Mobility assessments of geriatric emergency department patients: A systematic review

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ABSTRACT

Objectives: We wished to determine the impact of emergency department (ED) mobility assessments for older patients on hospitalization, return visits, future falls, and frailty.

Methods: We searched MEDLINE, Embase, CINAHL, Cochrane Library, PEDro, and OTseeker (September 2016). Two independent reviewers identified studies of patients ≥65 years with ED physical mobility assessments and outcomes of hospitalization, return to ED, falls, and frailty. Language was not restricted. Only clinical trials and observational studies were included.

Results: We identified 1,365 unique citations. Nine studies (six cohort and three cross-sectional) met full inclusion criteria. Patients (n = 2,513) with mean age 75-85 years, admitted to hospital and discharged, underwent these ED evaluations: Timed Up and Go (TUG), Get Up and Go, tandem walk, and a gait assessment. Study quality was moderate to poor. Tandem walk did not predict falls at 90 days. TUG was not associated with return to the ED/hospitalization at 90 days. Get Up and Go was associated with hospital admission but not return to ED visits at 1 or 3 months. Due to clinical heterogeneity in study populations and outcomes, a meta-analysis was not undertaken.

Conclusions: Despite multiple guidelines recommending a mobility assessment prior to ED discharge for older patients, we found that such assessments were neither associated with nor predictive of adverse outcomes. Robust research is required to guide clinicians on the utility of physical mobility assessments in older ED patients.

RÉSUMÉ

Objectif: L'étude visait à déterminer l'incidence de l'évaluation de la mobilité chez les personnes âgées au service des urgences (SU), sur l'hospitalisation, les reconsultations, les éventuelles chutes et la fragilité.

Méthode: Des recherches ont été effectuées dans les bases de données MEDLINE, Embase, CINAHL, Cochrane Library, PEDro et OTseeker (septembre 2016). Deux examinateurs indépendants ont repéré les études menées chez des patients âgés de 65 ans et plus, et fournissant des données sur l'évaluation de la mobilité physique au SU, les résultats de l'hospitalisation, les reconsultations au SU, les chutes ou la fragilité. Il n'y a pas eu de restriction de langue. Seuls ont été retenus les essais cliniques et les études d'observation.

Résultats: Les recherches ont permis de relever 1365 citations uniques, et 9 études (6 études de cohorte et 3 études transversales) respectaient tous les critères d'inclusion. Des patients (n = 2,513) âgés en moyenne de 75 à 85 ans, admis à l'hôpital puis renvoyés ont été soumis aux évaluations suivantes au SU : Timed Up and Go (TUG), Get Up and Go, la marche en tandem et une évaluation de la démarche. La qualité des études était moyenne ou médiocre. La marche en tandem n'a pas permis de prévoir les chutes au bout de 90 jours. L'évaluation TUG n'était pas associée aux reconsultations au SU ou à l'hospitalisation au bout de 90 jours. Quant à l'évaluation Get Up and Go, elle était associée à l'hospitalisation mais pas aux reconsultations au SU au bout de 1 mois ou de 3 mois. Il n'a pas été possible de procéder à une méta-analyse en raison de l'hétérogénéité clinique des populations à l'étude et des résultats.

Conclusions: D'après les résultats de l'étude et malgré de nombreuses lignes directrices selon lesquelles il faudrait procéder à une évaluation de la mobilité chez les personnes âgées avant leur sortie du SU, ce type d'évaluation n'est ni associé à des résultats défavorables ni prévisionnel de leur présence. Une recherche approfondie s'impose sur l'utilité des évaluations de la mobilité chez les personnes âgées au SU, visant à guider les cliniciens.

Keywords: emergency department, geriatrics, mobility

INTRODUCTION

Background

Currently, patients 65 years and older account for 12%-24% of all emergency department (ED) visits.[1-3] Although most older patients are discharged home following an ED visit, the return rate is double that of their younger

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counterparts, ranging from 17%-29%.[4-9] Multiple factors have been found to be associated with return ED visits in older patients, including polypharmacy, specific medical conditions such as heart failure or kidney disease, poor social supports, and poor physical functioning.[5,6,8]

Rationale

The Society for Academic Emergency Medicine Geriatric Task Force advocates for a functional assessment, such as the Get Up and Go test, as a mandatory component of the evaluation of an older ED patient. They cited as one of their top research priorities the development of minimal functional status measures that evaluate the ability to transfer and ambulate independently.[10] Multiple guidelines, including the recently published Geriatric Emergency Medicine Guidelines, recommend a mobility assessment prior to discharge in older patients presenting to the ED following a fall.[11-13] Unfortunately, most physicians do not conduct a mobility assessment within the ED.[14,15] Minnee et al. found that older patients were less likely to return to the ED within 7 days if there was documentation of mobility status prior to presentation and on discharge.[16] Thus, from a health care expenditures and a quality of care perspective, it is imperative to gain an increased understanding of what mobility assessments are performed in the ED and to evaluate their association with adverse outcomes.

Objectives

This systematic review was undertaken to identify mobility assessments that are used in ED patients of 65 years and older and determine whether mobility test measures are associated with reported outcomes of hospitalization, repeat visits to the ED, future falls, or frailty.

METHODS

Protocol and registration

This systematic review conforms to the PRISMA guidelines for the reporting of systematic reviews. A protocol was not registered.

Eligibility criteria

Randomized controlled trials and observational studies were considered for inclusion. Editorials, commentaries, letters, case reports, systematic reviews, and meta-analyses were excluded. For abstract citations that met criteria for the full-text review, primary authors were contacted, where contact information was available, for further study information. No language restrictions were placed on the electronic search strategies. Non-English papers were translated prior to the full-text review.

We sought to include studies on patients of 65 years or older who underwent a physical mobility assessment in the ED that reported association with hospitalization, repeat visits to the ED, future falls, or frailty. Examples of mobility assessments included but were not limited to a Timed Up and Go (TUG) test,[17] six-metre walk test (6MWT),[18] sit-to-stand test with five repetitions (STS-5),[19] sit-to-stand (STS) test,[20,21] half-turn test,[22] alternate step test (AST),[22] and the lie-to-sit-to-stand test.[23] There was no restriction placed on who could perform the mobility assessment. The assessment could be performed by emergency physicians, registered nurses, physiotherapists, occupational therapists, patient care technicians, or research assistants. A broad criterion was used for types of mobility tests and the assessors so as not to miss any relevant studies. Physical assessments of balance or strength were excluded. Our outcomes included a 90-day return to the ED (with or without subsequent hospitalization), recurrent falls, increased frailty, or functional decline.

Information sources

The electronic search strategies were developed with the guidance of a professional health sciences research librarian. A comprehensive search strategy was conducted to identify all relevant articles from the following electronic databases: Ovid MEDLINE (1946 to September 7, 2016), Embase (September 7, 2016), CINAHL (September 11, 2016), Cochrane Library (September 7, 2016), PEDro (September 7, 2016), and OTseeker (September 7, 2016). The full literature search is available in the Supplementary Appendix S1. References of all articles included for full-text reviews and systematic reviews were reviewed for any publications that may have been missed by our electronic search strategy.

Study screening and selection

EndNote software (Thomson Reuters, NY) was used to store and deduplicate included studies for the review.

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Two independent reviewers (KY, DE) independently screened all of the citations from the electronic literature search. The first phase of screening involved a review of titles and abstracts only. The second phase involved a review of full-text articles that met the inclusion criteria. Three articles (two French, one Spanish language) were translated prior to the full-text review. At the conclusion of each phase, the independent reviewers resolved discrepancies and involved a third party (JJP) when required in order to achieve consensus. Kappa was calculated to determine statistical agreement between the two reviewers.

Data collection

Both reviewers (KY, DE) abstracted data from all included publications. A data extraction form (see Supplementary Appendix S2) was used to aid screening of abstracts and for the full-text review of potentially relevant articles. Key datapoints included type of publication; sample size; age criteria; mobility assessments with applicable cut-off points; and 90 day outcomes, including admission, return to the ED, future falls, and frailty with effect estimates and confidence intervals (CIs).

Risk of bias

Randomized control trials were to be assessed using the Cochrane Risk of Bias tool.[24] The Newcastle-Ottawa Scale (NOS) (quality assessment) for cohort and cross-sectional studies was used to assess study quality and risk of bias in the non-randomized studies.[25] This scale was specifically designed for assessing the quality of non-randomized studies for meta-analyses. Each component (selection, comparability, and outcome) has several questions for which stars can be allocated. The maximum star rating for each component is 4, 2, 3 and 5, 2, 3 for cohort and cross-sectional studies, respectively.

Analysis of results

We planned to conduct a meta-analysis using a random effects model and assess for statistical heterogeneity; however, a qualitative systematic review without a meta-analysis was performed due to study heterogeneity.

RESULTS

Study selection

The results of the screening process are summarized in a PRISMA flow diagram (Figure 1).[26] The search identified a total of 1,365 unique citations after removal of duplicates. Initial screening of titles and abstracts resulted in 1,333 citations being excluded. The reviewers had a substantial level of agreement with a kappa of 0.66.[27,28] Thirty-two citations were included for the full-text review.[29-60] Twenty-three articles were excluded after the full-text review, leaving nine articles for inclusion in the systematic review.[37-39,44,55-58,61]

A list of excluded studies from the second phase of screening is provided in Supplementary Appendix S3 (see Appendix Table S1). Twelve studies were excluded because they did not meet the full-inclusion criteria (two studies had a non-applicable outcome measure,[54,60] two did not meet age criteria,[29,47] four did not have a formal physical mobility assessment,[30,31,45,46] and six were conducted in a non-ED setting).[32,35,43,49,59] Seven studies were excluded because of insufficient data.[40-42,48,50,52,53] Five of these were abstracts. We attempted but were unsuccessful in getting more information from the authors; therefore, the studies were excluded. One study was a duplicate, and one other was a commentary.[33,34]

Study quality assessment

The quality of all nine studies was assessed using the NOS (Table 1). Overall, the studies are of moderate to poor quality with a high risk of bias. Few studies provided sufficient data about the study participants or controlled for confounding.

Result of individual studies

The study design, population, mobility assessment intervention, and outcomes of the nine studies included in this review are summarized in Table 2. Included studies consisted of six cohort[37,51] and three cross-sectional studies.[38,39,44] Study populations were from six different nations, ranged in size from 26-778 enrolled patients (total n = 2,513), and ranged in mean age from 75-85 years.

No meta-analysis was undertaken due to the heterogeneity of the studies. There were five different

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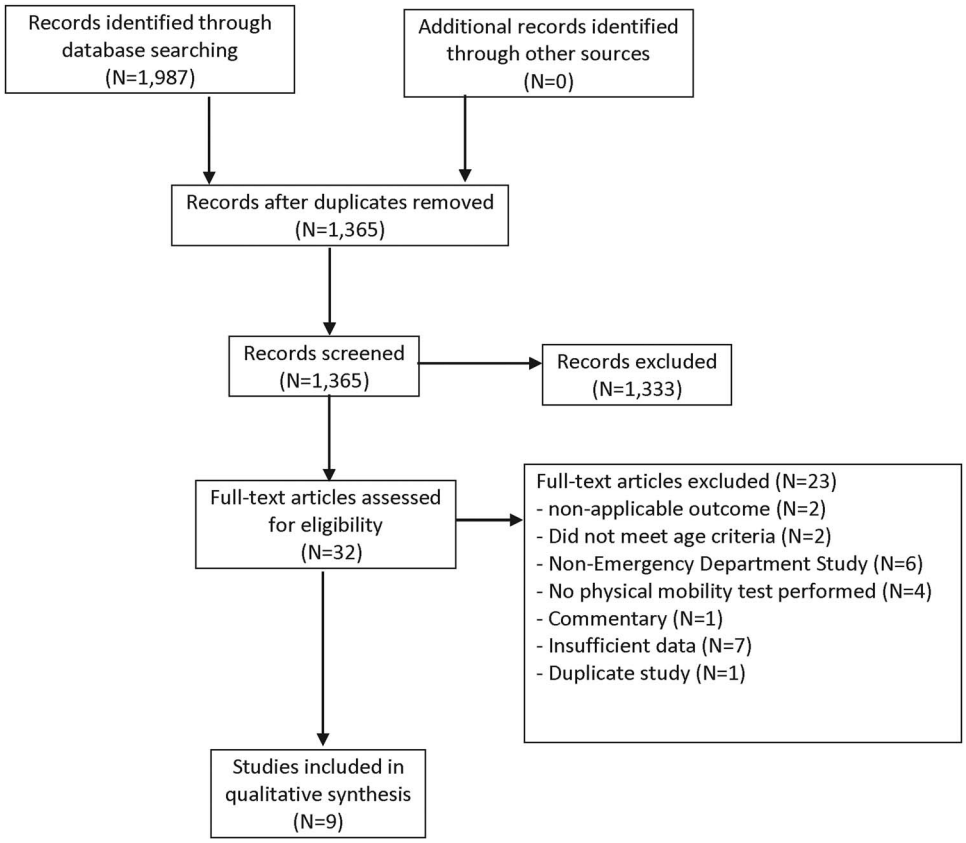

Figure 1. Flow diagram.

Table 1. Quality assessment of studies using the Newcastle-Ottawa Scale

Study	Selection	Comparability	Outcome
Suffoletto, B[58] (2016) *Prospective cohort*	****		***
Deschodt, M[55] (2015) *Prospective cohort*	****		***
Dresden, SM[56] (2015) *Prospective cohort*	****	**	***
Huded, JM[57] (2015) *Prospective cohort*	****		***
Carpenter, C[37] (2009) *Prospective cohort*	****		*
Walker, KJ[61] (2006) *Prospective cohort*	****		***
Crehan, F[38] (2013) *Cross-sectional*	**		**
Lee, V[44] (2001) *Cross-sectional*	**		**
Davies, AJ[39] (1996) *Cross-sectional*	*		

Asterisks are the grading system used for the NewCastle Ottawa Scale.

mobility tests. Hospitalization was the most common outcome, described in four studies. Most studies had insufficient information to characterize their patient population. Three studies enrolled patients who presented to the ED for management of a fall, whereas the remainder enrolled patients presenting to the ED for any issue. It is likely that the severity of illness or functional disability was also dissimilar between studies given the difference in rates of admissions between the cohorts, ranging from no admissions to 77% admitted patients.

The most common mobility assessment was the TUG test, which was evaluated in five studies.[38,44,51,56,57] The TUG test consists of the number of seconds that it takes to stand up from a chair, walk 3 meters with the usual gait aid and speed, turn and return to the chair, and sit down. The inability to perform the TUG was associated with increased hospitalization in one study;[44] however, in another that controlled for age, race, and the Emergency Severity Index, no association was found.[56] No association was found between TUG time and ED return visit or admission at 90 days.[51]

Other mobility assessments included the Get Up and Go test,[55,58] tandem gait,[37] subjective "gait abnormality,"[39] and the Tinetti fall risk screen.[44] Deschodt et al. reported that patients assessed as dependent in the

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Table 2. Summary of main study characteristics

Reference	Study design	Population	Mobility measure	Outcome	Results
Suffoletto, B[58] (2016)	Prospective cohort	202 ED patients Mean age 77 United States	Get Up and Go test Abnormal score >3 or refusal to perform	Composite outcome of return ED visit, postdischarge hospitalization or death at 30 days	No association between abnormal Get Up and Go test and composite end point
Deschodt, M[55] (2015)	Prospective cohort	442 ED patients Mean age 84 74% admitted Belgium	Get Up and Go test Described as dependent or independent with or without walking aid	Hospitalization, return ED visit at 1 and 3 months	Patients who were assessed as dependent with Get Up and Go test were more likely to be admitted to the hospital. Get Up and Go test dependence was not associated with return ED visits at 1 or 3 months.
Dresden, SM[56] (2015)	Prospective cohort	778 ED patients United States	Timed Up and Go Abnormal >12 seconds	Hospitalization	No significant association between hospitalization and abnormal Timed Up and Go when adjusted for age, race, and Emergency Severity Index
Huded, JM[57] (2015)	Prospective cohort	443 ED patients Mean age 80 29% admitted United States	Timed Up and Go Abnormal >12 seconds	Admission to hospital, physiotherapy, social work referrals	For patients with TUG >12 seconds: 29% admitted, 38% referred to physiotherapy, 44% referred to social work
Carpenter, C[37] (2009)	Prospective cohort	240 post-fall ED patients Mean age 77 54% admitted United States	Tandem gait	Self-reported falls 90 days	Unable to perform tandem gait: 59% No association between ability to perform tandem gait and self-report falls in 90 days (p-value = 0.526)
Walker, KJ[61] (2006)	Prospective cohort	100 ED patients Mean age 80 No admitted Australia	Timed Up and Go	ED return visit, admission or death 90 days	Mean TUG time 17.8 seconds No association between TUG time and: ED return visit OR 1.0 (CI 0.93-1.06) Hospitalization on revisit OR 0.99 (CI 0.91-1.07) days to return visit PCC 0.38 (CI −0.04-0.69) days to hospitalization PCC 0.32 (CI −0.23-0.71)
Crehan, F[38] (2013)	Cross-sectional	40 post-fall ED patients 77% admitted Mean age 85 Ireland	Timed Up and Go	Falls Frailty	Mean TUG time 46 seconds 38% unable to complete Timed Up and Go No association between frailty and Timed Up and Go
Lee, V[44] (2001)	Cross-sectional	80 ED patients 43% admitted Mean age 75 Canada	Timed Up and Go Tinetti fall risk Screen	Admission to hospital	Functional tests included the Timed Up and Go and the Tinetti fall risk screen; data for individual tests not given. Overall unable to complete either test in 49% Admission rate if: Able to complete either test: 32% Unable to complete either test: 52%
Davies, AJ[39] (1996)	Cross-sectional	188 post-fall ED patients 30% admitted Mean age 79 United Kingdom	Subjective gait analysis	Falls	Only subset (26/188) had gait assessment; of those, 35% were identified as having gait abnormality.

CI = confidence interval (95%); OR = odds ratio; PCC = Pearson correlation coefficient.

Get Up and Go test were more likely to be admitted to the hospital; however, it was not associated with a return to the ED.[55] Suffoletto found no association between the Get Up and Go test and a composite score of a return ED visit, post-discharge hospitalization, or death at 30 days.[58] Tandem gait was not associated with future falls.[37]

DISCUSSION

Summary

In this systematic review, we conducted a comprehensive electronic search of the medical literature using six databases to identify any studies of older adults (age ≥65 years) who presented to the ED and received a mobility assessment. Our search identified nine relevant studies, totaling 2,513 patients. Study quality of the six cohort and three cross-sectional studies was assessed to be moderate to poor. There was substantial clinical heterogeneity between the studies, such that a meta-analysis could not be done. This review found that the TUG was the most widely used mobility test performed in older ED patients (see S4 for a summary of various mobility assessments). The patient's ability to perform the test varied widely, and no association was noted in a return ED visit or hospitalization.

There are multiple reasons that an evaluation of mobility continues to be recommended by geriatric guidelines, textbooks, and experts alike – reasons that include, at the very minimum, a need to demonstrate an ability to transfer and ambulate to be safely discharged from the ED, because self-report is not a reliable measure.[60] These mobility tests do not require expensive, sophisticated equipment to perform; often only a chair is required and contributes little to the overall length of stay, taking less than 1 minute to perform, in general. Performing the mobility test does not put the patient at any greater risk of pain or harm than if the patient were to be discharged and the test performed in an unsupervised environment. Thus, the overall risk benefit balance lies in the performance of these tests in as much as an aid to making appropriate discharge decisions.

Three recent systematic reviews have evaluated use of the TUG as a tool for assessing fall risk in older adults.[62-64] Their conclusions were similar: the TUG test has limited ability to predict future falls in older persons; the reviews contained studies that were completed in the community or in admitted patients; and it is unclear what difference on outcome, if any, this would have in an ED population. Schoene et al. found that the difference between fallers and non-fallers was 0.63 (95% CI 0.14-1.12) seconds in high-functioning subjects and 3.59 (95% CI 2.18-4.99) in low-functioning subjects.[64] The meta-analysis completed by Barry et al. found that the sensitivity and specificity of the TUG with a cut-off of >13.5 seconds was 0.32 (95% CI 0.14-0.57) and 0.73 (95% CI 0.51-0.88), respectively, for all studies. The TUG was poor at predicting future falls with odds ratio (OR) 1.01 (95% CI 1.00-1.02).[62] The ED study by Walker et al. is consistent with the systematic reviews, finding no association with outcomes.[51] Carpenter et al. completed a systematic review of the ED literature to determine predictors of geriatric falls following an ED visit.[65] They reported that simple bedside functional tests, including chair stand, chair sit, raise feet while walking, turn 180 degrees, and near tandem stand were not associated with a 6-month fall risk.

Crehan et al. assessed frailty and the TUG in their evaluation of older patients presenting to the ED after falling.[38] Using Fried's classification for frailty, 75% of their cohorts were classified as frail, 15% as pre-frail, and 10% as non-frail. However, 38% of patients were unable to complete the TUG, and the remainder had an abnormally slow TUG, with a mean score of 46 seconds. A 2015 meta-analysis by Clegg et al. examined the diagnostic test accuracy of various tools to predict frailty in older community dwelling persons.[66] Two mobility assessments, gait speed and the TUG test, were found to be highly sensitive for predicting frailty in persons older than 65 years. A TUG time >10 seconds had a sensitivity of 0.93, a specificity of 0.62, positive predictive value of 0.17, and negative predictive value of 0.99 for frailty.[66] Hastings et al. found that frail, older ED patients were at increased risk of adverse outcomes (repeat ED visit, hospital admission, nursing home admission, or death) within 30 days of discharge from the ED (HR 1.44, 95% CI 1.06-1.96).[67] The concept of frailty is widely accepted. However, there is no agreement on a standardized definition or measurement tool that contributes to a clinician's difficulty in interpreting or managing the frail patient.

The lack of high quality studies, the heterogeneity in measures and outcomes make drawing strong conclusions or recommendations based on the result of this

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systematic review difficult. Foremost, it highlights a large gap in knowledge in the care of this vulnerable patient population. The challenge of disposition decisions is complex in older patients and goes beyond addressing an acute medical condition. When considering discharge back to the community, mobility assessments are performed in the elderly to determine functional ability to be safely discharged as well as attempt to identify those at high risk of returning to the ED. The lack of feasible ED tools that can predict adverse outcomes hinders the ED physician in making appropriate discharge decisions and puts the older ED patient at risk of preventable morbidity.

Implications for future research

Given the current lack of evidence, there is ample opportunity for future research. Robust research is needed with strong methodological foundations.[10] For any meaningful clinical impact to be achieved, the following key issues must be addressed. Firstly, the target population must be specified. The ideal test would be designed to assess all older ED patients not just those who present post-fall. Secondly, the feasibility of the test for use in the ED is critical. It must be quick, not require any extra tools, and be easy for any bedside clinician (nurse, physician) to use to enhance widespread uptake in all ED settings. Thirdly, explicit outcomes must be established. The research question must address whether they are answering a diagnostic (immediate disposition decisions, such as admission to hospital v. discharge to the community) or prognostic (to establish risk of long-term outcomes, such as return to the ED, future fall, or frailty) concern. An evaluation of both harms and benefits should be included. Finally, test characteristics, including cut-off values, inter-rater reliability, and positive and negative predictive values, must be determined. Ultimately, a randomized controlled trial to investigate the effects of a mobility test would be needed. Such research would be highly informative and would provide important evidence to better inform clinical care and future geriatric ED guideline recommendations.

Strengths and limitations

This systematic review used robust methodology to complete the electronic search for relevant studies. Search strategies were developed with the input of an experienced health sciences research librarian. In total, six electronic databases were searched, and no language restrictions were used. Therefore, we feel that it is unlikely that any studies published in peer-reviewed journals would have been missed. A limited grey literature search was conducted, and we excluded some potential studies due to the inability to contact those study authors.

CONCLUSIONS

Our comprehensive systematic review identified a significant gap in knowledge surrounding physical mobility assessments for older ED patients. The TUG was the most commonly used measure. No association was found between TUG scores and a return to the ED. Clinicians should continue to evaluate mobility of older ED patients prior to discharge, although use of the TUG cannot be strongly advocated at this time. Robust research is needed to develop and evaluate standardized mobility measures to assist physicians in making appropriate disposition decisions, ultimately in an effort to improve the care and outcomes in this older, vulnerable patient population.

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Competing interests: None declared.

SUPPLEMENTARY MATERIAL

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