NICE National Institute for Health and Care Excellence

Late-stage assessment

GID-HTE10050 Bed frames for adults in acute settings

Final scope

1 Introduction

The topic has been identified for late-stage assessment (LSA) by NICE, in collaboration with the Department of Health and Social Care. LSA aims to assess technologies that are in widespread or established use in the NHS. Over time, technologies in use often undergo continuous or incremental innovation and adaptation. LSA will assess if the value added by incremental innovation justifies any price variation. It will ensure that patient and system benefits are maximised and support procurement services and commissioners to make well-informed decisions and ensure that effective technologies are available for use while maintaining choice in the system.

The technologies identified for this assessment are bed frames for use in acute settings that are available in the NHS Supply Chain framework for Pressure Area Care and Patient Handling. The evaluation will assess the clinical and economic benefits and user preferences of acute bed frames as well as evaluating how product features impact outcomes and user preference.

1.1 Background

Acute hospitals provide care for patients with severe or urgent health issues. Risk assessments should be carried out to determine a person's requirements and ensure they are placed in a bed that is safe for them and meets their care needs. Acute hospitals are made up of different types of wards, each of which are designed to meet specific patient needs and conditions. These wards include:

- Acute medical units (AMUs) provide rapid assessment, investigation and treatment for medical emergencies. Patients typically spend no more than 48 hours in an AMU.
- General medical wards provide ongoing care for patients with a wide range of medical conditions. Patients may spend several days to weeks on a general medical ward.
- Surgical wards provide pre- and post-operative care for surgical patients. The length of stay for these patients can vary depending on the type of surgery they have received and the recovery process.

Bed frame design and local procurement considers the needs and preferences of people involved at all stages of the product's lifecycle. There are different groups of bed frame users and decision-makers, including:

- Patients
- Family members and other visitors
- Nurses, nursing associates and healthcare assistants deliver care to patients in their beds, assisting patients to be repositioned and helping them to get in and out of bed safely
- Manual handling leads will provide advice on manual handling practices to minimise risks and ensure compliance with health and safety regulations
- Infection control teams will work to deliver training on best practices for infection prevention and control. They will conduct audits to ensure protocols are being followed. Domestic teams will work to decontaminate bed frames.
- Falls prevention teams develop and implement strategies to prevent falls, including risk assessments and safety protocols. They provide training to staff on prevention and management.
- Tissue viability nurses consider pressure ulcer prevention, with leads working to select the appropriate equipment for use that will meet needs of the patient and ensure optimal support and comfort
- Physiotherapists and physiotherapy support workers promote patient mobility and recovery. They may teach patients how to move safely in bed and implement exercise programs that can be done in their bed. They

advise on optimum patient positioning and help ensure patients can transfer in and out of bed safely to maximise independence and recovery.

- Occupational therapists evaluate a patient's physical abilities in order to determine which bed frame would be safest and most accessible for the patient. They may suggest additional adaptive equipment for getting in and out of bed.
- Portering staff will move patients around the hospital in their beds.
- Different types of engineers: clinical engineering teams will work on the servicing, maintenance and repair of medical equipment, including bed frames.
- Procurement teams will make a final decision on which beds to purchase.

There may be other additional groups of bed frame users who make up the multidisciplinary teams delivering care to patients. Each of these users will have different preferences for bed frame features. Bed frame procurement decisions are made collaboratively with these users within a trust.

1.2 Bed frame considerations

This assessment will consider acute bed frames used in Acute Medical Units, general and surgical wards. Many acute settings will use electric profiling beds as standard. These beds have features that make them suitable for patients who have a wide range of medical conditions and care needs. The key considerations when deciding on beds to procure are:

Patient safety

Falls are the most frequently reported incident affecting hospital inpatients, with 247,000 falls occurring in inpatient settings each year in England alone (NHS Improvement, 2022). Falls in hospital increase patients' time in hospital regardless of the degree of harm, with both falls that cause injury and falls that do not being associated with prolonged length of stay (Dunne et al., 2014). People who are frail may be at higher risk of falling. NICE's clinical guideline on assessing risk and prevention of falls in older people recommends ensuring that aspects of the inpatient environment (including flooring, lighting,

furniture and fittings such as hand holds) that could affect patients' risk of falling are systematically identified and addressed.

The MHRA has a National Patient Safety Alert for medical beds on the risk of death from entrapment or falls (MHRA, 2023). According to investigations, deaths were found to involve factors including inadequate risk assessment, maintenance issues and children and adults of small stature using beds which are designed for adults with typical body dimensions. It is a requirement for the NHS to adhere to the standards in this safety alert.

People with a mental health condition may have an increased risk of self-harm. NICE's clinical guideline on assessing, managing and preventing recurrence of self-harm recommends considering removal of items that may be used to self-harm. This could include sharp objects, potential ligatures and possible ligature points.

Health-related considerations

In clinical practice it is common for hospitals to elevate the head of the bed to at least 30° to help with breathing. This angle is associated with a decreased incidence of aspiration and ventilator-associated pneumonia (VAP). NICE's clinical guideline on acutely ill adults in hospital states that respiratory rate should be measured as part of a monitoring system for acutely ill adults in hospital.

When the head of the bed is elevated the body of the patient can slide down the bed. This generates frictional forces between the body and the surfaces it is in contact with. This can cause shearing deformations in the soft tissues of the buttocks and heels and lead to pressure ulcers. Pressure ulcers are the single most costly chronic wounds in the NHS, with a study from 2017 indicating that treating pressure ulcers costs the NHS more than £1.4 million every day (Guest et al., 2017). In addition to causing pain and discomfort to the patient, tissue damage results in increased nursing time, hospitalisation, equipment provision, consumables and pharmaceuticals. The NICE clinical guideline on the prevention and management of pressure ulcers recommends that adults who have been assessed as being at high risk of developing a

pressure ulcer change their position frequently and at least every 4 hours. If they are unable to reposition themselves, help should be offered to do so, using appropriate equipment if needed.

Safety of caregivers

Repositioning patients in bed and movement of patients in beds around the hospital are common patient handling activities. Guidance from the Health and Safety Executive on Manual Handling Operations Regulations 1992, published in 2016, states that most injuries resulting from pushing and pulling activities affect the back, neck and shoulders and that injuries from trapping hands and other body parts are also common. The guidance notes that it is important to ensure that the equipment being used is:

- fitted with brakes (if needed) that are easy to apply and release
- fitted with the correct type of wheels, so that they run easily over the surfaces involved
- provided with a handle at a suitable height.

Infection prevention

Bed frames and bed rails are high-touch surfaces and are therefore prone to bacterial growth which could lead to infection. The NHS has a document on National Standards of Healthcare Cleanliness 2021 which states that frequent touch points should be cleaned more frequently than other surfaces.

Ease of use

In fast-paced hospital environments, caregiver tasks must be completed quickly and efficiently to ensure patient safety. Bed frame features that are easy to use can help to save caregiver time, allowing them to deliver care to a greater number of patients. Standardising the type of bed frames used in a trust may be beneficial from a training perspective as staff do not need to be trained on using several types of bed frames.

People with a learning disability and those with cognitive impairment may benefit from handsets that are easy to use.

Adaptability

Beds which enable adaptation to suit the needs of patients of different height, weight and care requirements will reduce the need for trusts to have a range of different beds available. In emergency situations patients may need to be quickly and safely removed from the bed or appropriately repositioned. Collapsible frame structure may make the bed frame suit the dimensions of narrow corridors or lifts in the hospital.

Compatibility

Compatibility of the bed frame with different mattresses, side rails and accessories such as hoists is important to ensure it is able to meet the needs of different patients and ensure the safety of patients and caregivers.

Facilitation of recovery, independence and rehabilitation

Steps to early mobility can support patient independence and rehabilitation and prevent hospital-acquired conditions.

Comfort

As people may spend several days or weeks in hospital beds, their comfort will be important.

Maintenance and repair

Bed frames are used for many patients throughout the duration of their lifespan. Lifespan may be defined as the period during which the product will maintain its expected performance and safety, provided it has been maintained and operated in conditions of normal use. The lifespan of acute bed frames is around 10 years. They may be used in excess of their intended lifespan as long as they are compliant with manufacturer and regulatory requirements. Electric profiling beds should be serviced annually to check compliance and to minimise the risk of malfunction.

Trusts will have their own policies on how bed frame maintenance and repair should take place. Repairs may be carried out by the manufacturer on-site. Alternatively, maintenance may take place in-house, managed by clinical engineers. In-house maintenance may reduce costs for trusts. However, some

trusts will have small in-house clinical engineering departments who are unable to keep up with the large volume of maintenance and repairs needed. Repairs may be needed on a frequent basis for parts such as control panels and mains leads, which are subject to wear and tear daily. Replacement parts may be needed when a repair cannot be done.

Connectivity

Trusts may consider advances in IT that allow connectivity between beds and other systems or applications.

Sustainability

When purchasing bed frames choices may be made to align with the NHS' commitment to a net zero health service (NHS England, 2022).

1.3 Current NHS market for acute bed frames

Since 2021 the number of general and acute hospital beds in England has increased slightly, but this has been outweighed by a post-COVID-19 shock to hospital length of stay, resulting in still higher bed occupancy rates. It has been estimated that in order to deliver 2018/19 (pre-COVID) rates of care, 21,000-37,000 additional general and acute beds would be needed over the next decade, with a projected cost of £18bn to over £30bn (REAL Centre, 2024).

In the period April to June 2024, there was reported to be a total of 105,634 general and acute beds available, with an occupancy of 91.2% (NHS England, 2024). Data from NHS Supply Chain shows that in the 12-month period 2024-2025, the estimated sum of sales value for acute beds and accessories through NHS Supply Chain is £3,115,177.

Acute hospitals may purchase or rent bed frames through several routes. One route is national frameworks, such as NHS Supply Chain, NHS Shared Business Service and Health Trust Europe. Another option is direct provision from manufacturers, with purchase and rental agreement options available.

2 Technologies

2.1 Technology features

Basic technology requirements

All acute adult bed frames will have features that are designed to ensure basic functionality. Acute adult bed frames should demonstrate that they are compliant with safety standards and legislation:

- BS EN 60601-2-52:2010+A1:2015 applies to basic safety and essential performance of medical beds
- BS ISO 22882:2016 applies to castors for hospital beds.
- All acute adult bed frames must be CE/UKCA marked, with evidence to demonstrate compliance.

The basic requirements for beds available in the NHS are:

- Patient safety: Any gaps in the bed frame or between the mattress and the bed frame are an acceptable width. The bed must also have height adjustment.
- Health-related considerations: The bed must be able to be profiled.
- Infection prevention: cleaning and disinfection instructions provided
- Ease of use: full technical specification provided.
- Adaptability: provision of, and compatibility with, accessories such as side rail bumpers and hoists
- Maintenance and repair: protection against splashing water from any direction

Additional features, adaptions and potential innovations

Some acute bed frames have innovative features which are designed to give clinical, patient and carer benefits associated with the bed frame considerations discussed in section 1.2. The potential innovations in this section**Error! Reference source not found.** are not exhaustive, and other distinguishing or innovative features may be available. Some features may help to address more than 1 consideration.

Patient safety

- Under-frame lighting
- Bed exit alert systems
- Anti-entrapment systems
- Innovative side rails
- Bluetooth connectivity to reduce the number of leads/cables required
- Expanded range of heights

Health-related considerations

- Features designed to reduce patient migration in bed when head of bed is raised
- Features designed to ensure the head of the bed is raised to the appropriate angle, for example, head of bed pauses and angle indication

Safety of caregivers

- Castor design
- Electric power-assisted steering
- Expanded range of heights
- Features that can help with the manual task of turning patients
- Features designed to reduce migration in bed
- In-built bed weighing scales

Adaptability

- Collapsible frame for easy transport and storage
- Variable bed width and length
- Removable headboards/footboards
- Battery power backup
- Compatible with static, hybrid and dynamic mattresses

Infection prevention

- Frame structures that have unrestricted access to all parts for cleaning

Ease of use

- Bed controls that are in an accessible location and have an intuitive design
- Ease of use of accessories, such as hoists
- One-push buttons for cardiopulmonary resuscitation (CPR) positioning and 30° backrest angle positioning
- A handle for adjusting the height of the bed
- QR code that links to videos on bed functionality

Facilitation of recovery, independence and rehabilitation

- Programmable custom height settings for when the patient is getting in or out of bed (including suitable height settings to allow a person to place their feet on the floor from a seated position)
- Elements that are easy for patients to reach and use, such as handsets or controls
- Side rail grips

Comfort

- Castor configuration with low vibrations when the bed is moved

Sustainability

- Local sourcing of materials and bed frame production
- Recycling options and recyclable materials

Maintenance and repair

- Durable frame construction and integrated or semi-integrated components to reduce hospital-acquired damage
- Access to all parts of the bed to facilitate easy repair

Connectivity

- Features that enable connection between patients and caregivers when assistance is required
- Features that enable patient data to be sent to electronic medical records, subject to national cyber security measures
- Features to track and locate beds

2.2 Relevant technologies

Technologies available in the NHS and relevant to this assessment.

Company	Product name
Apex	OOK SNOW ward bed, OOK SNOW falls bed, OOK SNOW mental health bed
Arjo	Enterprise E5000, Enterprise E8000, Enterprise E9000 , Enterprise 5000 X, Enterprise 8000 X, Enterprise 9000 X, Citadel
Baxter	Centuris Pro X2, Hillrom 900 X2 (B2), Hillrom 900 X3 (C2), Hillrom 900, Accella Hillrom 900, Accella Therapy
Benmor medical	Deprimo
Direct Healthcare	Delta 4, Lago Hospital
Drive DeVilbiss	Innov8
Innova Care	Interlude V3
Linet	Eleganza 1, Eleganza 2, Essenza 300, Essenza 300LT, Image 3
Medstrom	Solo, Solo+, SoloMH, Luxe
OSKA	OSKA Florence
Stryker	SV2 Electric Hospital Bed, ProCuity™ Bed Series
Talley Group	IMO Matrix E30, IMO Matrix U24

This list is not exhaustive and other technologies may be available to the NHS currently or in the future. The following types of bed frame may be used in acute settings in some trusts, but will be excluded from this assessment:

- Ultra-low beds
- Bariatric beds
- Junior beds for adult patients with atypical anatomy
- Highly specialised intensive care beds
- Beds with integrated mattresses.

3 Decision problem

Population	Users of acute adult bed frames, which includes adults admitted to acute care settings and caregivers providing care for these patients

Subgroups	If the evidence allows, the following subgroups will be considered: • People with a mental health condition • People who are frail • People with a learning disability or cognitive impairment
Intervention	Acute adult bed frames available to purchase in the NHS that meet the basic technology requirements and safety standards, and have additional innovative features
Comparator	Acute adult bed frames that meet all basic technology requirements and safety standards
Outcomes	Technical outcomes may include: • Migration in bed • Pressure area index/pressure relief measurement/reduction in shearing forces • Torso compression • Falls and entrapment • Push and pull force requirements • Caregiver work reduction Clinical outcomes may include: • Hospital acquired pressure injury/pressure ulcer development • Infection • Respiratory function • Caregiver musculoskeletal injury User reported outcomes may include: • Patient satisfaction • Caregiver reported ease of use Costs and resource use may include: • Cost of purchasing or renting acute bed frames (and lifespan) • Cost of staff training • Cost of caregiver time • Cost of treating falls and entrapment injuries • Maintenance and repair costs (third-party or in-house maintenance and repair, cost of consumables and replacement parts, warranty period) • Maintenance turn-around time/ length of period that bed frames are out of service • Litigation costs
Economic analysis	A health economic model will be developed where possible. Costs will be considered from an NHS and Personal Social Services perspective.

	Sensitivity and scenario analysis should be undertaken to address the relative effect of parameter or structural uncertainty on results. The time horizon should be long enough to reflect all important differences in costs or outcomes between the technologies being compared.

4 Potential equality issues or considerations

NICE is committed to promoting equality of opportunity, eliminating unlawful discrimination and fostering good relations between people with particular protected characteristics and others. People with some physical disabilities may require additional support other than that provided by the bed frames in assessment.

Older people or people with underlying skin conditions are more likely to have fragile skin that is prone to tearing. These people may be at higher risk of infection or pressure ulcers in a hospital bed setting.

People that are shorter or taller than average may struggle to get into or out of beds that have limited height variability. Caregivers may be at higher risk of sustaining injury when moving and handling patients if they are shorter or taller than average.

Some people may need additional support or may have difficulty using certain bed features because of a visual or cognitive impairment, reduced manual dexterity or a learning disability.

Neurodivergent people may find certain bed features unsuitable or may need additional support. For people admitted to acute hospitals who are at high risk of self-harm, beds that have a reduced ligature risk may need to be used (BSI, 2024).

5 Stakeholders

5.1 Healthcare professional organisations

The following healthcare professional organisations have been identified as potential stakeholders for this evaluation:

- All Wales Tissue Viability Nurses Forum
- British Association of Dermatologists
- British Association of Plastic Reconstructive and Aesthetic Surgeons
- British Burn Association
- British Geriatrics Society
- British Infection Association
- Chartered Society of Physiotherapy
- Circulation Foundation
- Clinical Pharmacy Association, Pharmacy Infection network
- European Pressure Ulcer Advisory Panel
- European Wound Management Association
- Infection Prevention Society
- Legs Matter
- Royal College of Emergency Medicine
- Royal College of General Practitioners (RCGP)
- Royal College of Nursing (RCN)
- Royal College of Occupational Therapy
- Royal College of Paediatrics and Child Health
- Royal College of Pathologists
- Royal College of Physicians (RCP)
- Royal College of Podiatry
- Royal College of Surgeons of England
- Royal Pharmaceutical Society
- Society of Tissue Viability
- Society of Vascular Nurses
- The Welsh Wound Innovation Centre

- Vascular Society of Great Britain and Ireland
- Welsh Wound Network
- Wounds research network
- Wounds UK

5.2 Patient and carer organisations

NICE's Public Involvement Programme have identified the following patient and carer organisations for advice:

- Action Cancer - NI
- Action on Pain
- Age UK
- Arthritis and Musculoskeletal Alliance (ARMA)
- Association for Improvements in the Maternity Services (AIMS)
- Asthma and Lung UK
- Beth Johnson Foundation
- Brain and Spinal Injury Centre (BASIC)
- Brain and Spine Foundation (UK)
- Brain Charity
- Brain Injury Rehabilitation Trust
- British Red Cross
- Cancer Black Care
- Cancer Support UK
- Cancer52
- Care and Support Alliance
- Carers Trust
- Carers UK
- Compassion in Care
- Critical Care Patient Liaison Committee (CritPaL)
- Headway - The Brain Injury Association
- ICU Steps
- Independent Cancer Patients' Voice
- Macmillan Cancer Support

- Maggie's Centres
- Mind
- NARA the Breathing Charity
- National Care Forum
- National Federation of Occupational Pensioners
- National Pensioners Convention
- National Voices
- Neurological Alliance
- Older People's Advocacy Alliance
- Pain Concern
- Pain UK
- PINNT (Patients on Intravenous and Nasogastric Nutrition Therapy)
- Rethink Mental Illness
- South Asian Health Foundation (SAHF)
- Sue Ryder
- The Patients Association (PA)
- Trauma Care
- WellBeing of Women

5.3 Non-clinical professional organisations

The following non-clinical professional organisations have been identified as potential stakeholders for this evaluation:

- Association of British Healthcare Industries (ABHI)
- British Healthcare Trades Association (BHTA)
- Chartered Institute for Ergonomics and Human Factors
- Healthtrust Europe
- NHS Shared business services
- NHS Supply Chain

6 Authors

Sophie Harrison and Simon Webster

Topic leads

NICE National Institute for Health and Care Excellence

Frances Nixon

Topic adviser

Toni Gasse

Project manager

September 2024

Appendix A Related guidance

Related guidelines

Falls in older people: assessing risk and prevention (CG161). National Institute for Health and Care Excellence (NICE). Published 12 June 2013.

Pressure ulcers: prevention and management (CG179). National Institute for Health and Care Excellence (NICE). Published 23 April 2014.

Acutely ill adults in hospital: recognising and responding to deterioration (CG50). National Institute for Health and Care Excellence (NICE). Published 25 July 2007.

Health and Safety Executive. Manual Handling Operations Regulations 1992.

Medicines & Healthcare products Regulatory Agency (MHRA). Guidance. Bed rails: management and safe use. Published 30 August 2023.

National Patient Safety Alert: Medical beds, trolleys, bed rails, bed grab handles and lateral turning devices: risk of death from entrapment or falls (MHRA). Published 30 August 2023.

National Standards of Healthcare Cleanliness. NHS. Published April 2021.

Prevention and Treatment of Pressure Ulcers/Injuries: Clinical Practice Guideline. European Pressure Ulcer Advisory Panel, National Pressure Injury Advisory Panel and Pan Pacific Pressure Injury Alliance, in conjunction with Associate Organizations. Published 2019.

Related quality standards

Rehabilitation after critical illness in adults (QS158). NICE quality standard. Published 7 September 2017.