



Topic Exploration Report

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:

1. Determine the quantity and quality of evidence available for a technology of interest.
2. Identify any gaps in the evidence/ongoing evidence collection.
3. Inform decisions on topics that warrant fuller assessment by Health Technology Wales.

Topic:	Aspire for opportunistic identification of osteoporotic vertebral fragility fractures from computed tomography scans
Topic exploration report number:	TER120

Introduction and aims

People with osteoporosis are at increased risk of fragility fractures. Early identification of vertebral fragility fractures can help to identify people with osteoporosis and manage their condition to reduce the risk of future fractures. Aspire is a diagnostic service that uses machine learning to identify incidental vertebral fractures in computed tomography scans whenever the spine is imaged, with the aim of providing more timely assessment, diagnosis and treatment of osteoporosis.

Health Technology Wales researchers searched for evidence on the use of Aspire or any other systems designed to opportunistically identify osteoporotic vertebral fragility fractures.

Summary of findings

Aspire is a diagnostic service for semi-automated vertebral fracture identification in computed tomography scans. Searches did not identify any evidence on the accuracy of using the Aspire system compared to analysis by radiologists, or how using the Aspire system influences the care of people at risk of osteoporotic fractures. However, further evidence collection is ongoing that may answer these questions in future.

Aspire is a digital health technology and was determined to be a Tier 3b technology according to the NICE Evidence Standards Framework for Digital Health Technologies. For technologies of this classification, it is recommended that a high quality intervention study showing improvements in relevant outcomes is produced to demonstrate effectiveness of the technology.

Evidence

Existing guidelines and guidance

Guidelines from NICE (CG146) and SIGN (SIGN142) include recommendations on risk factors for osteoporosis where early intervention may be warranted, but do not include any specific recommendations on the opportunistic identification of osteoporotic fractures.

Secondary research and economic evaluations

An existing Cochrane Review studied interventions for improving the appropriate use of imaging in people with musculoskeletal conditions. This review was published in 2010 and does not appear to have been updated since. The review included studies on use of imaging in people deemed at risk of osteoporosis, but does not include any studies on the effectiveness of using incidental findings from CT scans to detect osteoporotic fractures.

The Eunetha Rapid Relative Effectiveness Assessment *Screening for osteoporosis in the general population* did not include any evidence on the use of Aspire or any other methods of using incidental findings from CT scans to detect osteoporotic fractures. The assessment concluded that there is no or little evidence on how screening for osteoporosis affects the rate of symptomatic fractures.

We did not identify any published economic evaluations of Aspire or similar methods of identifying osteoporotic fractures. A recently published economic evaluation (Turner, 2018) based on a UK randomised trial (Shepstone, 2018) suggests that a screening programme based on a risk assessment tool for osteoporosis could be cost effective.

Primary studies

The technology developer highlighted published evidence on the current underreporting of incidental fractures by radiologists (Mitchell, 2017) but this study did not include any comparison with the Aspire service. Our searches identified two studies on the reliability and technical methods of computer-aided vertebral fracture detection (Oei, 2013 and Cawthon 2014).

Ongoing evidence collection

The technology developer reports that retrospective pilots of Aspire have been carried out in several trusts in NHS England, comparing rates of vertebral fracture detection between Aspire and hospital radiologists. A prospective pilot is also ongoing.

Areas of uncertainty

Pilot studies are ongoing in NHS England: the timescales for availability of results of these are not known.

Conclusions

Published studies of computer-aided detection of vertebral fragility fractures are very limited. We did not identify any evidence on how accurate Aspire or similar systems are in identification of vertebral fragility fractures compared to analysis by radiologists, or how using the Aspire system influences the care of people at risk of osteoporotic fractures. Research is ongoing that may answer these questions in the future.

Brief literature search results

Resource	Results
HTA organisations	
Healthcare Improvement Scotland:	We did not identify any relevant guidance from this source.
Health Technology Assessment Group	We did not identify any relevant guidance from this source.
Health Information and Quality Authority	We did not identify any relevant guidance from this source.
UK guidelines and guidance	
SIGN	<p>SIGN142. Management of osteoporosis and the prevention of fragility fractures: a national clinical guideline. https://www.sign.ac.uk/sign-142-management-of-osteoporosis-and-the-prevention-of-fragility-fractures.html. March 2015 (update ongoing).</p> <p>This guideline identifies a range of risk factors for osteoporosis where early intervention may be warranted, but does not include any specific recommendations on the opportunistic identification of osteoporotic fractures.</p>
NICE	<p>NICE Clinical Guideline CG146. Osteoporosis: assessing the risk of fragility fracture. https://www.nice.org.uk/guidance/cg146 Last updated February 2017 (a further update is ongoing). This guideline identifies a range of risk factors for osteoporosis where early intervention may be warranted, and recommends the most effective methods of assessing risk. It does not include any specific recommendations on the opportunistic identification of osteoporotic fractures.</p> <p>This guideline is being updated. Updates will include more evidence on methods of diagnosing and assessing vertebral fractures specifically.</p> <p>Medtech innovation briefing MIB106. Bindex for investigating suspected osteoporosis. https://www.nice.org.uk/advice/mib106/chapter/Summary May 2017.</p>
Secondary literature and economic evaluations	
ECRI	We did not identify any relevant guidance or advice from this source.
Cochrane library	<p>French SD, Green S, Buchbinder R, Barnes H. Interventions for improving the appropriate use of imaging in people with musculoskeletal conditions. Cochrane Database of Systematic Reviews 2010, Issue 1. Art. No.: CD006094. DOI: 10.1002/14651858.CD006094.pub2.</p> <p>This review includes studies on use of imaging in people deemed at risk of osteoporosis, but does not include any studies on the effectiveness of using incidental findings from CT scans to detect osteoporotic fractures.</p>
Medline	<p>Turner DA, Khioe RFS, Shepstone L, Lenaghan E, Cooper C, Gittoes N, Harvey NC, Holland R, Howe A, McCloskey E, O'Neill TW, Torgerson D, Fordham R; SCOOP Study Team. The Cost-Effectiveness of Screening in the Community to Reduce Osteoporotic Fractures in Older Women in the UK: Economic Evaluation of the SCOOP Study. J Bone Miner Res. 2018 May;33(5):845-851. doi: 10.1002/jbmr.3381</p>

eunetha	Eunetha Rapid Relative Effectiveness Assessment: Screening for osteoporosis in the general population. 2019. https://eunetha.eu/otca19-screening-for-osteoporosis-in-the-general-population-final-assessment-and-related-documentation-is-now-available/
Primary studies	
Medline	<p>Cawthon PM, Haslam J, Fullman R, Peters KW, Black D, Ensrud KE, Cummings SR, Orwoll ES, Barrett-Connor E, Marshall L, Steiger P, Schousboe JT; Osteoporotic Fractures in Men (MrOS) Research Group. Methods and reliability of radiographic vertebral fracture detection in older men: the osteoporotic fractures in men study. <i>Bone</i>. 2014 Oct;67:152-5. doi: 10.1016/j.bone.2014.06.039</p> <p>Oei L, Ly F, El Saddy S, Makurthou AA, Hofman A, van Rooij FJ, Uitterlinden AG, Zillikens MC, Rivadeneira F, Oei EH. Multi-functionality of computer-aided quantitative vertebral fracture morphometry analyses. <i>Quant Imaging Med Surg</i>. 2013 Oct;3(5):249-55. doi: 10.3978/j.issn.2223-4292.2013.09.03</p>
Cochrane library	We did not identify any relevant evidence from this source
Other sources	
Evidence submitted by the technology developer	<p>Adams JE. Opportunistic Identification of Vertebral Fractures. <i>Journal of Clinical Densitometry</i> Volume 19, Issue 1, January 2016, Pages 54-62. https://doi.org/10.1016/j.jocd.2015.08.010</p> <p>Mitchell RM, Jewell P, Javaid MK, McKean D, Ostlere SJ. Reporting of vertebral fragility fractures: can radiologists help reduce the number of hip fractures? <i>Arch Osteoporos</i>. 2017 Dec;12(1):71. doi: 10.1007/s11657-017-0363-y.</p> <p>International Osteoporosis Foundation. Broken Bones, Broken Lives: A roadmap to solving the fragility fracture crisis in Europe. 2018. https://www.iofbonehealth.org/broken-bones-broken-lives</p>
Evidence identified from existing guidelines and guidance	<p>Lems WF, Dreinhöfer KE, Bischoff-Ferrari H, Blauth M, Czerwinski E, da Silva J, Herrera A, Hoffmeyer P, Kvien T, Maalouf G, Marsh D, Puget J, Puhl W, Poor G, Rasch L, Roux C, Schüler S, Serio B, Tarantino U, van Geel T, Woolf A, Wyers C, Geusens P. EULAR/EFORT recommendations for management of patients older than 50 years with a fragility fracture and prevention of subsequent fractures. <i>Ann Rheum Dis</i>. 2017 May;76(5):802-810. doi: 10.1136/annrheumdis-2016-210289</p> <p>Hernlund E, Svedbom A, Ivergård M, Compston J, Cooper C, Stenmark J, McCloskey EV, Jönsson B, Kanis JA. Osteoporosis in the European Union: medical management, epidemiology and economic burden. A report prepared in collaboration with the International Osteoporosis Foundation (IOF) and the European Federation of Pharmaceutical Industry Associations (EFPIA). <i>Arch Osteoporos</i>. 2013;8:136. doi: 10.1007/s11657-013-0136-1</p> <p>Kanis JA, Johnell O, Oden A, Johansson H, McCloskey E. FRAX and the assessment of fracture probability in men and women from the UK. <i>Osteoporos Int</i>. 2008 Apr;19(4):385-97. doi: 10.1007/s00198-007-0543-5</p>

	Shepstone L, Lenaghan E, Cooper C, Clarke S, Fong-Soe-Khioe R, Fordham R, Gittoes N, Harvey I, Harvey N, Heawood A, Holland R, Howe A, Kanis J, Marshall T, O'Neill T, Peters T, Redmond N, Torgerson D, Turner D, McCloskey E; SCOOP Study Team. Screening in the community to reduce fractures in older women (SCOOP): a randomised controlled trial. <i>Lancet</i> . 2018 Feb 24;391(10122):741-747. doi: 10.1016/S0140-6736(17)32640-5
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Date of search:	October 2019
Concepts used:	Osteoporosis, fracture, Aspire, Optasia