Technoleg Iechyd Cymru
Health Technology Wales

Topic Exploration Report [1]

Topic explorations are designed to provide a high-level briefing on new topics submitted for consideration by Health Technology Wales. The main objectives of this report are to:

- Determine the quantity of evidence available for a technology of interest.
- Identify any gaps in the evidence.
- Inform decisions on topics that warrant fuller assessment by Health Technology Wales (HTW).

Topic exploration report number	TER532
Topic	Hip protectors for users at risk of falls
Summary of findings	Hip fractures are the most common serious injury affecting adults over the age of 60 years. It has been proposed that the use of hip protectors may reduce the risk of hip fractures in adults. We identified two relevant Health Technology Assessments (HTA), four systematic reviews, three primary studies and one Standard concerned with testing of hip protectors. Use of hip protectors was also considered in clinical guidelines on osteoporosis and fall management. Evidence for effectiveness is drawn from one meta-analysis, referenced by HTAs and guidelines, and a later retrospective cohort study. The meta-analysis reported that providing hip protectors to adults over the age of 65 living in the community does not reduce hip fractures. The was evidence that provision of hip protectors for adults living in long-term residential care may reduce hip fractures. However, studies reported adherence was poor in both settings. A systematic review of economic evaluations reported that provision of hip protectors to long-term care residents at risk of falling was cost-effective. One systematic review found multiple barriers and facilitators in the use of hip protectors and one pilot randomised controlled trial advised that objective measures of adherence should be used. We did not find comparative evidence in practice for different types or brands of hip protectors. A systematic review on testing standards used to evaluate hip protectors found variation in the standards used. A study evaluating biomechanical properties of eighteen hip protectors against a draft Canadian Standard found that different hip protectors had different capabilities to absorb impact. It is uncertain as to whether poor adherence to hip protectors, especially in community dwelling adults, explains lack of effectiveness and it is unknown as to how different brands of hip protectors perform in comparison with each other.

[1] Cyfieithu dogfennau HTW wedi'u cyhoeddi o'r Saesneg i'r Gymraeg
Translation of published technical HTW documents from English into Welsh

Introduction and aims

Hip fractures are the most common and serious injury affecting people over the age of 60 years. More than 70,000 people sustain a hip fracture each year in the UK, around 3,500 in Wales. Between 2016 and 2019 in Wales, 27% of people who had experienced a hip fracture had died at one year and the costs associated with care were £17,857 per patient. More than 90% of hip fractures are due to falls.

It has been proposed that hip protectors may reduce the number of hip fractures in adults who are prone to falling. Hip protectors are soft pads or airbags which absorb the impact of a fall, or hard shells which deflect impact onto the thigh. They are typically worn within specifically designed underwear. There are multiple brands of hip protectors made by different manufacturers.

Health Technology Wales researchers searched for evidence on the clinical and cost-effectiveness for hip protectors in preventing fall-related injuries in adults.

This topic was identified from horizon scanning of the International Network of Agencies for Health Technology Assessment (INAHTA) database.

Evidence overview

Health technology assessments and guidelines

In 2013 NICE published guidelines assessing the risk and prevention of falls in older people (Guideline CG161). The authors reported that hip protectors could not be recommended due to insufficient evidence and advised that research should be conducted on the clinical effectiveness of hip protectors. An updated NICE Surveillance review (2019) found no additional available evidence.

Farrell & Walter (2021) for the Canadian Agency for Drugs and Technologies in Health (CADTH) conducted a Health Technology Review on the clinical effectiveness of hip protectors in preventing fall-related injuries in adults aged 55 and older living independently in the community. Searches were conducted between January 2014 to July 2021, identifying four articles. One was a Cochrane systematic review and meta-analysis on hip protectors for preventing hip fractures in older people (Santesso et al. 2014). Three were evidence-based guidelines from Australia, Canada, and the USA that all also referenced the same Cochrane review. Outcomes were incidence or number of fractured hips and other related injuries, user satisfaction, mortality, and adverse events (e.g., skin irritation, risk of pelvic fractures, impediment to activities of daily living).

The key message from Farrell &Walter (2021) was that there was no difference in the risk of fractures or pelvic fractures between adults who wore hip protectors compared to those who did not. However, it was reported that one guideline advised that hip protectors should be considered in adults at risk for falls and hip fracture; one advised that hip protectors should not be considered in older adults in community settings, and one made conditional positive recommendations for use for frail older adults in the appropriate environment. The CADTH authors reported that the findings in the report were limited by the small amount of available evidence and that the guidelines that advised use did not include recommendations around the style of hip protectors or methods to improve adherence or satisfaction.

In 2015 CADTH published a Rapid Response Report of the comparative clinical and cost-effectiveness of three different brands of hip protectors (HipSaver, Safe Hip and Secure brands). There were no studies found that compared the three brands of hip protector.

Rentzeperi et al. (2023) reviewed guidelines on diagnosis and management of osteoporosis from the UK, USA, Australia, and Europe. The Royal Australian College of General Practitioners, National Osteoporosis Guideline Group (UK) and North American Menopause Society recommend hip protectors only for high-risk patients living in residential care. Montero-Odasso et al. (2021) conducted a systematic review of clinical guidelines for falls prevention and management. Fifteen guidelines were identified but the authors report that recommendations for the use of hip protectors were often missing.

Evidence overview

Secondary evidence

Hip fractures and adverse events

Santesso et al. (2014) conducted a Cochrane systematic review and meta-analysis of randomised and quasi-randomised controlled trials (RCTs) on the use of hip protectors for preventing hip fractures in older people. Participants were people aged 65 years or older living in the community or people in institutional care without minimum age restriction. Primary outcomes were risk of sustaining a hip or pelvic fracture, overall rate of pelvic and other fractures and rate of falls. Secondary outcomes were acceptance, adherence, adverse events such as skin irritation, and economic outcomes. Searches were conducted up to December 2012. A total of 19 studies were included in the meta-analysis, 18 of which tested soft hip protectors worn in special underwear. The review did not report as to whether studies were conducted using the same brand or different brands of hip protectors. Studies included 17,000 people with mean age range of 78 to 86 years. Most studies were rated at being low risk of bias. Fourteen studies were conducted in nursing or residential homes, three of which were UK-based studies. There was evidence for a reduction in hip fractures when people were provided with hip protectors, with an absolute effect of 11 fewer people per 1000 (95% CI: 0 to 20 people) experiencing hip fractures. In adults in the community (5 studies) there was evidence that providing people with hip protectors had little to no effect on hip fractures (Relative risk (RR): 1.15 [95% CI: 0.84 to 1.58]). There was some evidence that pelvic fractures may have increased when hip protectors were provided (absolute effect of one more person per 1000 [95% CI: 1 fewer to 5 more]). There was no evidence that provision of hip protectors reduced incidence of falls. Adverse events, including skin irritation were reported as between 0% to 5%. Over the long term it was reported that adherence was low.

Facilitators and barriers to use

Korall et al. (2015) conducted a systematic review examining facilitators and barriers to use of hip protectors in long-term institutional care settings. Participants were people aged 65 years or older, or their caregivers. Studies of any design, published between 2000 and 2013 were considered, and outcomes were those related to acceptability or adherence. Twenty-eight articles were included. Findings were synthesised narratively. Facilitators and barriers to use were categorised into four areas: system-related, caregiver-related, resident-related, and product-related, with strategies to increase adherence highlighted in each area.

Primary evidence

Wong et al. (2022) conducted a pilot RCT examining adherence to hip protectors in thirty-one participants by using hip protectors fitted with monitors to assess wear time plus a self-reported survey. All participants were provided with hip protectors and randomised to wear conventional underwear or purpose-designed underwear for four weeks. Eight participants were excluded because they became wheelchair users during the study. Eighteen participants were excluded from analysis of data collected through the monitors due to limited or no data collection. It was reported that the remaining 13 participants showed 77.5% adherence to hip protectors with greater adherence in the purpose-designed underwear group (n=7; $p<0.05$). Twenty-three participants completed the survey and reported adherence of 83.3%. The authors concluded that purpose-designed underwear may improve adherence and an objective measure of adherence was necessary.

Korall et al. (2019) conducted a 12-month retrospective cohort study, reviewing fall incident reports in residents in 14 long-term care homes in Canada. It was reported that 3520 falls were recorded, and hip protectors were worn in 2108 (60%) of these. Incidence of hip fracture per 100 falls with a hip protector vs without was 0.33 vs 0.92 (RR: 0.36 [95% CI: 0.14 to 0.90], p=0.029). The authors report that propensity to wear a hip protector was associated with being male, having cognitive impairment, wandering behaviour, cardiac dysrhythmia, use of a walking aid, use of anti-anxiety medication and urinary or bowel incontinence. After adjustment for

Evidence overview

propensity the RR was 0.38 (95% CI: 0.14 to 0.99, p=0.048). Authors comment that most RCTs have failed to achieve a similar level of adherence with hip protectors and there is a need for research in this area.

Mechanical testing of hip protectors

In 2020 the Canadian Standards Association (CSA) published testing and labelling requirements for hip protectors (CSA Z325:20). The Standard (CSA 2020) gives details of a test method for measuring the reduction in force to the proximal femur from a simulated fall. It does not appear that there is an equivalent standard in the UK.

Yahaya (2020) conducted a narrative systematic review of test systems that evaluate biomechanical effectiveness of hip protectors with impact testing systems that simulate hip anatomy and falls. Twenty-eight articles were identified. There was evidence that there was variability and a lack of standardisation in the test systems. The authors suggest that this means that there is an evidence gap in terms of efficacy of hip protectors before they are deployed in clinical studies.

Keenan (2019) conducted a primary study testing eighteen different hip protectors according to a 2017 draft of the standard test method published by the Canadian Standards Association. There were differences between hip protectors of between 3% and 36% in reduction in peak force on the femur and a reduction in performance of a maximum of 20% was observed if the hip protector was misplaced.

Economic evaluation

de Bot et al. (2020) conducted a systematic review that considered cost-effectiveness of hip protectors for the prevention of fractures in patients with high fracture risk. Fifteen economic evaluation studies were identified. In long-term care settings and care of the elderly hospital wards there was evidence that hip protectors were cost-effective for the prevention of fractures. Four studies included people living in the community and long-term care residents and were more mixed as to whether hip protectors were a cost-effective intervention.

Ongoing studies

We identified one ongoing pilot study (NCT06204471) evaluating the acceptability of two different airbag hip protectors in community-dwelling adults. The study is being conducted in Ireland and aims to recruit 40 adults, aged 65 and older who are at risk of falls. Participants will be randomised to wear a Helite hip protector or a Wolk hip protector for two months. Outcomes are qualitative and quantitative assessment of acceptability and usability and quantitative assessment of fear of falling. The study aims to complete by April 2025.

Areas of uncertainty

- It is unclear how many brands of hip protectors are available in the UK and there is a lack of comparative evidence for different types and brands of hip protector. Most research appears to have been undertaken using soft hip protectors.
- Impact of adherence in community dwelling adults on clinical and cost effectiveness
- How to improve adherence and satisfaction with hip protectors if they are advised
- Clinical and cost-effectiveness of hip protectors in adults aged less than 65 years at high risk of falls or fractures
- Whether hip protectors are widely used in Wales in the community or nursing homes

Literature search results

Health technology assessments and guidance

Canadian Agency for Drugs and Technologies in Health. (2015). Hip Protectors: A Review of the Comparative Clinical and Cost-Effectiveness [Internet]. Available at: https://www.ncbi.nlm.nih.gov/books/NBK274346/

CSA Group. (2020). CSA Z325:20: Hip protectors. Canada: CSA Group. Available at: https://www.csagroup.org/store/product/CSA%20Z325%3A20/?format=PDF [Accessed 21st February 2024].

Farrell K, Walter M. (2021). Hip Protectors for Community-Dwelling Older Adults [Internet] Ottawa (ON): Canadian Agency for Drugs and Technologies in Health. Available at: https://www.ncbi.nlm.nih.gov/books/NBK586517/

Montero-Odasso MM, Kamkar N, Pieruccini-Faria F, et al. (2021). Evaluation of Clinical Practice Guidelines on Fall Prevention and Management for Older Adults: A Systematic Review. JAMA Netw Open. 4(12): e2138911. https://doi.org/10.1001/jamanetworkopen.2021.38911

NICE. (2013). Falls in older people: assessing risk and prevention. Clinical guideline [CG161]. Available at: https://www.nice.org.uk/guidance/cg161 [Accessed 15 Feb 2024].

NICE. (2019). Appendix A: Summary of evidence from surveillance - 2019 surveillance of falls in older people: assessing risk and prevention (2013) NICE guideline CG161. Available at: https://www.nice.org.uk/guidance/cg161/evidence/appendix-a-summary-of-evidence-from-surveillance-pdf-6784064894

Rentzeperi E, Pegiou S, Tsakiridis I, et al. (2023). Diagnosis and Management of Osteoporosis: A Comprehensive Review of Guidelines. Obstet Gynecol Surv. 78(11): 657-81. https://doi.org/10.1097/ogx.0000000000001181

Note: There is no reference to hip protectors made by AAOS in the following guidelines:

AAOS. (2021). AAOS Clinical Practice Guideline for the Management of Hip Fractures in Older Adults. Available at: https://www.orthoguidelines.org [Accessed 19th February 2024].

AAOS. (2023a). AAOS Appropriate Use Criteria: Prevention of Secondary Hip Fracture and/or Fragility Fracture. Available at: https://www.orthoguidelines.org/ [Accessed 19th February 2024].

AAOS. (2023b). AAOS Clinical Practice Guideline on the Management of Osteoarthritis of the Hip. Available at: https://www.orthoguidelines.org/ [Accessed 19th February 2024].

Evidence reviews and economic evaluations

de Bot R, Veldman HD, Witlox AM, et al. (2020). Hip protectors are cost-effective in the prevention of hip fractures in patients with high fracture risk. Osteoporos Int. 31(7): 1217-29. https://doi.org/10.1007/s00198-019-05252-8

Korall AM, Feldman F, Scott VJ, et al. (2015). Facilitators of and barriers to hip protector acceptance and adherence in long-term care facilities: a systematic review. J Am Med Dir Assoc. 16(3): 185-93. doi: 10.1016/j.jamda.2014.12.004

Santesso N, Carrasco-Labra A, Brignardello-Petersen R. (2014). Hip protectors for preventing hip fractures in older people. Cochrane Database of Systematic Reviews. (3). https://doi.org/ 10.1002/14651858.CD001255.pub5

Yahaya SA, Ripin ZM, Ridzwan MIZ. (2020). Test systems for the biomechanical evaluation of hip protectors: a systematic review. Osteoporos Int. 31(1): 43-58. https://doi.org/10.1007/s00198-019-05128-x

Individual studies

Keenan BE, Evans SL. (2019). Biomechanical testing of hip protectors following the Canadian Standards Association express document. Osteoporos Int. 30(6): 1205-14. https://doi.org/10.1007/s00198-019-04914-x

Korall AMB, Feldman F, Yang Y, et al. (2019). Effectiveness of Hip Protectors to Reduce Risk for Hip Fracture from Falls in Long-Term Care. J Am Med Dir Assoc. 20(11): 1397-403.e1. https://doi.org/10.1016/j.jamda.2019.07.010

Wong MS, Wu HD, Beygi BH, et al. (2022). Compliance study of hip protector users for prevention of fragility fracture: A pilot randomized trial. Prosthetics and Orthotics International. 46(4).
Ongoing research
Acceptability of Hip Protector Airbags in Older People (2024) https://clinicaltrials.gov/study/NCT06204471 Estimated completion 04/2025 Pilot study assessing acceptability of air-bag style hip protectors in 40 participants.
Other
Background: Baji P, Patel R, Judge A, et al. (2023). Organisational factors associated with hospital costs and patient mortality in the 365 days following hip fracture in England and Wales (REDUCE): a record-linkage cohort study. The Lancet Healthy Longevity. 4(8): e386-e98. http://dio.org/10.1016/S2666-7568(23)00086-7

Date of search	February 2024
Concepts used	Hip protector

Proposed research question and evidence selection criteria (if selected)

Proposed Research question	**What is the clinical and cost-effectiveness of hip protectors in adults at risk of falls?**

	Inclusion criteria	**Exclusion criteria**
Population	Adults at risk of falls or fractures, in any setting	
Intervention	Provision of hip protectors (soft, airbag or hard)	Multimodal intervention that include additional components e.g., vitamin D or exercise
Comparison/ Comparators	No provision of hip protectors	
Outcome measures	Risk / rate of hip fracture Risk / rate of pelvic fracture Other adverse events such as skin irritation Acceptance Adherence Quality of life Economic outcomes.	

Proposed specialities	**Musculoskeletal system; caring for older people; injuries, accidents and wounds**