International Emergency Nursing

Emergency nurses' preference for tools to identify frailty in major trauma patients: a prospective multi-centre cross-sectional study

--Manuscript Draft--

Manuscript Number:	YAAEN-D-23-00171R1
Article Type:	Original Research Paper
Keywords:	Emergency Nursing, injuries, Frailty, aged
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Abstract:	Background Frailty is known to be a predictor of poor recovery following trauma and there is evidence that providing early frailty specific care can improve functional and health outcomes. Accurate assessment of frailty is key to its early identification and subsequent provision of specialist care. The aim of this study was to determine the feasibility and acceptability of different frailty screening tools to nurses administering them in the ED in patients admitted following traumatic injury. Methods Patients aged 65 and over attending the Emergency Department of five major trauma centres following injury participated in the study between June 2019 and March 2020. Patients were assessed using the clinical frailty scale (CFS), PRIMSA7, and the Trauma Specific Frailty Index (TSFI). Nurses were asked to rank their ease of use and to state their preference of each of the tools from best to worst. If the tool was not able to be completed fully then free text responses were enabled to identify reasons. Accuracy of the tool in identifying if the patient was frail or not was determined by comparison with the reference standard of a frailty score determined by a geriatrician. Results There were 372 patients included in the analysis. Screening tool completion rates were highest with the CFS (98.9%), followed by PRISMA7 (93%) and TSFI (31.9%). PRISMA7 and CFS were reported as 'extremely easy to complete' by over half of nurses. Nurses were two times more likely to prefer the CFS as their first-choice frailty assessment tool compared to PRISMA7 (57.3% vs. 32.2%). Conclusion This study provides information on feasibility, acceptability and accuracy to inform the consensus on which frailty screening tool can be applied to major trauma patients in the ED. Our results suggest that most suitable screening tool for frailty in major trauma in the ED is the CFS.
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- Frailty is an important predictor of outcome following trauma in older people
- Nurses' preference for use of frailty tools is an important determinate for their use
- This study contributes to the understanding of frailty screening in ED trauma patients
- The Clinical Frailty Scale is accurate and feasible in identifying frailty in ED trauma patients

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Conflict of interest

None

Ethical statement

The study obtained an ethical opinion for conduct by the UK Social Care Research Ethics Committee (REC no 19/IEC08/0006). Consent guidance for undertaking research in emergency settings and with patients lacking capacity was followed.

Funding source

This work was supported by The Burdett Trust for Nursing. The funder was not involved in the design of the study, collection, analysis, or interpretation of data or in writing the manuscript

Trial registration

ISRCTN10671514. Registered 22 October 2019

Acknowledgments

We would like to thank the ED and research nurses at all the sites for their work on the study. Dr Chao Wang, Kingston University for his contribution to the statistical advice in the FRAILT study protocol. In addition to the authors, the following members of the Pan-London Elderly Major Trauma Group provided advice and consensus opinions on the use of frailty tools and the recruitment processes: Trish Burton, Dr Cara Jennings, Dr George Peck, Dr Dhanupriya Sivapathasuntharam, Dr. Rhonda Sturley, and Jane Tippett.

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Methods

Patients aged 65 and over attending the Emergency Department of five major trauma centres following injury participated in the study between June 2019 and March 2020. Patients were assessed using the clinical frailty scale (CFS), Program of Research to Integrate Services for the Maintenance of Autonomy 7 (PRIMSA7), and the Trauma Specific Frailty Index (TSFI). Nurses were asked to rank ease of use and to state their preference for each of the tools from best to worst. If the tool was not able to be completed fully then free text responses were enabled to identify reasons. Accuracy of the tool in identifying if the patient was frail or not was determined by comparison with frailty determined by a geriatrician.

Results

Data were analysed from 372 patients. Completion rates for each of the tools varied, with highest degree of compliance using the CFS (98.9%). TSFI was least likely to be completed with "lack of available information to complete questions" as the most cited reason. Nurses showed a clear preference for the CFS with 57.3% ranking this as first choice (PRISMA-7 32.16%; TSFI 10.54%). Both PRISMA-7 and CFS were both rated highly as 'extremely easy to complete' (PRISMA-7 58.5%, CFS 59.61%).

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1. Introduction

Globally the population is getting older leading to both socioeconomic and healthcare challenges from an increased demand on resource. One area of clinical practice that has seen a significant rise in cases is major trauma in older people, specifically those patients suffering from life-threatening or life-limiting injuries. This increasing incidence is well documented across several countries with data showing higher mortality and risk of complications in this group [1-3]. However, older people differ in their pre-injury state, and physiological response to trauma. Those with decreased physiological reserve, co-morbidities, polypharmacy and frailty experience a more complicated recovery following trauma. Frailty is broadly recognised as a multidimensional clinical condition characterised by physical and psychosocial decline across several biological systems. This means those affected by frailty are less able to adapt and recover from injury resulting in poor outcomes [4-6]. There is also evidence that frailty is a dynamic state that can be improved through appropriate management if identified early [7].

In recent years there has been increased interest in how frailty can be identified early in the hospital admission to improve detection of those at risk of adverse outcomes, including in major trauma, and screening for frailty to inform care is recommended [8,9] This has led to guidelines for the routine screening of older patients for frailty when accessing healthcare [10-12]. Whilst there is consensus

on the need to screen for frailty there is no agreement on the best method to do this.

A review of frailty screening tools found 67 different measures for use in a variety of clinical settings [13] Challenges such as lack of availability of information, the clinical condition of the patient and staff awareness have all been shown to impact on their adoption in practice.

Although there is increasing evidence on the use of different frailty assessment tool in major trauma, these have generally addressed the ability of instruments to predict patient outcome rather than whether they are feasible to complete [14-16]. Specific tools for screening for frailty in major trauma are most often applied to patients in the in-hospital phase of their admission which may be too late to guide decisions on initial management [14].

In situations where there is limited time to gather information the main limitations of frailty screening are the relatively short time to complete an assessment, lack of available information, access to special equipment, 'ageist' restrictions on care, and level of training required for those completing the tool [17,18]. Empirical evidence on the use of frailty screening tools in the initial phase of major trauma care in the emergency department (ED) has been scarcely reported. As the ED is the first point at which the patient enters the hospital ED nurses are well positioned to screen for frailty so that early specialist care can be instigated. Frailty screening in time-pressured situations

needs to be accessible and easy to navigate, whilst accurately identifying frail patients so that resources can be appropriately allocated to those most in need.

2. Objectives

We aimed to evaluate nurse-led assessment of frailty in the major trauma patients in the ED. The objectives of this analysis were to:

1) Assess the feasibility and acceptability of different frailty screening tools to the ED nurses administering them
2) Determine the accuracy of frailty screening by nurses in the ED compared with geriatrician assessed frailty.
3) Explore factors in the frailty screening tools that impact on their use in the ED

3. Methods

A cross-sectional study design was used. The study was approved by the UK Social Care Research Ethics Committee (REC no 19/IEC08/0006) in March 2019, trial registration number: ISRCTN12345678. The study was prospectively registered on the National Institute for Health and Social Care Research (NIHR) portfolio (reference UK CRN 41047). The study design and reporting follow the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for cross-sectional studies [19]

3.1 Study design

A prospective observational study was conducted. Collection of feasibility and acceptability data was incorporated into a larger study determining the accuracy of frailty assessment performed by nurses in patients aged 65 years or over

admitted to UK major trauma centres (MTC) - the FRAIL-T in major trauma study [5,20].

3.2 Setting

The study took place in the emergency departments of five MTCs in the south of England between June 2019 and March 2020. In the UK MTCs are designated to provide care to the most severely injured patients as part of regional major trauma networks [21]

3.3 Participants

Participants recruited in the FRAIL-T study were aged 65 or over requiring 'major trauma team activation' and admitted to hospital. The major trauma team is a specialised team of ED clinicians, surgeons, and nurses providing immediate care to patients following injury. Patients were screened for inclusion into the study whilst in the ED and written consent was obtained. If potential participants lacked capacity to consent due to their clinical condition or existing cognitive impairment a family member or professional representative was approached under guidance for consent in emergency settings in England [22].

3.4 Data measurement and variables

Following participant consent, data were collected by study trained nurses prior to the participant leaving the ED. The data collection tool for the study included 3 sections (A – patient and injury characteristics, B – frailty assessment, C – evaluation of frailty instruments). Section A covered standard socioeconomic

characteristics (age, gender, ethnicity), comorbidities and mechanism of injury. Section B included three frailty screening tools – the Trauma Specific Frailty Index (TSFI) [16] the Program of Research to Integrate Services for the Maintenance of Autonomy 7 (PRISMA7) [23], and the Clinical Frailty Scale (CFS) [24] (table 1). Section C contained questions on the sources of information used to complete the frailty assessments, nurse ranking of the tools from best to worst, and rating of their ease of use (5-point Likert scale from "extremely easy to complete" to "extremely hard to complete").

Frailty tool	Description	Score used to determine frailty
Trauma Specific Frailty Index (TSFI)	A scale composed of 15 variables designed to predict the presence of frailty in the trauma setting. It requires knowledge of functional state and pre-existing medical conditions. A TSFI score of >0.27 is found to be an independent predictor of unfavourable outcomes after trauma [16]	>0.27
Program of Research to Integrate Services for the Maintenance of	A self-report questionnaire comprising of 7 unambiguous questions aimed at identifying frail older adults: older than 85 years, male, health problems requiring staying at home, social support, and use of a	3 or more

Autonomy 7 (PRISMA7)	cane/walker/wheelchair. It utilises closed questions, 'yes' or 'no' answers, and a score of three or more is indicative of frailty [23]	
Clinical Frailty Scale (CFS)	A 9-point scale using patient report or clinical judgement to assess functional capacity. It uses nine pictorial representations alongside a short descriptor to assign a frailty score: 1 (very fit) to 9 (terminally ill). Participants scoring 5 or more are considered frail [24]	5 or more

Table 1: Description of frailty tools used

The frailty tools were selected by an expert panel of clinicians including ED and trauma specialists, geriatricians, nursing staff and patients based on their clinical application to trauma in an emergency setting.The reliability and validity of each of the tools has previously been demonstrated [25-27].

3.4 Bias

Bias was minimized in the study by collecting data through standardized reporting tools and by using validated screening instruments. All nurses collecting data were given specific online training detailing study procedures and instructions on completing frailty screening. Instruments were administered in a standard order (TSFI, PRISMA7, CFS).

3.5 Study size

Data from participating sites estimating prevalence of frailty in trauma patients age 65 years or over was put at 37%. For calculating sample size, using frailty as the outcome variable, it was determined a sample of 370 to achieve a 95% CI (32% to 42%) at 97% probability of achieving the target precision was needed [20].

3.6 Statistical methods

Data were analysed using Stata (version 16.1). Completed scores for the frailty screening were dichotomised by ‘frail’ or ‘non-frail’ according to the cut-offs for each of the tools. Descriptive statistics were used to analyse patients’ and nursing demographics, and clinical characteristics. Age data were nonparametric and reported as median with interquartile range. Categorical variables are reported as frequencies and percentages. Feasibility of each tool was determined by calculating completion rates, ranking nurse preference, and determining reasons for non-completion if relevant. Accuracy of the tool in identifying if the patient was frail or not was determined by comparison with the reference standard of a frailty score determined by a geriatrician carried out with 72 hours of admission to hospital in line with best practice recommendations in the UK [28]. Reasons for non-completion were collected in free text and then coded for analysis. Proportions of responses to the 5-point Likert scale are reported as percentages. Inter-rater agreement of frailty between the ED nurses

and geriatricians was determined using Kappa statistic. A p-value of < 0.05 is considered statistically significant.

4. Results

4.1 Participants

A total of 465 patients were screened as eligible to participate in the study. Of these, 93 were withdrawn following enrolment due to inability to gain written consent from the patient or consultee (52) or the patient or consultee withdrawing consent (23).

There were 372 patients included in the analysis. The median patient age was 80 years, more than half were female (53.8%) and the predominant mechanism of injury was a fall from a height of less than two metres (Table 2). Of those admitted to hospital, 35 (9.4%) died. Most nurses completing the frailty assessments were junior nurses at bands 5 and 6 (88.1%) (Table 2).

Variable	**n=372**
Demographics	
Age, years (median, IQR)	80 (73–86)
Female (n, %)	200 (53.8)
Clinical characteristics	
Pre-dominant mechanism of injury (n, %)	
Fall < 2m	211 (56.7)
Fall > 2m	79 (21.2)

Pedestrian v. vehicle	36 (9.7)
Disposition from ED (n, %)	
Ward	249 (66.94)
High dependency area	8 (2.15)
Intensive care area	34 (9.14)
Died in ED	2 (0.54)
Grade of nurse completing the frailty assessments	
Band 5 (junior)	127 (34.1%)
Band 6	201 (54.0%)
Band 7	12 (3.2%)
Band ≥ 8 (senior)	32 (8.7%)

Table 2: Demographic and clinical characteristics

4.2 Main results

In those patients with completed assessment tools, TSFI identified the highest proportion of frailty (95.0%). Whereas PRISMA7 identified just over half of patients as being frail (57.1%) and CFS a third (31.8%). ED scores were compared with geriatrician assessment (GA) of frailty within 72 hours of admission where available (279 patients). There was substantial inter-rater agreement between ED nurse CFS identified frailty and GA identified frailty (Kappa 0.637, $p<0.001$). Agreement between PRISMA7 and the GA was moderate (Kappa 0.458, $p<0.001$) but TSFI and GA agreement was only slight (Kappa 0.103, $p=0.017$).

Patients were the most reported source of information, either as the only respondent or in combination with others (figure 1). Very few assessments were based on nurse judgement as the sole source of information, and this occurred more frequently with the CFS than the other tools.

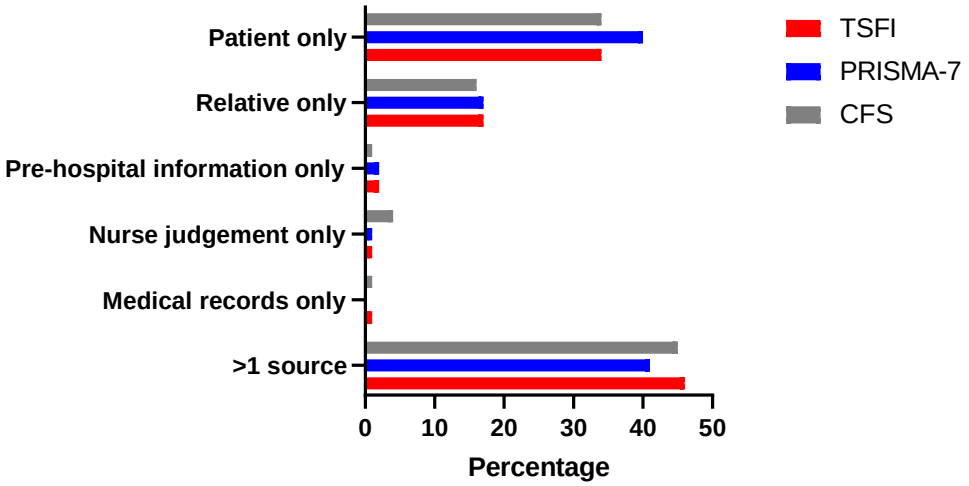

Figure 1: Source of information for frailty screening tool completion

The completion rates for each of the three screening tools varied. TSFI was completed in the least number of patients (31.9%), compared to PRIMSA7 (93%) and CFS (98.9%) (Table 4). There was no association between band of nurse and frailty assessment completion.

Screening tool	Number of individual items	Min – max number of items missing	Participants with all data items complete	Participants with >10% data items missing

	required for calculation		n (%)	n (%)
Trauma specific frailty index	15	1 - 14	119 (31.9)	116 (31.1)
PRISMA7	7	1 – 5	346 (93)	26 (7)
Clinical Frailty Scale	1	n/a*	368 (98.9)	4 (1.1)

Table 3: Item completion for frailty screening tools. * CFS is a single score there is no min-max item

Both PRISMA-7 and CFS were rated highly as '***extremely easy to complete***' (PRISMA7 58.5% of respondents, CFS 59.6%, Figure 2). TSFI was reported to be ***hard or extremely hard to complete*** by more respondents (29.6%) compared to only 5.8% for both PRISMA7 and CFS. Nurses were two times more likely to prefer the CFS as their first-choice frailty assessment tool compared to PRISMA7 (57.3% vs. 32.2%), with only a minority (10.5%) primarily choosing TSFI.

The only reason given for non-completion of both CFS and PRISMA7 (7% and 1% respectively), was the patient being unable to give information due their clinical or cognitive state with no collateral history available. Almost 70% of patients did not have TSFI completed. Patient inability to respond with no other sources of information was reported to prevent TSFI assessment in 63 (16.9%) cases. The TSFI consists of 15 variables of which 144 patients (39%) had a

single item not scored and 116 (31%) had more than one item not scored. The most frequently non-completed item was the patient's blood albumin test result (196, 52.6%) which was not available in the ED. TSFI includes a question about the patient's sexual activity and in 27 patients with capacity to respond nurses indicated they did not want to ask about this information.

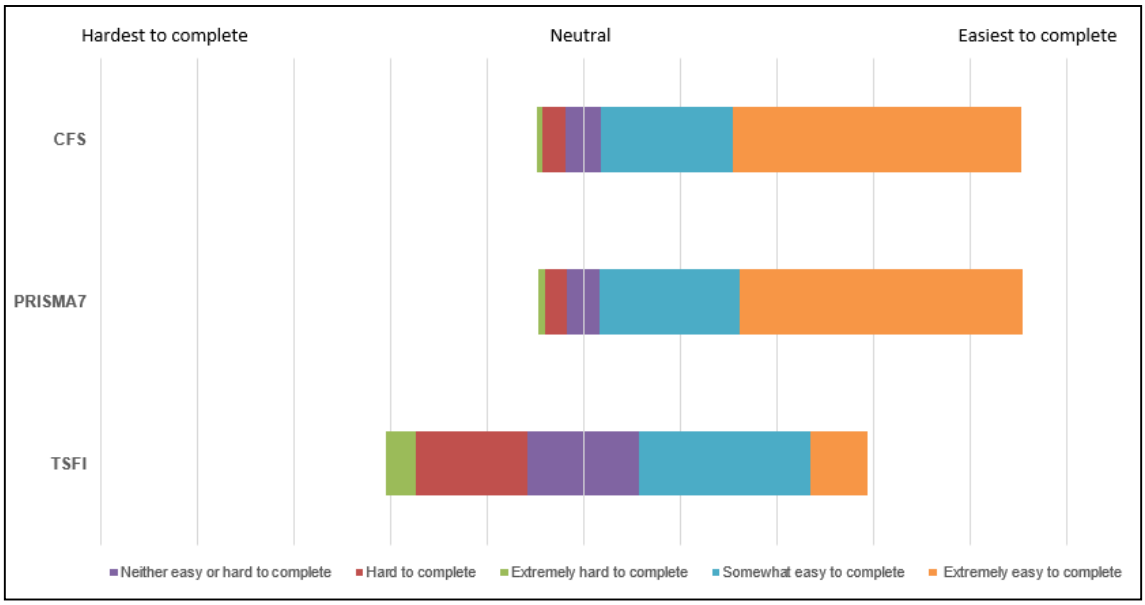

Figure 2: Respondent rating of ease of completion of each of the tools. Bars show proportions rating each category.

5. Discussion

5.1 Key results

This study aimed to determine the feasibility and acceptability of three tools for frailty screening in ED major trauma patients by nurses and showed that the CFS scored most highly overall. It had the highest agreement with geriatrician assessed frailty (accuracy), had the highest completion rate (feasibility), and was ranked first choice by the majority of nurses (acceptability). We found two key factors in determining the completeness of frailty screening tools: 1)

patients being able to provide their own information; and 2) the opinion of nurses on their use.

Whilst there is increasing evidence on the use of frailty screening in major trauma patients there is still no consensus as to which tool can be most easily applied in the first phase of care in the ED. In the ED, nursing staff most frequently complete frailty screening. They need a simple, brief and standardised assessment tool that can easily be applied to identify frail patients under their care. CFS and PRISMA7 scored highly on ease of use and completion, TSFI scored lower on the ease of use in comparison to the other tools and therefore is unlikely to be accepted for use in the ED. Both CFS and PRISMA7 have previously been shown to be usable within the ED [29] although Van De Burgh et al found CFS was the least preferred tool for use in a study assessing ease of frailty tool use in the ED [30]The feasibility of screening tools is key to their adoption in practice and complex or time-consuming tools are difficult to use in the ED where they may be constraints on time or the availability of clinical information. In the UK there is guidance that frailty assessment should be undertaken in the ED for all patient groups within 30 minutes of arrival, adding to the need for tools that can be rapidly applied [31]. The time taken for completion, ease of use, patient and user acceptability, and level of training required as factors affecting implementation of assessment tools in clinical practice [32]. [33]Previous studies identify the optimal features of frailty tools used in the ED as those which do not require use of equipment, can be quickly applied and can use objective parameters [33-36]. Screening tools

that do not have these features are unlikely to be successfully adopted into practice.

Studies reporting the use of frailty tools in the ED most often apply screening to the 'general' ED population of which those with major trauma may be part, but there are important differences in our study compared to some of these. We included patients who lacked capacity due to their injuries or pre-existing condition, but other studies have excluded unconscious patients [37], those who are unable to provide consent [38], and those too unwell to participate [39]. We found that patient self-report was the single most common method of gathering information about a patient's condition, followed by information from relatives. However the emergency nature of major trauma means that information and collateral history is less available than in other ED patient groups and therefore requires clinical judgement in making an assessment. Clinical judgement appears to be a factor in predicting frailty in the ED [40] The CFS aims to standardise clinical judgement regarding a patients' general function [8,41]. Both TSFI and PRIMSA7 include on social status or medical history that was not accessible in the ED and led to some patients not having completely calculated frailty scores. This was particularly true of the need for an albumin level to calculate the TSFI which was not available or not taken in the ED.

Previous studies have found good interrater reliability between clinicians and nurses using the CFS in the ED. Direct comparison of studies is made difficult by differences in tools, the staff groups involved and in the statistical tests used. Horlin et al found moderate to good agreement between physicians and ED

nurses using CFS [38], with Ringer et al finding good inter-rater reliability when comparing its use in nurses and doctors, but only moderate agreement compared with patients' perceptions of their own frailty [42]. Good agreement levels across professions and settings suggests that frailty is interpreted in the same way when using the same tool regardless of how the information to complete the assessment is gathered giving the tool widespread validity.

There are multiple advantages to early ED assessment of frailty in major trauma patients. Frailty status may provide a strong indication of patient outcome and should be used to guide discussion about level of intervention and likely outcome. It can also be used to help prioritise specialist geriatric input. The first step is frailty identification by non-geriatric specialists followed by a multidisciplinary comprehensive geriatric assessment [43]. We used agreement with geriatrician assessment of frailty to determine accuracy, showing substantial agreement between nurse and geriatrician assessed frailty. Accuracy in identification is an important consideration in the selection of a frailty assessment tool as understating frailty can lead to lack of recognition of need for frailty specific care. Similarly, overstating frailty may lead to treatment being withheld or not instigated due to perceptions of futility.

5.2 Limitations

The perceptions of nurses regarding ease of use with differing frailty tools are likely to be influenced by contextual factors such as workload, patient injury severity and availability of information at the time the frailty tools were

completed. We acknowledge that this may have impacted on the rating and opinions regarding the tools used at a particularly point in time.

Additionally, we did not test all the frailty assessment tools in use and are therefore making recommendation based on information about the three tools selected for use in this study. Despite this we add to the body of evidence regarding the feasibility of nurse-delivered CFS in ED major trauma patients.

Despite these limitations, a strength in this work is the inclusion of patients who lacked capacity and the use of emergency consent procedures. Most of the previous work in the ED has been undertaken in the general attendances including only patients who could consent to participate. We believe that our findings better reflect a 'real-world' older major trauma population

6. Interpretation and conclusions

Accurate identification of frail patients whilst still in the ED offers an opportunity to inform clinical decisions for subsequent management and provide focused early intervention in frail patients with higher risk of adverse outcomes. Information gained from frailty screening tools should facilitate and support these decisions. Despite the clinical value of screening for frailty in major trauma patients in the ED there remain distinct challenges in this patient group. This study provides information on feasibility, acceptability and accuracy to inform the consensus on which frailty screening tool can be applied to major trauma patients in the ED. Our results suggest that most suitable screening tool for frailty in major trauma in the ED is the CFS.

References

[1] JR Dixon, F Lecky, O Bouamra, P Dixon, F Wilson, A Edwards, et al., Age and ageing. 49 (2020) 218-226.

[2] M Fröhlich, M Caspers, R Lefering, AA Driessen, B Bouillon, MM Maegele, et al., Eur J Trauma Emerg Surg. 46 (2020).

[3] B Beck, P Cameron, J Lowthian, M Fitzgerald, R Judson, BJ Gabbe, BJS Open. 2 (2018) 310-318.

[4] AGAG Alqarni, Gladman, John R F John R F, AAAA Obasi, BB Ollivere, Age and ageing. 52 (2023).

[5] H Jarman, R Crouch, M Baxter, C Wang, G Peck, D Sivapathasuntharam, et al., Scandinavian journal of trauma, resuscitation and emergency medicine. 29 (2021) 54.

[6] B Joseph, V Pandit, B Zangbar, N Kulvatunyou, A Hashmi, DJ Green, et al., JAMA surgery. 149 (2014) 766-772.

[7] J Morley, B Vellas, K Abellan van, S Anker, J Bauer, R Bernabei, et al., Journal of the American Medical Directors Association. 14 (2013) 392-397.

[8] KF Boreskie, JL Hay, PE Boreskie, RC Arora, TA Duhamel, BMC Geriatr. 22 (2022).

[9] B Joseph, H Phelan, A Hassan, T Orouji Jokar, T O'Keeffe, A Azim, et al., The journal of trauma and acute care surgery. 81 (2016) 1150-1155.

[10] NHS England, (2019).

[11] E Dent, JE Morley, AJ Cruz-Jentoft, L Woodhouse, L Roíguez-Mañas, LP Fried, et al., J Nutr Health Aging. 23 (2019) 771-787.

[12] British Geriatrics Society, British Geriatric Society. (2014).

[13] BJ Buta, JD Walston, JG Godino, M Park, RR Kalyani, Q Xue, et al., Ageing research reviews. 26 (2016) 53-61.

[14] KE Engelhardt, Q Reuter, J Liu, JF Bean, J Barnum, MB Shapiro, et al., The journal of trauma and acute care surgery. 85 (2018) 167-173.

[15] M Hamidi, Z Haddadin, M Zeeshan, AT Saljuqi, K Hanna, A Tang, et al., The journal of trauma and acute care surgery. 87 (2019) 1172-1180.

[16] B Joseph, V Pandit, B Zangbar, N Kulvatunyou, A Tang, T O'Keeffe, et al., Journal of the American College of Surgeons. 219 (2014) 10-17.e1.

[17] X Liu, MK Le, AYC Lim, EJ Koh, TN Nguyen, NA Malik, et al., BMC Geriatr. 22 (2022).

[18] VS McDonald, KA Thompson, PR Lewis, CB Sise, MJ Sise, SR Shackford, The journal of trauma and acute care surgery. 80 (2016) 824-834.

[19] E von Elm, DG Altman, M Egger, SJ Pocock, PC Gøtzsche, JP Vandenbroucke, International journal of surgery (London, England). 12 (2014) 1495-1499.

[20] H Jarman, R Crouch, M Baxter, E Cole, B Dillane, C Wang, BMJ Open. (2020).

[21] AL McCullough, JC Haycock, DP Forward, CG Moran, Br J Anaesth. 113 (2014) 202-206.

[22] Department of Health, (2008).

[23] M Raîche, R Hébert, M Dubois, Archives of gerontology and geriatrics. 47 (2008) 9-18.

[24] K Rockwood, Canadian Medical Association journal (CMAJ). 173 (2005) 489-495.

[25] B Joseph, AT Saljuqi, JD Amos, A Teichman, ML Whitmill, T Anand, et al., The journal of trauma and acute care surgery. 94 (2023) 36-44.

[26] O Higginbotham, A O'Neill, L Barry, A Leahy, K Robinson, M O'Connor, et al., HRB open research. 3 (2020) 26.

[27] A Leahy, M O'connor, J Condon, S Heywood, E Shanahan, C Peters, et al., BMJ Open. 11 (2021).

[28] NHS England and NHS Improvement, (2019).

[29] A Elliott, K Phelps, E Regen, SP Conroy, Age and ageing. 46 (2017) 840-845.

[30] R van der Burgh, N en, M Visscher, B de Groot, J Lucke, Eur.J.Emerg.Med. 29 (2022) 301-303.

[31] UK NHS, (2019).

[32] A Smart, International journal for quality in health care. 18 (2006) 377-382.

[33] E Kajsa, W Katarina, L Sten, I Synneve, BMC emergency medicine. 16 (2016) 27.

[34] ET Lewis, E Dent, H Alkhouri, J Kellett, M Williamson, S Asha, et al., Archives of gerontology and geriatrics. 80 (2019) 104-114.

[35] SP Shah, K Penn, SJ Kaplan, M Vrablik, K Jablonowski, TN Pham, et al., The American journal of emergency medicine. 37 (2019) 12-18.

[36] A Elliott, L Hull, SP Conroy, Age and ageing. 46 (2017) 509-513.

[37] C Hsu, C Lee, S Hsu, W Huang, Y Hsu, M Chi, International emergency nursing. 68 (2023).

[38] E Hörlin, S Munir Ehrlington, J Henricson, RT John, D Wilhelms, Academic emergency medicine. 29 (2022) 1431-1437.

[39] R O'Caoimh, M Costello, C Small, L Spooner, A Flannery, L O'Reilly, et al., International journal of environmental research and public health. 16 (2019) 3626.

[40] AH Calf, S Lubbers, AA van den Berg, E van den Berg, CJ Jansen, BC van Munster, et al., European journal of emergency medicine. 27 (2020) 137-141.

[41] CS van Dam, EO Hoogendijk, SP Mooijaart, YM Smulders, RCW de Vet, JA Lucke, et al., European journal of emergency medicine. 28 (2021) 266-276.

[42] T Ringer, C Thompson, S McLeod, D Melady, U Hwang, Academic emergency medicine. 27 (2020) 419-422.

[43] JM Fisher, C Bates, J Banerjee, Age and ageing. 46 (2017) 709-712.

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	1
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*6*
Bias	9	Describe any efforts to address potential sources of bias	8
Study size	10	Explain how the study size was arrived at	9
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	n/a
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	9
		(*b*) Describe any methods used to examine subgroups and interactions	n/a
		(*c*) Explain how missing data were addressed	n/a
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	n/a
		(*e*) Describe any sensitivity analyses	n/a
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	10
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	10
		(b) Indicate number of participants with missing data for each variable of interest	10
Outcome data	15*	Report numbers of outcome events or summary measures	n/a
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	11

		(*b*) Report category boundaries when continuous variables were categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	14
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	17
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	18
Generalisability	21	Discuss the generalisability (external validity) of the study results	18
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	Title page

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

Author statement

Heather Jarman – conceptualisation, methodology, writing – original draft, supervision, project management, funding acquisition, **Mark Baxter -** conceptualisation, methodology, writing – review and editing, **Robert Crouch -** conceptualisation, methodology, writing – review and editing, **Elaine Cole -** conceptualisation, methodology, formal analysis, writing – review and editing