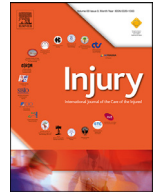




Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



Review

Frailty in orthopaedics: is age relevant? ☆

Michaela Rogers^{a,1,*}, Robyn Brown^b, Sophie Stanger^b^a University of Bristol Medical School, Bristol, BS8 1UD, United Kingdom^b Gloucestershire Hospitals NHS Foundation Trust, Trauma & Orthopaedics, Gloucester Royal Hospital, Gloucester, GL1 3NN, United Kingdom

ARTICLE INFO

Article history:

Accepted 13 July 2020

Keywords:

Frailty
Geriatric
Hip fracture
Fragility fracture
Clinical frailty scale
Best practice tariff

ABSTRACT

Over the last decade, national guidelines and the Best Practice Tariff (BPT) have been created to incentivise quality care in patients aged over 60 with hip fractures. This has resulted in significantly decreased length of stay, mortality and post-operative complications in this patient cohort. However, there is increasing recognition of frail patients in all age groups sustaining all fragility fractures. Until recently, these patients experienced poorer outcomes and were excluded from the dedicated care pathways that hip fracture patients received.

The BPT and other national guidelines are now expanding inclusion criteria into care packages between guidelines which were initially reserved for hip fracture patients. This expansion is placing increasing pressure on limited NHS resources. Current variations between society guidelines risks producing regional and departmental inconsistencies in care. There is therefore a need to provide consistent guideline targeted at the most vulnerable trauma patients of this expanded cohort.

Although the current BPT applies to over 60s only, there is limited evidence to support age-related prognosis in trauma. In contrast, frailty is being increasingly recognised as a global indicator of patient outcomes irrespective of age, with use of Clinical Frailty Scale (CFS) being adopted in various medical fields. BOAST is already using CFS as an inclusion criterion for major trauma and there is increasing data to suggest that frail trauma patients benefit most from comprehensive geriatric care and expedient time-to-operation.

We suggest that CFS should take precedence over age when ascertaining clinical priority and producing Best Practice Tariffs. Further research is required to investigate frailty-related outcomes in trauma and the impact of comprehensive care bundles on the outcomes of frail orthopaedic patients.

© 2020 Elsevier Ltd. All rights reserved.

Introduction

Best practice for the care of older and frail orthopaedic patients has evolved hugely over the past fifteen years. An aging population has led to more complex comorbidities and frailty among patients who require orthopaedic treatment. This has been recognised previously in patients sustaining hip fractures and has given rise to a drive for optimisation of these patients in the form of national guidelines and the Best Practice Tariff (BPT) for hip fractures [1]. Initiatives such as a comprehensive geriatric assessment prior to

surgery and time to surgery within 36 hours have improved care and reduced mortality [2].

Over the past decade, there has been an increased recognition of poor outcomes amongst other orthopaedic trauma patient cohorts [3,4]. In response, policymakers have gradually expanded their guidelines to include additional fracture patterns, demographic inclusions, and care recommendations (Table 1).

However, with this ever-expanding inclusion criteria for comprehensive multi-disciplinary care, can our current healthcare resources provide this increasingly high standard of care for frail and older orthopaedic patients? Or does there need to be a streamlining of inclusion criteria, identifying the most vulnerable to receive limited resources?

This paper discusses the increasing pressures on current resources, describes the rising recognition of frailty, and suggests that utilising Clinical Frailty Scale (CFS) rather than age may identify those with the greatest clinical need and best utilise limited resources.

☆ Declaration of interest: none.

* Corresponding author.

E-mail addresses: il18321@bristol.ac.uk (M. Rogers), robyn.brown2@nhs.net (R. Brown), sophie.stanger@nhs.net (S. Stanger).¹ Permanent Address: 9 Court Drive, Kettering, Northamptonshire, NN16 9EP, United Kingdom.

Table 1

Comparison of the Best Practice Tariff Criteria, National Institute of Health and Care Excellence (NICE) Guidelines and the Blue Book for the management of hip fractures.

	BPT 2020	BOAST 2019	NICE	Blue Book
Inclusion Criteria	Hip fracture or femoral fracture in aged 60++	Sustaining a fragility fracture OR Major trauma with CFS of 5+	Hip fracture in adults (aged 18+).	All fragility fractures with some recommendations for hip fractures only. (*=hip fracture-specific)
Time to surgery	Within 36hrs of arrival in the emergency department.	Within 36 hours of admission.	Day of, or the day after admission.	Within 48 hours of admission (if medically fit)*.
Orthogeriatric input	Geriatrician assessment in preoperative period (within 72hrs of admission), dmitted under joint care of consultant geriatrician and consultant orthopaedic surgeon. Postoperative geriatrician-directed multi-professional rehabilitation team.	Comprehensive Geriatric Assessment within 72 hours of injury.	From admission, patients should be offered orthogeriatric assessment, optimisation for fitness for surgery, orthogeriatric and multidisciplinary review.	Should be managed on an orthopaedic ward with routine access to acute orthogeriatric medical support*.
Physiotherapy input	Assessed by physiotherapist the day of or day following surgery.	Should be seen by physiotherapist the day after surgery.	Offer appropriate mobilisation strategies e.g. physiotherapist assessment.	
Fracture/falls prevention	Fracture prevention assessments (falls and bone health).	Bone health review. Multifactorial falls risk assessment, referred to falls prevention services if indicated.	Liaison with appropriate services e.g. falls prevention.	Offered MDT assessment and intervention to prevent future falls. Assessed for need for antiresorptive therapy to prevent future osteoporotic fractures.
Other guidelines	Admitted using an assessment protocol agreed by geriatric medicine, orthopaedic surgery and anaesthesia AMTS before surgery, with score recorded in the NHFD. Delirium assessment using the 4AT screening tool during admission. Nutritional assessment during admission.	Delirium assessment. Nutrition assessment.		Should be admitted to an acute orthopaedic ward within 4 hours of presentation*. Should be assessed and cared for to minimise risk of developing a pressure ulcer.

BPT: Best Practice Tariff, BOAST: British Orthopaedic Association Standards for Trauma and Orthopaedics, NICE: National Institute of Health and Care, CFS: Clinical Frailty Scale, Excellence, MDT: Multidisciplinary Team, AMTS: Abbreviated Mental Test Score, NHFD: National Hip Fracture Database, 4AT: rapid assessment test for delirium.

Current resources

There is an increasing pressure on hospitals to provide high quality care. In 2018, only 62% of hospitals had a dedicated hip fracture ward [5]. Alongside this, hospitals struggle to have a fully staffed orthogeriatric service. With increased demand for geriatric services, recruitment initiatives have been developed to encourage more trainees to consider the specialty. These initiatives need to tackle the perception that geriatricians take on a disproportionate burden of acute illness [6]. More geriatricians are required to provide for our aging population [7].

Despite the increasing demand for geriatricians, it is difficult to recruit to vacant consultant posts, with only a third of advertised positions being filled at interview, as there is a lack of appropriate candidates. As geriatric medicine is more developed in the UK compared to other countries, the NHS struggles to recruit individuals from elsewhere with the skills required. The British Geriatric Society has the opinion that these candidates would need extra supervision and training before they can start a higher position [8].

Time to theatre is also an issue. Trauma services are becoming more pressured and prioritising patients for a trauma list is an ever-complex task.

One way to address the increasing demand on resources is to increase supply. Incentives should be made for students to choose geriatrics in order to provide appropriate care for our geriatric population in response to the “increasing numbers of aging, more medically complex and frail people” [7]. In the long term, more geriatricians are needed to meet the increasing demands on geriatric services.

The other way to address this is to be selectively identify and prioritise patients who would benefit the most from BPT inclusion. BPT inclusion criteria is currently age-specific: £1353 is rewarded to all patients over the age of 60 sustaining a hip or femoral fracture [1]. However, the National Institute of Clinical Excellence (NICE) hip fracture guidelines [9] does not have an age-specific inclusion criterion. In contrast, the British Geriatric Society’s “Blue Book” [10] and British Orthopaedic Association Standards for Trauma (BOAST) guidelines [11] focus on frailty, including all fragility fractures, regardless of age. BOAST guidelines now quantify frailty in the form of a “Clinical Frailty Scale” as an independent inclusion criterion for those sustaining major trauma. This suggests that frailty is increasingly being recognised in trauma as an independent indicator of complex medical need, regardless of age.

Introducing frailty

The British Geriatric Society describes frailty as a distinctive health state related to the ageing process in which multiple body systems gradually lose their in-built reserves.”[12] Although distinct entities, there may be overlap between the management of frailty, chronic conditions and disability, and it is important to note that frailty may be the cause of disability and vice-versa. [13]. It is predicted that approximately 10% of people aged over 65 have frailty and that in future, this number will continue to rise [12].

Two known models of frailty exist: the phenotype and cumulative deficit model (Table 2). Alongside his description of the cumulative deficit model, Rockwood also suggested the “Clinical Frailty

Table 2
Comparing the “phenotype” and “cumulative deficit” models of frailty.

	Phenotype	Cumulative Deficit
Measures	<ul style="list-style-type: none"> • Unintentional weight loss • Reduced muscle strength • Reduced gait speed • Self-reported exhaustion • Low energy expenditure 	<p>Symptoms:</p> <ul style="list-style-type: none"> • e.g. loss of hearing/vision, low mood, slow walking speed, tiredness/exhaustion, reduced dexterity/strength, falls, incontinence, poor appetite/nutrition <p>Signs:</p> <ul style="list-style-type: none"> • e.g. mobility problems/use of walking aids, tremor, poor posture, cachexia and muscle wasting, confusion <p>Factors</p> <ul style="list-style-type: none"> • e.g. age, multi-morbidity, disability, polypharmacy, smoking, alcohol excess, poor diet, inactivity, psychological factors, social factors, dementia
Outcomes	Pre-frail: 2 characteristics Frail: 3 or more characteristics	Analysis of frailty along a gradient combining an accumulation of characteristics

Adapted from British Geriatric Society [12].

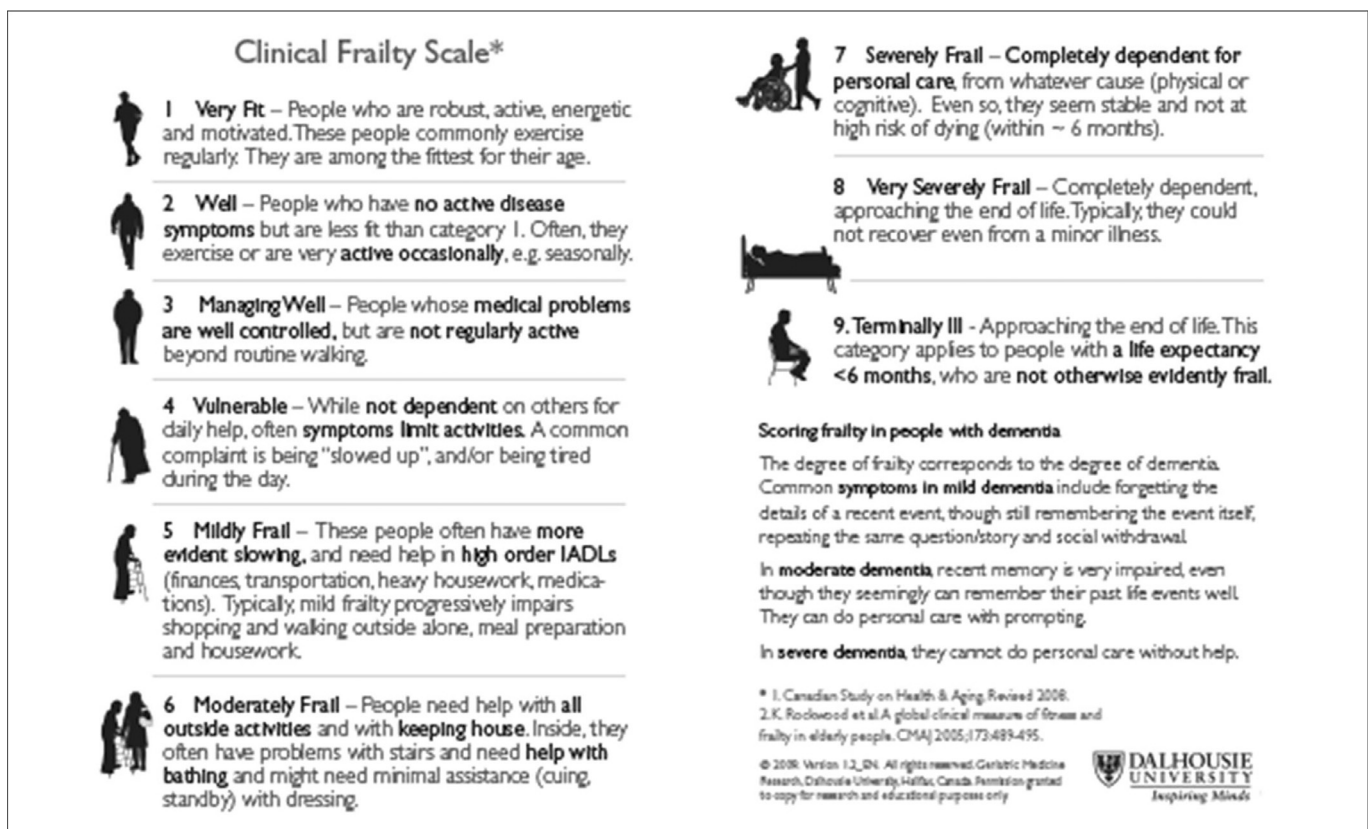


Fig. 1. Rockwood Clinical Frailty Scale [15].

Scale”, a measurement of frailty based on his model (Fig. 1) [14]. Whilst multiple clinical frailty scales exist, some are more user-friendly and therefore more optimal for regular use in clinical practice. The CHSA Frailty Index was based upon a 70-item scale which would be difficult to use when assessing acute admission to hospital. The CFS is simpler but has been shown to have equal predictive validity [15]. The Reported Edmonton Frailty Scale also has a simple approach to assessing frailty but has limited use for patients that are not English-speaking or have visual or hearing disorders [16].

The Rockwood scale is usable, not only within an orthogeriatric setting because of the image aids next to each description of a par-

ticular frailty score, which allows for a more rapid assessment of frailty and improved compliance. It has been shown to be acceptable and practical amongst a group of junior doctors who did not receive training, with a 95% completion rate [17]. A key attribute to its success among this group was felt to be lack of increase to a busy workload. This scale is now being widely used to predict prognosis and allocate appropriate resources in various fields of medicine, most recently and significantly during the COVID-19 outbreak [18].

Frailty is increasingly ubiquitous in the National Health Service. Both the NHS Long-Term Plan and Five Year Forward View have identified the importance of comprehensive geriatric assessments

for frail patients and their role within A&E and acute medical care units [19]. It recommends that all major A&E departments set up an acute frailty service to ensure those with frailty receive appropriate care quickly: “All hospitals with a major A&E department will provide an acute frailty service for at least 70 hours a week. They will work towards achieving clinical frailty assessment within 30 minutes of arrival” [20].

In line with this, frailty is now increasingly considered important in trauma. The 2017 Trauma Audit and Research Network (TARN) report recognised that comorbidity has a negative impact on outcomes for geriatric patients and suggests that other age-related factors could have further involvement. It highlighted the relevance of frailty for major trauma patients and suggested that frailty should be measured as well as recommending that the relationship between age, comorbidity and frailty needs to be explored [21]. Further research has shown that increased frailty decreases quality of life after a hip fracture and early identification of frailty will have a direct impact on prognosis, care planning and treatment [22]. Others have reported that using CFS allows predictions to be made with regards to outcomes such as “increased mortality, length of stay, and postoperative complications” as well as increasing patient-centred care through identifying the most vulnerable patients [23].

With the current BPT guidelines [1] remained focussed on age rather than frailty, is there a cohort of younger but frail patients losing out on optimisation, whilst an older, fit cohort currently receive unnecessary resources.

Is clinical frailty scale (CFS) a better predictor of clinical need than age?

It is difficult to assess whether the reduction of mortality rates for elderly hip fracture patients is due to the impact of the age-specific BPT [1], or to the concurrent introduction of further frailty-specific guidelines and development of the orthogeriatric speciality [24]. Oakley et al. sought to determine whether the introduction of the BPT has improved outcomes with an observational cohort study. They appropriately comment that although there appears to be improved survival at 1 year for patients who fulfilled BPT criteria, the overall mortality and length of stay in both cohorts was unchanged. This may well represent that the frailest patients have a delay to theatre due to a complicating medical issue which also increased their risk of mortality. There has not been a profound “improvement in outcomes at organisational level” due to the introduction of the BPT [25]. The BPT’s age criteria and lack of acknowledgement of frailty could be a factor in why there has not been a significant impact on overall outcomes before and after its introduction. Other younger patients with lower limb injuries who share many of the same vulnerabilities are currently less prioritised.

In contrast to this, the evidence for using Clinical Frailty Scale as a predictor of benefit from comprehensive care bundles remains limited. Despite this exciting new proposal that frailty may overtake age in indicating future resource allocation, there is the need for significantly more research into frailty-based outcomes to provide sufficient proof that fit, elderly patients could be excluded from current BPT guidelines.

Conclusions

Hip fracture care has transformed over the past decade and is increasingly expanding to include care for all frail trauma patients. This is a significantly larger burden on NHS resources. The NHS is currently under extreme pressure to provide high quality care with limited resources. To meet the needs of our frail and older orthopaedic patients, supply (resources) must be increased or de-

mand (patient numbers) must be limited. One way to control the latter is to introduce more streamlined inclusion criteria.

The BPT is currently applicable to patients that are 60 or above which will put a huge strain on current resources when applied to all fragility fractures alongside all hip fractures. Frailty has shown to be a promising indicator of prognosis, irrespective of age. In our current NHS, could frailty scale provide a more appropriate guide than age for providing appropriate patients with the care that will change their outcome? Further work is required to investigate the relationship between Clinical Frailty Scale and outcomes in orthopaedic patients to demonstrate whether frailty should replace age in the best practice guidelines for trauma.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

- [1] '2019/20 National tariff payment system – a consultation notice: annex Dtd. Guidance on best practice tariffs' (improvement.nhs.uk, 2019) <https://improvement.nhs.uk/documents/484/Annex_Dtd_Best_practice_tariffs.pdf>accessed 30 November 2019
- [2] Middleton M. 'Orthogeriatrics and hip fracture care in the UK: factors driving change to more integrated models of care'. *Geriatrics* 2018;3. <https://doi.org/10.3390/geriatrics3030055>.
- [3] Shields E, others. Mortality and financial burden of periprosthetic fractures of the femur'. *Geriatr Orthop Surg Rehabil* 2014;5. <https://doi.org/10.1177/2151458514542281>.
- [4] Adams A, others. Physeal fractures of the distal femur. *J Pediatr Orthop B* 2020;29. <https://doi.org/10.1097/BPB.0000000000000664>.
- [5] 'National hip fracture database (NHFD) annual report september 2018' (Nhfd.co.uk, 2019) <<https://nhfd.co.uk/files/2018ReportFiles/NHFD-2018-Annual-Report-v100.pdf>>accessed 25 November 2019
- [6] Fisher JM, others. 'Why geriatric medicine? A survey Of UK specialist trainees in geriatric medicine'. *Age Age* 2017;46. <https://doi.org/10.1093/ageing/afx009>.
- [7] Cantor MD. We need more geriatricians, not more primary care physicians. *NEJM Catal* 2017.
- [8] 'Workforce and the BGS | British geriatrics society' (Bgs.org.uk, 2019) <<https://www.bgs.org.uk/resources/workforce-and-the-bgs#anchor-nav-how-many-geriatricians-do-we-need-per-head-of-population->>accessed 11 November 2019.
- [9] 'Recommendations | Hip fracture: management | guidance | NICE' (Nice.org.uk, 2017) <<https://www.nice.org.uk/guidance/cg124/chapter/Recommendations>>accessed 25 November 2019
- [10] 'Blue book on fragility fracture care' (Bgs.org.uk, 2007) <<https://www.bgs.org.uk/sites/default/files/content/attachment/2018-05-02/Blue%20Book%20on%20fragility%20fracture%20care.pdf>>accessed 25 November 2019
- [11] 'The care of the older or frail orthopaedic trauma patient' (Boa.ac.uk, 2019) <<https://www.boa.ac.uk/uploads/assets/04b3091a-5398-4a3c-a01396c8194bfe16/the%20care%20of%20the%20older%20or%20frail%20orthopaedic%20trauma%20patient.pdf>>accessed 19 November 2019
- [12] 'Introduction to frailty | British geriatrics society' (Bgs.org.uk, 2020) <<https://www.bgs.org.uk/resources/introduction-to-frailty>>accessed 13 March 2020
- [13] Fried L, others. 'Untangling the concepts of disability, frailty, and comorbidity: implications for improved targeting and care'. *J Gerontol Ser A: Biol Sci Med Sci* 2004;59. <https://doi.org/10.1093/gerona/59.3.m255>.
- [14] Rockwood clinical frailty scale'. (2018) https://www.bgs.org.uk/sites/default/files/content/attachment/2018-07-05/rockwood_cfs.pdf
- [15] Rockwood K. A global clinical measure of fitness and frailty in elderly people. *Canada Med Asso J* 2005;173. <https://doi.org/10.1503/cmaj.050051>.
- [16] The assessment of frailty in older people in acute care. *Australas J Age* 2009;28. <https://doi.org/10.1111/j.1741-6612.2009.00405.x>.
- [17] Gregorevic K, others. The clinical frailty scale predicts functional decline and mortality when used by junior medical staff: a prospective cohort study. *BMC Geriatr* 2016;16. <https://doi.org/10.1186/s12877-016-0292-4>.
- [18] Nice Institute for Health and Care Excellence (2020) COVID-19 rapid guideline: critical care in adults ((NICE guideline NG159). Available at: <https://www.nice.org.uk/guidance/ng159>
- [19] 'Next steps on the five year forward view' (England.nhs.uk, 2019) <<https://www.england.nhs.uk/wp-content/uploads/2017/03/NEXT-STEPS-ON-THE-NHS-FIVE-YEAR-FORWARD-VIEW.pdf>>accessed 25 November 2019
- [20] 'The NHS long term plan' (Longtermplan.nhs.uk, 2019) <<https://www.longtermplan.nhs.uk/wp-content/uploads/2019/08/nhs-long-term-plan-version-1.2.pdf>>accessed 25 November 2019
- [21] 'Major trauma in older people' (Tarn.ac.uk, 2017) <<https://www.tarn.ac.uk/content/downloads/3793/Major%20Trauma%20in%20Older%20People%202017.pdf>>accessed 29 January 2020

- [22] van de Ree C, others. Effect of frailty on quality of life in elderly patients after hip fracture: a longitudinal study. *BMJ Open* 2019;9. <https://doi.org/10.1136/bmjopen-2018-025941>.
- [23] Chan S, others. The predictive value of the clinical frailty scale on discharge destination and complications in older hip fracture patients. *J Orthop Trauma* 2019;33. <https://doi.org/10.1097/BOT.0000000000001518>.
- [24] Metcalfe D, others. Pay for performance and hip fracture outcomes. *Bone Joint J* 2019;101-B. <https://doi.org/10.1302/0301-620X.101B8.BJJ-2019-0173.R1>.
- [25] Oakley B, others. Does achieving the best practice tariff improve outcomes in hip fracture patients? An observational cohort study. *BMJ Open* 2017;7. <https://doi.org/10.1136/bmjopen-2016-014190>.