)	Pros: Simple approach, robust indicator of frailty, reproducible mathematical properties, precise grading  Cons: Cumbersome in clinical setting
Frailty Scale (e.g., Canadian Study of Health and Aging –Clinical Frailty Scale)	Single descriptor of a person's state of frailty (fitness)	CSHA- CFS: A 7 point scale ranging from "very fit" to "severely frail"	Rockwood <i>et al.</i> <sup>(14)</sup>	Clinical Judgment	Pros: Subjective, easy to use/ implement  Cons: validated for use by specialists, insensitive in some populations

they were not focused on measuring frailty in the practice setting. The search strategy was considered up to date as of April 2009. A single reviewer (JG) initiated the search strategy, screened the titles and abstracts using the inclusion/exclusion criteria, and reviewed the full text articles.

## RESULTS

The title and abstract screening was performed on 5568 studies by a single reviewer. An additional 412 records would have been located if the search strategy was not restricted by language. A total of 42 full-text articles were reviewed. No articles specifically using a measure of frailty in the pre-hospital setting or emergency department were identified. The 6 original studies on risk screening tools used in the pre-hospital setting or emergency department were included in this review.

### Frailty in EMS Patients

No primary research that implemented a validated measure of frailty in the EMS setting was identified. Because frailty is predictive of the risk for adverse outcomes, a search was also performed to identify tools that may predict risk for health deterioration or decline in functional status among older patients. Although no risk screening tools appear to be used by EMS, one study described how EMS services have attempted to provide more extensive care through screening, education, and referral programs for older patients in an attempt to identify unmet health care needs (Table 2).<sup>(21)</sup> EMS-based public health promotion programs are rare; however, Shah *et al.*<sup>(21)</sup> determined that it is feasible for EMS agencies to take on non-traditional roles in public health. In addition, an EMS specific tool is currently in the derivation phase (PERIL – Paramedics Assessing Elders at Risk For Independence Loss).<sup>(22)</sup> This risk screening tool may represent a feasible approach for assessing older people within their own home.

### Frailty in Emergency Department Patients

No primary research that implemented a validated measure of frailty in the Emergency Department was identified. In the ED setting, efforts have been made to develop tools that identify older patients at risk for functional decline, re-admission to the ED, or other adverse outcomes. Although these are not conceptualized as measures of frailty, their goal is to capture those patients who might be considered to be frail in their state of vulnerability. The first point of contact in the ED is triage, so it would be intuitive that risk assessment scales may be administered at this point. Triage scales are used in emergency departments to aid with assigning acuity levels to patients so priority can be given to those with more urgent medical problems. A suitable risk assessment tool in this context would have to be easily obtained and embedded into the triage process.

Five risk screening tools were identified that specifically targeted older adults in the ED prior to discharge (Table 2).<sup>(23-27)</sup> The Triage Risk Screening Tool (TRST), a six-item tool comprised of yes/no questions that are completed during the triage process, has been evaluated for use in older patients being discharged from the ED.<sup>(24,28)</sup> It evaluates the presence of cognitive impairment, difficulty walking or transferring, recent falls, living alone with no available caregiver, taking five or more prescription medications, ED use in previous 30 days or hospitalization in previous 90 days, and registered nurse (assessor) concern. Two or more risk factors or the presence of cognitive impairment leads to a designation of “high risk”.<sup>(24,28)</sup>

The Identification of Seniors at Risk (ISAR) is a self or caregiver-completed, six-item measure that is administered during the ED visit either upon early presentation or prior to discharge. It incorporates questions pertaining to pre-morbid and acute functional dependence, recent hospitalization (within 6 months), impaired memory, impaired vision, and polypharmacy (taking more than three medications). This tool has been demonstrated to be clinically relevant and to be predictive of adverse outcomes in a high-risk group of elderly patients.<sup>(23,29)</sup>

The Brief Risk Identification for Geriatric Health Tool (BRIGHT) is a self- or caregiver-completed, 11-item measure. It has been designed for use as a postal questionnaire or can be administered within the ED in order to detect older adults that might benefit from comprehensive geriatric assessment.<sup>(27)</sup> The BRIGHT requests the patient or caregiver to think about the previous three months and respond with “yes” or “no” to questions related to functional problems, shortness of breath, mobility problems, cognition, falls, self-rated health, and depression.<sup>(27)</sup>

The final two screening tools identified were the seven-item questionnaire developed by Rowland *et al.*<sup>(26)</sup> and an eight-item questionnaire by Ruciman *et al.*<sup>(25)</sup> The seven-item screening primarily assesses function (activities of daily living (ADL) and instrumental activities of daily living (IADLs)) and mobility. A score of four or more would identify an individual at risk for re-admission. The tool developed by Ruciman *et al.* included questions pertaining to function, use of diuretics, presence of soft tissue injury, memory problems, difficulties with mobility, and problems urinating. The questions were derived from a pilot study evaluating the use of a health visitor intervention post-discharge from the emergency department. The eight variables were identified through logistic regression and formulated based on the opinion of ED staff. A patient was considered at risk if three or more positive responses were present.

## DISCUSSION

At present, no measure of frailty is being used by emergency medical services. Further, we found limited reference to mechanisms used to identify high-risk older patients. Reasons

TABLE 2.  
Risk screening tools or programs used by EMS or in the Emergency Department

<i>Study</i>	<i>Tool/ Program</i>	<i>Setting/Sample Size</i>	<i>Reliability/Validity</i>	<i>Outcomes</i>
Shah <i>et al.</i> <sup>(21)</sup>	EMS Screening Program (falls, need for vaccination)	Community-dwelling patients requesting EMS N=143 control group, 258 intervention group	Feasibility of screening for vaccination status, falls, environmental hazards	Feasibility of screening programs, reduction of risk
McCusker <i>et al.</i> <sup>(23)</sup>	ISAR (Identification of Seniors at Risk)	Four urban academic ED N=1854	Test-retest reliability – 0.78 <sup>(33)</sup> Predictive validity has been assessed independently <sup>(34,35)</sup>	Adverse Outcomes Sensitivity:72% Specificity:58%
Meldon <i>et al.</i> <sup>(24)</sup>	TRST (Triage Risk Screening Tool)	Two urban academic ED N=647	Inter-rater reliability – kappa 0.94-1.0 <sup>(24)</sup> / 0.9 <sup>(28)</sup> Validated by Moons <i>et al.</i> <sup>(35)</sup> Lee <i>et al.</i> <sup>(36)</sup> (moderate predictive validity )	ED use (30 day) RR=1.7 (95% CI 1.2-2.3), Hospital Admission (30 day) RR=3.3 (95% CI 2.2-5.1) Sensitivity:64% Specificity:63%
Ruciman <i>et al.</i> <sup>(25)</sup>	VEQ (Vulnerable Elderly Questionnaire)	One urban ED N=48 75 years and older	Inter-rater reliability not reported Validated by Moons <i>et al.</i> <sup>(35)</sup>	Risk for readmission Sensitivity:86.4% Pecificity:38.5%
Rowland <i>et al.</i> <sup>(26)</sup>	Seven item questionnaire	One urban ED N=450 75 years and older	Inter-rater reliability not reported Validated by Moons <i>et al.</i> <sup>(35)</sup>	Risk for readmission Sensitivity: 85% Specificity: 28%
Boyd <i>et al.</i> <sup>(27)</sup>	BRIGHT (Brief Risk Identification for Geriatric Health Tool)	One urban ED N=139 75 years and older	Inter-rater reliability – n/a No independent validation	Functional Decline Sensitivity: 76% Specificity: 79%

for this may be a lack of attention paid to research focused on older patients, EMS system design factors, or lack of clear understanding regarding how these tools can be applied. In general, there appears to be a paucity of geriatric presence within the EMS literature and this could be reflected in current protocols and practices. Although an operational definition of frailty has been elusive, those currently available have proven to be useful in predicting adverse outcomes. Older patients cared for by EMS may not present in a typical fashion. For the frail older patient coming into the emergency department, these so called “atypical presentations” are common.<sup>(30)</sup> The presence of geriatric syndromes has been shown to be predicative of prolonged hospital stay for patients admitted through the ED to medical units.<sup>(31)</sup> Discerning between the fit and frail patient is critical as a first step towards identifying common geriatric problems that may have an impact on care needs and outcomes.

In addition, not all patients attended to by EMS are transported. A measure of frailty may be useful towards identifying vulnerable older adults in the community. Recently released quality indicators for geriatric emergency medicine, identified by Terrell *et al.*,<sup>(32)</sup> are intricately connected to frailty. Pre-hospital care providers could improve care for older adults by initiating the screening process and facilitating referral or transport to the most appropriate service.

The utility of defining frailty is clear; however, a practical method of incorporating a measure of frailty into the clinical setting is more difficult. Jones *et al.*<sup>(37)</sup> demonstrated the feasibility of constructing a Frailty Index based on data collected from a Comprehensive Geriatric Assessment. Of note, it is not the nature of the deficits but rather the index value that is most predictive of outcomes.<sup>(18)</sup> The Rockwood-Mitnitski frailty index is relatively simple to calculate and provides a high degree of precision. Due to the broad nature of



the deficits that can be included into the FI, it may be possible to create an index based upon routinely collected data from the EMS environment (e.g., patient function). Paramedics are in a unique position to document the living conditions and function of an older person within their own home. A method for capturing this important information and aggregating it in a useful format is required. EMS agencies may want to consider how the measurement of frailty can be included into current clinical practice.

A decision to incorporate a measure of frailty into the clinical assessment should be guided by the purpose.<sup>(38)</sup> During triage or in the pre-hospital setting, identifying whether a patient is fit or frail may be the primary concern and could lead to directing care. For this, a brief screening process such as a clinical frailty scale (rating system) or rules-based approach resembling the risk screening tools outlined in Table 2 may be appropriate and feasible in this setting. These tools are easily applied and may be able to stratify patients by level of frailty. Later, during the clinical evaluation, other measures of frailty (e.g., frailty index) may aid with identifying changes in health status and provide prognostic value (see Table 1). This approach is thought to be more cumbersome; however, it can be more precise in its ability to grade levels of frailty. In the pre-hospital setting, it may be enough to know whether someone is fit or frail; however, later in the care process when intervention options are being considered, a more precise measure may be useful in directing treatment decisions.

No research focused on frailty conceptualization in the ED was identified. A persistent problem is the lack of appropriate tools designed for use or validated in the ED to aid with the assessment of the older patient. Risk-screening tools have been developed to identify patients at risk for re-admission to the ED, functional decline or death.<sup>(23-27)</sup> Although these tools are not attempting to quantify frailty, their components are related to a conceptualization of frailty (e.g., function, mobility, cognitive impairment). For older patients discharged from the emergency department, functional deficits and use of community services were predictive of re-admission.<sup>(39)</sup> Caplan *et al.*<sup>(39)</sup> advocated for the use of a simple screening tool on all people over 75 presenting to the ED. The TRST and ISAR screening tools have been the most-studied to date. Each brief screening instrument has demonstrated a moderate ability to predict functional decline in older ED patients.<sup>(27)</sup> These tools are not designed to grade frailty, and may lack the necessary precision to identify which patients may benefit most from specialized geriatric services.

In older patients presenting to the Emergency Department, functional impairment is common and is a predictor for poor short-term outcomes following discharge.<sup>(40)</sup> It is often an unrecognized contributing factor to their ED visit.<sup>(40)</sup> Attempts have been made to quantify the under-recognition of cognitive impairment,<sup>(41,42)</sup> problems with function,<sup>(40)</sup> and other geriatric syndromes.<sup>(30)</sup> Evaluating frailty, depending on the measure employed, may provide a more robust measure

of impairment or general health status. There is evidence that case finding with subsequent intervention can lead to improved outcomes for older people following discharge from the emergency department.<sup>(29)</sup> It may be possible to improve the screening process through the identification and measurement of frailty in older ED patients.

### Limitations

Although our search criteria allowed us to conduct a comprehensive review of the literature, we may have missed publications on this subject matter. The primary objective of this review was to identify frailty tools (Table 1) that are currently used in the pre-hospital and emergency medicine setting. Risk-screening tools were included in this analysis, as they may identify frail older adults in the EMS/ED setting; however, this linkage has not been studied and should be the focus of further exploration. Differences in terminology between medical settings may have precluded our search criteria from identifying relevant articles in the emergency medicine literature.

### Implications to Research

It is clear that more geriatric specific research is necessary in the pre-hospital setting. To improve processes of care for older patients using pre-hospital and emergency services, geriatric patients should be tracked through different nodes of care (e.g., pre-hospital, triage, clinical assessment/treatment, and discharge). The implications of frailty on care provision should be evaluated. Older patients are often not included in clinical trials or interventional research. A measure of frailty may mean an improved ability to include geriatric patients in interventional research, as the ability to stratify patients according to their overall health status will be possible. The clinical utility of frailty measurement and screening requires further investigation.

### Implications to Practice

An older person who is fit but acutely unwell can benefit from aggressive “usual care”. For the older person who is frail with multiple co-morbidities and acutely unwell, complex care brought by a multidisciplinary team is recommended.<sup>(43)</sup> For the frail older adult, it may be ideal to intervene early through comprehensive assessment and management of issues within the community setting. A common language of frailty is necessary to facilitate communication between health-care providers and provide a non-arbitrary way to classify relative fitness and frailty. Pre-hospital providers may be able to effectively identify those frail patients who would benefit most from specialized geriatric services. EMS providers have the advantage of interacting with patients within their own home, which provides them with a more in-depth understanding of the patient’s environment, social supports, and family dynamics.

Collating this information with frailty measurement may lead to improvements in processes of care, possibly through early identification and referral to geriatric services.

## CONCLUSION

To our knowledge, this is the first comprehensive review that aggregates research pertaining to frailty in the pre-hospital and emergency medicine literature. There is a paucity of geriatric specific research on frailty in the pre-hospital literature. A number of approaches to frailty conceptualization and measurement are evident. Each approach has certain benefits. A standardized approach to frailty assessment is warranted in order to detect and document common geriatric problems (e.g., cognitive impairment, functional impairment, social vulnerability, and mobility impairment) and guide care provision in this setting.

Any measure of frailty used by EMS must be designed to address the challenges of clinical care encountered in this setting and must be rigorously evaluated. It is clear, based upon our review, that little attention has been focused on this construct in the pre-hospital and emergency medicine literature. Efforts should be devoted towards developing tools to aid with discerning between fitness and frailty in older adults requiring emergency services, as their care needs will be dependent on this distinction.

## CONFLICT OF INTEREST DISCLOSURES

The authors declare that no conflicts of interest exist.

## REFERENCES

- Shah MN, Bazarian JJ, Lerner B, *et al.* The epidemiology of emergency medical services use by older adults: an analysis of the national hospital ambulatory medical care survey. *Acad Emerg Med.* 2007;14(5):441–48.
- Bridges J, Meyer J, Dethick L, *et al.* Older people in accident and emergency: implications for U.K. policy and practice. *Rev Clin Gerontol.* 2005;14:15–24.
- Aminzadeh F, and Dalziel WB. Older adults in the emergency department: a systematic review of patterns of use, adverse outcomes, and effectiveness of interventions. *Ann Emerg Med.* 2002;39(3):238–47.
- Canadian Institute for Health Information. Understanding emergency department wait times: who is using emergency departments and how long are they waiting? 2005. Accessed on February 26, 2008. Available from: [http://secure.cihi.ca/cihiweb/products/Wait\\_times\\_e.pdf](http://secure.cihi.ca/cihiweb/products/Wait_times_e.pdf)
- Shah MN. The formation of the emergency medical services system. *Am J Public Health.* 2006;96(3):414–23.
- Hogan DB, MacKnight C, Bergman H. Models, definitions, and criteria for frailty. *Aging Clin Exp Res.* 2003;15(3 Suppl):1–29.
- Fried LP, Ferrucci L, Darer J, *et al.* Untangling the concepts of disability, frailty, and comorbidity: implications for improved targeting and care. *J Gerontol A Biol Sci Med Sci.* 2004; 59(3):M255–M263.
- Rockwood K, Howlett SE, MacKnight C, *et al.* Prevalence, attributes and outcomes of fitness and frailty in community-dwelling older adults: report from the Canadian Study of Health and Aging. *J Gerontol A Biol Sci Med Sci.* 2004;59(12):1310–17.
- McCusker J, and Verdon J. Do geriatric interventions reduce emergency department visits? A systematic review. *J Gerontol A Biol Sci Med Sci.* 2006;61(1):53–62.
- Caplan G, Williams A, Daly B, *et al.* A randomized, controlled trial of comprehensive geriatric assessment and multidisciplinary intervention after discharge of elderly from the emergency department – the DEED II study. *J Am Geriatr Soc.* 2004;52(9):1417–23.
- Rockwood K, Andrew M, Mitnitski A. A comparison of two approaches to measuring frailty in elderly people. *J Gerontol A Biol Sci Med Sci.* 2007;62(7):738–43.
- Whitson HE, Purser JL, Cohen HJ. Frailty thy name is ... phrailty? *J Gerontol A Biol Sci Med Sci.* 2007;62(7):728–30.
- Fried LP, Tangen CM, Walston J, *et al.* Frailty in older adults: evidence for a phenotype. *J Gerontol A Biol Sci Med Sci.* 2001;56(3):M146–M156.
- Rockwood K, Song X, MacKnight C, *et al.* A global clinical measure of fitness and frailty in elderly people. *CMAJ* 2005;173(5):489-95.
- Mitnitski AB, Mogilner AJ, Rockwood K. Accumulation of deficits as a proxy measure of aging. *TheScientificWorld.* 2001;1:323–36.
- Ensrud KE, Ewing SK, Taylor BC, *et al.* Comparison of 2 frailty indexes for prediction of falls, disability, fractures, and death in older women. *Arch Intern Med.* 2008;168(4):382–89.
- Rolfson DB, Majumdar SR, Tsuyuki RT, *et al.* Validity and reliability of the Edmonton Frail Scale. *Age Ageing.* 2006;35(5):526–29.
- Rockwood K, and Mitnitski A. Frailty in relation to the accumulation of deficits. *J Gerontol A Biol Sci Med Sci.* 2007;62(7):722–27.
- Rockwood K, and Mitnitski A. Frailty, fitness, and the mathematics of deficit accumulation. *Rev Clin Gerontol.* 2007;17:1–12.
- Hastings NS, Purser JL, Johnson KS, *et al.* Frailty predicts some but not all adverse outcomes in older adults discharged from the emergency department. *J Am Geriatr Soc.* 2008;56(9):1651–57.
- Shah M, Clarkson L, Lerner B, *et al.* An emergency medical services program to promote the health of older adults. *J Am Geriatr Soc.* 2006;54(6):956–62.
- Lee J, Verbeek R, Morrison L, *et al.* Paramedics assessing elders at risk for independence loss (PERIL): feasibility and inter-rater reliability of risk factors for adverse outcomes [abstract]. *Acad Emerg Med.* 2007;14(5):S19.
- McCusker J, Bellavance F, Cardin S, *et al.* Detection of older people at increased risk of adverse health outcomes after an emergency visit: the ISAR screening tool. *J Am Geriatr Soc.* 1999;47(10):1229–37.
- Meldon SW, Mion LC, Palmer RM, *et al.* A brief risk-stratification tool to predict repeat emergency department

- visits and hospitalizations in older patients discharged from the emergency department. *Acad Emerg Med.* 2003;10(3):224–32.
25. Ruciman P, Currie CT, Nicol M, *et al.* Discharge of elderly people from an accident and emergency department: evaluation of health visitor follow-up. *J Adv Nurs.* 1996;24(4):711–18.
  26. Rowland K, Maitra AK, Richardson DA, *et al.* The discharge of elderly patients from an accident and emergency department: functional changes and risk of readmission. *Age Aging.* 1990;19(6):415–18.
  27. Boyd M, Koziol-McLain J, Yates K, *et al.* Emergency department case-finding for high-risk older adults: the Brief Risk Identification for Geriatric Health Tool (BRIGHT). *Acad Emerg Med.* 2008;15(7):598–606.
  28. Hustey FM, Mion LC, Connor JT, *et al.* A brief risk stratification tool to predict functional decline in older adults discharged from the emergency department. *J Am Geriatr Soc.* 2007;55(8):1269–74.
  29. McCusker J, Verdon J, Tousignant P, *et al.* Rapid emergency department intervention for older people reduces risk of functional decline: results of a multicenter randomized trial. *J Am Geriatr Soc.* 2001;49(10):1272–81.
  30. Madden KM, Hogan DB, Maxwell CJ, *et al.* The prevalence of geriatric syndromes and their effect on the care and outcome of patients aged 75 years of age and older presenting to an emergency department. *Geriatrics Today.* 2002;5(May):69–75.
  31. Lang P, Heitz D, Hédelin G, *et al.* Early markers of prolonged hospital stays in older people: a prospective, multicenter study of 908 inpatients in French acute hospitals. *J Am Geriatr Soc.* 2006;54(7):1031–39.
  32. Terrell K, Hustey F, Hwang U, *et al.* Quality indicators for geriatric emergency care. *Acad Emerg Med.* 2009;16(5):441–49.
  33. McCusker J, Bellavance F, Cardin S, *et al.* Screening for geriatric problems in the emergency department: reliability and validity. *Acad Emerg Med.* 1998;5(9):883–93.
  34. Salvi F, Morichi V, Grilli A, *et al.* Predictive validity of the Identification of Seniors at Risk (ISAR) screening tool in elderly patients presenting to two Italian emergency departments. *Aging Clin Exp Res.* 2009;21(1):69–75.
  35. Moons P, De Ridder K, Geyskens K, *et al.* Screening for risk of readmission of patients aged 65 years and above after discharge from the emergency department: predictive value of four instruments. *Eur J Emerg Med.* 2007;14(6):315–23.
  36. Lee JS, Schwindt G, Langevin M, *et al.* Validation of the triage risk stratification tool to identify older persons at risk for hospital admission and returning to the emergency department. *J Am Geriatr Soc.* 2005;56(11):2112–17.
  37. Jones DM, Song X, Rockwood K. Operationalizing a frailty index from a standardized comprehensive geriatric assessment. *J Am Geriatr Soc.* 2004;52(11):1929–33.
  38. Rockwood K, Abeysundera M J, Mitnitski A. How should we grade frailty in nursing home patients? *J Am Med Dir Assoc.* 2007;8(9):595–603.
  39. Caplan G, Brown A, Croker W, *et al.* Risk of admission within 4 weeks of discharge of elderly patients from the emergency department – the DEED study. *Age Ageing.* 1998;27(6):697–702.
  40. Wilber ST, Blanda M, Gerson LW. Does functional decline prompt emergency department visits and admission in older patients? *Acad Emerg Med.* 2006;13(6):680–82.
  41. Hustey FM, and Meldon SW. The prevalence and documentation of impaired mental status in elderly emergency department patients. *Ann Emerg Med.* 2002;39(3):248–53.
  42. Kakuma R, Galbaud du Fort G, Arsenault L, *et al.* Delirium in older emergency department patients discharged home: effect on survival. *J Am Geriatr Soc.* 2003;51(4):443–50.
  43. Rockwood K, MacKnight C, Bergman H. Measuring frailty in geriatric patients [letter]. *CMAJ.* 2006;174(3):353–54.
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