BRITISH JOURNAL OF HOSPITAL MEDICINE

The BOAST recommendations for care of the older or frail orthopaedic trauma patient

Ben Sacks[1]

Hanaa N Mughal[2]

Aashish Ahluwalia[3]

Branavan Rudran[3]

Kishan R Parmar[3]

Author details can be found at the end of this article

Correspondence to:
Aashish Ahluwalia;
akahluwalia@doctors.org.uk

Abstract

Safe and effective care for the elderly or physiologically frail patient in cases of trauma requires a multidisciplinary perioperative approach. This article expands upon the British Orthopaedic Association Standards for Trauma and Orthopaedics guidelines for the management of the older or frail orthopaedic trauma patient. Optimisation of the patient is key to a successful surgical outcome, because these patients often have significant comorbidities involving bone health, nutrition, cognitive function and cardiovascular stability. This article discusses the evidence base for tailoring the management of these patients and the importance of doing so in an ageing population. It considers the requisite preoperative procedures and investigations, guidelines for specific cases such as comatose patients or those with complex fractures, and ceiling of care discussions, and then focuses on the postoperative period, including physiotherapy, rehabilitation goals and medical management.

Key words: BOAST; Fractures in elderly; Neck of femur fracture; Orthogeriatrics

Submitted: 20 January 2020; accepted after double-blind peer review: 16 June 2020

Introduction

This article focuses on the British Orthopaedic Association Standards for Trauma and Orthopaedics (BOAST) guideline for the care of elderly and frail orthopaedic trauma patients (British Orthopaedic Association, 2019). This advice pertains to fragility fractures and major trauma, where fragility fractures are defined as those that result from mechanical forces that would not ordinarily cause a fracture (National Institute for Health and Care Excellence, 2017). These forces are comparable to falling from a height of standing or less, referred to as low energy trauma (National Institute for Health and Care Excellence, 2017). The recommendations have been developed based on experience with hip fractures, but the BOAST guideline recommends that they be applied to all fragility or major trauma fractures in the elderly and frail population. This article expands on these recommendations to provide an approach to the management of elderly trauma patients, increasing the quality and safety of care for this vulnerable population.

Background

In an ageing society, the care of elderly orthopaedic trauma patients is becoming increasingly relevant. By 2030, the number of people over 65 years of age in the UK is expected to have increased by 50% and by 100% for those over the age of 85 years (Bless, 2017). The number of fragility fractures is expected to double in incidence by 2050 (British Orthopaedic Association, 2007).

Fragility hip fractures are common and have a significant mortality rate in elderly patients: 10% within 3 months and 30% in 1 year (Burge et al, 2001). There is also a significant financial cost; the health and social care of a patient who has a hip fracture costs an average of £13 000 (Burge et al, 2001). Patients who have sustained hip fractures comprise only 19% of the 520 000 fragility fractures sustained each year in the UK (International Osteoporosis Foundation, 2018). In 2013, the NHS spent a total of £4.4 billion across all fragility fractures (National Osteoporosis Society, 2017; National Institute for Health and Care Excellence, 2018). In the year following an injury, patients with fragility fractures that do not involve the hip require a greater number of unofficial care hours (provided by friends and relatives) than patients with hip fractures (International Osteoporosis Foundation, 2018). Given the

How to cite this article: Sacks B, Mughal HN, Ahluwalia A, Rudran B, Parmar KR. The BOAST recommendations for care of the older or frail orthopaedic trauma patient. Br J Hosp Med. 2020. https://doi.org/10.12968/hmed.2020.0028

Table 1. Definitions of key terms	
Fragility fracture	Any fracture that results from mechanical forces that would not ordinarily cause a fracture. These forces are comparable to falling from a height of standing or less (National Institute for Health and Care Excellence, 2017)
Major trauma	An injury or combination of injuries that are life-threatening and could be life-changing because they may result in long-term disability. This corresponds to an Injury Severity Score >15
Head injury severity	A patient with a Glasgow Coma Scale score <8 is classified as having major head trauma. This is referred to by the British Orthopaedic Association as a 'serious head injury'. A Glasgow Coma Scale score of 9–12 is consistent with moderate head injury, and any head injury with a Glasgow Coma Scale score >13 is classified as minor
Comprehensive geriatric assessment	A holistic multidimensional assessment of an older person's health and wellbeing, facilitating the addressing of issues of concern to the older person (British Geriatric Society, 2019)

high levels of morbidity and mortality, along with the increasing incidence, the BOAST guidelines provide an evidence-based framework to manage the injury, rehabilitate and improve survival outcomes in all elderly or frail orthopaedic patients.

There is a substantial evidence base for the orthogeriatric approach to fracture management in the elderly. A multidisciplinary approach implementing a standardised pathway for managing frail patients with traumatic fractures consistently reduces morbidity and mortality (Briggs, 2015; Sabharwal and Wilson, 2015; Henderson et al, 2017). Although such pathways are commonly used for the management of patients with a hip fracture, this service is not routinely available for other orthopaedic injuries. Based on the evidence base available from patients with hip fractures (British Orthopaedic Association, 2012), the BOAST guidelines recommend providing the same approach to patients with other low-impact trauma injuries. As more data become available, it is likely that a similar evidence base will emerge for these other forms of injury. Table 1 outlines standard definitions of the key terms referred to in the article.

British Orthopaedic Association Standards for Trauma and Orthopaedics recommendations

The recommendations taken from the BOAST guidelines are subdivided into three sections:

1. The preoperative period
2. Referrals and individual management
3. The postoperative period.

The preoperative period

Fracture pathways

Frail patients with fractures benefit from a clearly defined pathway, ideally enacted within 72 hours of injury (British Orthopaedic Association, 2019). This article makes recommendations for the components of such a pathway, although there may be individual trust variation in preference and expertise. Despite inter-trust variations, the pathway should ideally define the management of ward-based perioperative patients from admission to 24 hours postoperatively. In addition, it may be helpful to include specific details regarding management on weekends and bank holidays when staffing levels may differ to those on weekdays (British Orthopaedic Association, 2019). Perhaps the most important aspect of the pathway is that it is clearly defined and agreed upon in advance. This ensures a collaborative approach, with all clinicians, including those in orthopaedic, anaesthetic, orthogeriatric and emergency departments, aware of their responsibilities within the pathway. This pathway should also include input from pre-hospital services.

While there is paucity in the literature specific to fragility fractures in the pre-hospital setting, current evidence suggests optimal care includes adequate pain management,

correction of fluid status and appropriate immobilisation of the affected leg before definitive treatment in the hospital setting. Analgesia should ideally be titrated to the patient's needs in accordance with the World Health Organization analgesic pain ladder (Eaton, 2012). GPs referring patients to the emergency department may be able to contact local orthogeriatric teams at the point of referral.

Comprehensive geriatric assessment

The comprehensive geriatric assessment consists of the following domains: cognition and psychological components, continence, balance and mobility, environmental risk factors, vision, hearing and a medication review (Figure 1) (Parker et al, 2018; British Orthopaedic Association, 2019). In the context of trauma, it should include a clear assessment of the mechanism of injury, including a multifactorial falls risk assessment. The comprehensive geriatric assessment should ideally be performed by an orthogeriatric team; however, this may not be feasible for all patients. When an orthogeriatric review is not available, the comprehensive geriatric assessment can act as a framework to help guide the general clinician. Although developed by specialists, the comprehensive geriatric assessment can be used by all members of the clinical team. Locally organised training in the use of the comprehensive geriatric assessment may increase use among non-specialists (Kocman et al, 2019).

Major trauma

In addition to the comprehensive geriatric assessment, it is helpful to consider the nature of the injury. Patients with serious injuries may require transfer to a major trauma centre. These patients should be assessed using the Injury Severity Score – a measure of trauma severity based on the sum of the individual injuries sustained (Tables 2 and 3) (Baker et al, 1974). Any region with an Abbreviated Injury Scale score of 6 automatically results in an Injury Severity Score of 75. Patients with an Injury Severity Score >15 are defined as having major trauma. If not being transferred to a major trauma centre, these patients must

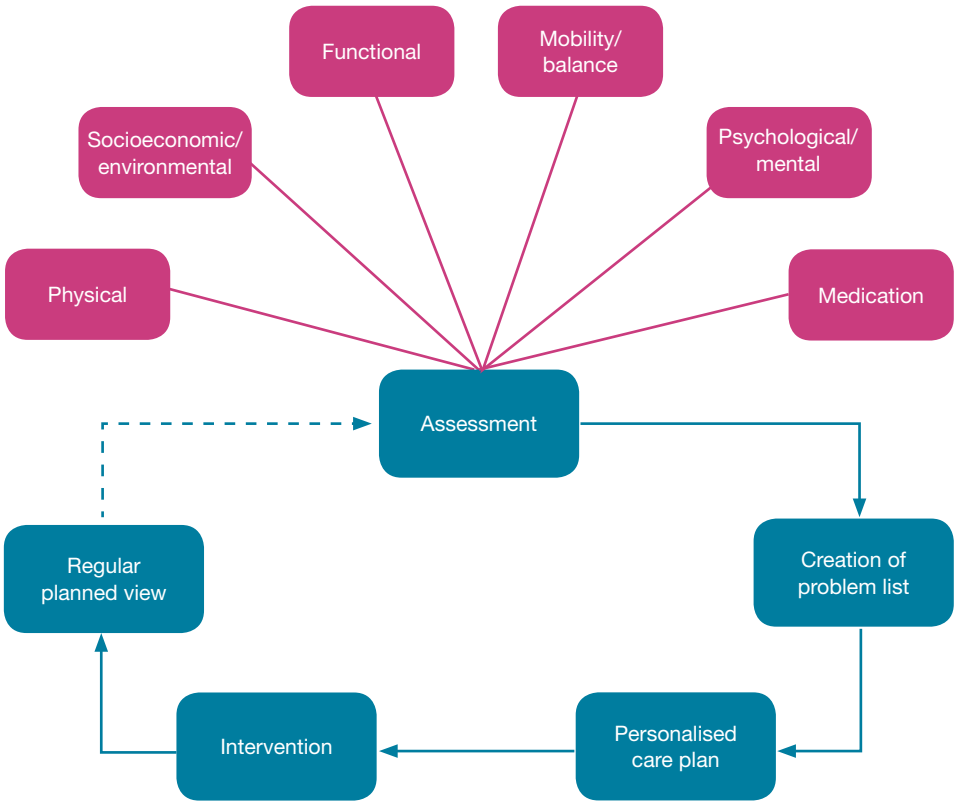

Figure 1. Diagrammatic representation of the comprehensive geriatric assessment (British Geriatric Society, 2019).

Table 2. The Abbreviated Injury Scale (AIS) is used for assessing injury severity by body region	
AIS 1	Minor
AIS 2	Moderate
AIS3	Serious
AIS4	Severe
AIS5	Critical
AIS6	Maximal (currently untreatable)

Table 3. Injury Severity Score is calculated as the sum of the squares of the three highest scoring regions on the Abbreviated Injury Scale, and is scored on a scale of 1–75
Injury Severity Score body regions
Head or neck
Face
Chest
Extremities or pelvic girdle
External

be discussed in a multidisciplinary team meeting and with external clinicians accessed via teleconferencing where appropriate (British Orthopaedic Association, 2019).

Cross-sectional imaging should be performed during the initial presentation in patients in whom it is indicated, such as those with an uncertain diagnosis or major trauma cases. Cases that receive cross-sectional imaging at later dates should be subject to ongoing audit with the aim of reducing the incidence of delayed imaging. The BOAST guidelines state that computed tomography head scans for trauma patients must visualise the cervical spine. If an unstable injury is confirmed or cannot be ruled out on cervical spine imaging, cervical spine protection is essential. The form of protection used must be clearly communicated and recorded (British Orthopaedic Association, 2019).

Preoperative assessments

Elderly patients should be optimised medically for planned surgery, particularly from a cardiorespiratory perspective. Most patients will benefit from adequate hydration and nutrition, blood pressure and heart rate control, and a medication review. Other interventions will vary depending on the needs of the individual patient and are at the discretion of the treating team. The aim of medical optimisation is to identify and treat reversible risk factors to increase the likelihood of successful surgery. If required before surgery, investigations should be performed promptly so that surgery is not delayed.

There is considerable debate among anaesthetists regarding the use of preoperative echocardiograms in the routine assessment of fragility fractures. If a cardiac cause for a fall is suspected, relevant investigations such as Holter monitoring and an echocardiogram should be performed (British Geriatric Society, 2019), but there is no clear consensus regarding the use of echocardiograms in falls believed to have non-cardiac causes. In addition, there is little guidance in BOAST guidelines to suggest that preoperative echocardiograms are mandatory before starting surgery. The decision to use echocardiograms is therefore at the discretion of the treating teams. Any non-mandatory preoperative assessment should be performed in a timely manner so that there is no undue delay in transfer to theatre, ensuring time to surgery is within 36 hours of admission (British Orthopaedic Association, 2019). A retrospective study comparing time to surgery with and without preoperative echocardiograms demonstrated time to surgery was significantly longer in patients undergoing preoperative echocardiogram (Alibhai et al, 2013). The delay in

transfer could result in increased hospital stay, morbidity and mortality in these vulnerable patients. To reach an operational standard on this matter, facilities to conduct preoperative echocardiogram must be sufficiently available to perform promptly and prevent unnecessary, avoidable adverse impacts on patient outcome.

Analgesia and venous thromboembolic prophylaxis

Preoperative pain management requires careful consideration, and clear postoperative analgesic plans should be documented. If pain is uncontrolled, local trust guidelines should be followed and pain management referral pathways used. Prescribed analgesia should be appropriate for the level of pain and take into account renal impairment and hepatic impairment. Whenever possible, non-steroidal anti-inflammatory drugs should be avoided (British Orthopaedic Association, 2019). The likelihood of a low body mass index or reduced body weight in this population is also higher than in the standard population; this should be taken into account by prescribing physicians.

Before any operation, it is important to consider the venous thromboembolic risk of each patient and prescribe prophylaxis accordingly. Should a patient require reversal of anticoagulation, this should be done in line with local trust guidelines (British Orthopaedic Association, 2019).

Ceiling of care discussions

Ceiling of care discussions should happen as early as possible during the admission and certainly before any surgery (British Orthopaedic Association, 2019). The BOAST guidelines recommend that these discussions address appropriate ceilings of care, treatment escalation plans and resuscitation status. Ideally these discussions will involve members from all treating teams, the patient and those close to them. Discussions should take into account patient comorbidities, the extent of reversible pathology and the wishes of the patient. The capacity of the patient should be appropriately assessed and documented when considering operative management.

Owing to the difficulty of determining likely outcomes, particularly in the setting of major trauma, ceiling of care discussions should occur between teams and be consultant led. Where these discussions have not taken place, it is important that all members of the team feel comfortable bringing it to the attention of their seniors. Advance directives, lasting powers of attorney and safeguarding concerns should always be held in mind, owing to the potential vulnerability of the patient population (British Orthopaedic Association, 2019).

There are inconclusive definitions and scarce literature on appropriate ceilings of care in the context of major trauma. Decisions regarding ceilings of care are performed on a case-by-case basis and are guided by a legal duty to incorporate patient views and to use the least restrictive measures in patients that lack capacity. They are determined by department related factors, the treating physicians and when in the care process the decision is made. These heterogenous factors give rise to significant inter-physician and trust dependent variation (Walzl et al, 2019).

Relevant referrals and individual management

It is important that patients are managed in the appropriate level centres. For example, any patient with serious head injury or a Glasgow Coma Scale <8 should be considered for transfer to a neuroscience centre. Some chest wall trauma patients may benefit from early stabilisation surgery. The BOAST guidelines advise the implementation of chest wall trauma pathways that include early access to regional anaesthesia. Chest wall trauma cases benefit from being transferred to an appropriate centre within 48 hours of the decision to operate (British Orthopaedic Association, 2019). Another specialised group of patients are those with complex peri-articular or peri-prosthetic fractures, it is always worth considering whether these cases will benefit from discussion with specialist revision hip surgeons (British Orthopaedic Association, 2019).

The postoperative period

Once the acute management has been addressed and the patient stabilised, it is important to consider investigations and subsequent interventions that will help healing of the acute injury and aid in secondary prevention.

Occupational therapy and physiotherapy

All frail patients suffering fragility fractures should complete a full falls assessment, beginning preoperatively (British Orthopaedic Association, 2019). This should include a detailed mobility review by a physiotherapist in the postoperative phase and the recommendation of a walking aid, if required, to improve balance and reduce the risk of further falls. Physiotherapy is key to recovery. The BOAST guidelines recommend that patients should be seen by a physiotherapist on day 1 postoperation with early identification of their functional rehabilitation goals. It is worth noting that all surgery in frail patients should be performed with the aim of allowing full weight bearing for activities of daily living and should be performed within 36 hours of admission (British Orthopaedic Association, 2019). Home hazards assessment by an occupational therapy team will also help to reduce environmental risk factors. A review of nutrition using a tool such as the Malnutrition Universal Screening Tool score is recommended (British Association for Parenteral and Enteral Nutrition, 2011) and a nutritional review by a dietitian or nutrition team sought if indicated (British Orthopaedic Association, 2019).

Secondary prevention

For secondary prevention of osteoporotic fragility fractures, it is important to perform a bone health assessment (British Orthopaedic Association, 2019). Tools such as Fracture Risk Assessment Tool or QFracture may be useful to assess ongoing fracture risk and to guide whether a dual energy X-ray absorptiometry scan for bone density is required to investigate for osteoporosis or the need for bone protection therapy. According to a 2017 Fracture Liaison Service database clinical audit, 91% of fracture liaison services in the UK were able to recommend or prescribe bone protection (Royal College of Physicians, 2017). Unfortunately, according to the most recent data, only 50% of patients who had sustained a fragility fracture were recommended this treatment and only 25% received it (Fracture Liaison Service Database, 2020). Secondary prevention should be considered early as a part of the acute admission and not simply deferred to primary care practitioners.

Management on the ward

The BOAST guidelines require local services to have the means to screen for delirium in the postoperative period using evidence-based assessment tools such as the 4AT (www.the4at.com; Bellelli et al, 2014). Each trust should have a delirium policy that describes preventative measures, early identification of potentially reversible causes and individualised interventional measures (British Orthopaedic Association, 2019).

It is important that patients remain as active as is safely possible in the postoperative period. Patients should not be nursed lying flat unless absolutely necessary, and early sitting up and walking around is encouraged (British Orthopaedic Association, 2019). Once the initial surgery and rehabilitation process is underway, all patients should progress along a discharge planning pathway. Communication between inpatient and outpatient physiotherapy teams, as well as clear communication with patients regarding advice and expectations for life after discharge, will aid in the efficiency and safety of discharge pathways (British Orthopaedic Association, 2019). Finally, the BOAST guidelines request that each hospital submits data to national databases such as the National Hip Fracture Database, the Fracture Liaison Service database and the Trauma Audit and Research Network to monitor clinical performance against national standards of care (British Orthopaedic Association, 2019).

Conclusions

In an ageing population, the morbidity, mortality and financial cost of traumatic fractures in frail patients carries an increasingly significant healthcare burden. Adopting a standardised approach to the management of these patients is vital in improving outcomes and reducing the incidence of orthopaedic emergencies. This approach, as recommended by the BOAST guidelines, involves early consideration of individual factors in the preoperative period, appropriate referrals to specialist centres for specific fracture presentations, and a multidisciplinary and forward thinking care plan for the postoperative patient. It is hoped that this article will help non-specialist clinicians, as well as those already familiar with

Key points

- In an ageing population, orthopaedic management of the frail patient is more important than ever.
- Frail patients with orthopaedic injury require a clear management pathway that should be enacted within 72 hours of injury.
- Each patient should receive a comprehensive geriatric assessment, medication review, falls assessment, bone health and cognition review.
- Patients with specific injuries such as chest wall trauma or head injury may require transfer to specialist centres.

Curriculum checklist

This article addresses the following requirements from the general internal medicine training curriculum:

- Communicates effectively and is able to share decision making, while maintaining appropriate situational awareness, professional behaviour and professional judgement
- Is focused on patient safety and delivers effective quality improvement in patient care
- Managing an acute specialty-related take

And the following requirements from the orthopaedic surgery curriculum:

Pre-operative assessment and management:

- History and examination of a patient from a medical and surgical standpoint
- Interpretation of preoperative investigations
- Management of comorbidity

orthogeriatrics, feel more confident in their management of the elderly or frail patient with a traumatic orthopaedic injury.

Author details

[1]Department of Colorectal Surgery, University College London Hospital, London, UK

[2]Imperial School of Medicine, London, UK

[3]Department of Trauma and Orthopaedics, Hillingdon Hospital, London, UK

Conflicts of interest

The authors declare no conflicts of interest.

References

Alibhai M, Sharma A, Alibhai MK, Fawdington RA, Moreau AP. Does pre-operative echocardiography delay hip fracture surgery? Indian J Anaesth. 2013;57(4):408–410. https://doi.org/10.4103/0019-5049.118538

Baker SP, O'Neill B, Haddon W, Long WB. The injury severity score: a method for describing patients with multiple injuries and evaluating emergency care. J Trauma. 1974;14(3):187–196. https://doi.org/10.1097/00005373-197403000-00001

Bellelli G, Morandi A, Davis DHJ et al. Validation of the 4AT, a new instrument for rapid delirium screening: a study in 234 hospitalised older people. Age Ageing. 2014;43(4):496–502. https://doi.org/10.1093/ageing/afu021

Bless N. Trauma in older people. In: Nickel C, Bellou A, Conroy S (eds) Geriatric emergency medicine. Cham: Springer; 2017:163–175

Briggs T. A national review of adult elective orthopaedic services in England: getting it right first time. London: British Orthopaedic Association. 2015

British Association of Parenteral and Enteral Nutrition. Malnutrition universal screening tool. 2011. https://www.bapen.org.uk/pdfs/must/must_full.pdf (accessed 18 June 2020)

British Geriatric Society. Comprehensive geriatric assessment toolkit for primary care practitioners. 2019. https://www.bgs.org.uk/sites/default/files/content/resources/files/2019-03-12/CGA Toolkit for Primary Care Practitioners_0.pdf (accessed 18 June 2020)

British Orthopaedic Association. The care of patients with fragility fracture. 2007. https://www.bgs.org.uk/sites/default/files/content/attachment/2018-05-02/Blue%20Book%20on%20fragility%20fracture%20care.pdf (accessed 18 June 2020)

British Orthopaedic Association. Patients sustaining a fragility fracture. 2012. https://www.boa.ac.uk/wp-content/uploads/2014/12/BOAST-1.pdf (accessed 18 June 2020)

British Orthopaedic Association. The care of the older or frail orthopaedic trauma patient. 2019. https://www.boa.ac.uk/uploads/assets/a30f1f4c-210e-4ee2-98fd14a8a04093fe/boast-frail-and-older-care-final.pdf (accessed 16 July 2020)

Burge RT, Worley D, Johansen A, Bhattacharyya S, Bose U. The cost of osteoporotic fractures in the UK: projections for 2000–2020. J Med Econ. 2001;4(1-4):51–62. https://doi.org/10.3111/200104051062

Eaton G. Management of an isolated neck-of-femur fracture in an elderly patient. J Paramed Pract. 2012;4(7):400–408. https://doi.org/10.12968/jpar.2012.4.7.400

Fracture Liaison Service Database. Fracture liaison service database annual report. Beyond measurement: a focus on quality improvement. 2020. London: Royal College of Physicians.

Henderson CY, Shanahan E, Butler A et al. Dedicated orthogeriatric service reduces hip fracture mortality. Ir J Med Sci. 2017;186(1):179–184. https://doi.org/10.1007/s11845-016-1453-3

International Osteoporosis Foundation. Broken bones, broken lives. 2018. https://www.iofbonehealth.org/broken-bones-broken-lives (accessed 18 June 2020)

Kocman D, Regen E, Phelps K et al. Can comprehensive geriatric assessment be delivered without the need for geriatricians? A formative evaluation in two perioperative surgical settings. Age Ageing. 2019;48(5):644–649. https://doi.org/10.1093/ageing/afz025

National Osteoporosis Society. NHS RightCare scenario: The variation between sub-optimal and optimal pathways. 2017. https://www.england.nhs.uk/rightcare/wp-content/uploads/sites/40/2017/02/rightcare-susans-story-full-narrative.pdf (accessed 18 June 2020)

National Institute for Health and Care Excellence. Osteoporosis: assessing the risk of fragility fracture. 2017. https://www.nice.org.uk/guidance/cg146 (accessed 18 June 2020)

National Institute for Health and Care Excellence. Falls and fragility fractures. 2018. https://www.nice.org.uk/Media/Default/About/what-we-do/Into-practice/measuring-uptake/NICE-Impact-falls-and-fragility-fractures.pdf (accessed 18 June 2020)

Parker SG, McCue P, Phelps K et al. What is comprehensive geriatric assessment (CGA)? An umbrella review. Age Ageing 2018. 2018;47(1):149–155. https://doi.org/10.1093/ageing/afx166

Royal College of Physicians. Fracture Liaison Service Database (FLS-DB) annual report. Leading FLS improvement: secondary fracture prevention in the NHS. London: Royal College of Physicians, 2017.

Sabharwal S, Wilson H. Orthogeriatrics in the management of frail older patients with a fragility fracture. Osteoporos Int. 2015;26(10):2387–2399. https://doi.org/10.1007/s00198-015-3166-2

Walzl N, Jameson J, Kinsella J, Lowe DJ. Ceilings of treatment: a qualitative study in the emergency department. BMC Emerg Med. 2019;19(1):1–8. https://doi.org/10.1186/s12873-019-0225-6