Technoleg Iechyd Cymru
Health Technology Wales

Topic Exploration Report [1]

Antibacterial hydrogel coating to reduce orthopaedic implant-related infections in people at higher risk

What is a Topic Exploration Report?

Topic Exploration Reports are not health technology assessments. These reports provide a high-level briefing on new topics submitted to Health Technology Wales and are not based on exhaustive or systematic literature searches. Instead, they rely on a focussed scan of key resources.

What evidence is used in a Topic Exploration Report?

Priority is given to summarising the most relevant or useful evidence, rather than covering all possible evidence. Information reported is typically based on abstracts and study authors' own conclusions, rather than detailed scrutiny of full texts.

What are the aims of a Topic Exploration Report?

Topic Exploration Reports offer an overview of the available evidence on a topic and aim to highlight any uncertainties or gaps in the evidence. These reports outline the quantity and type of evidence found, but no critical appraisal or formal evidence synthesis is conducted.

How should a Topic Exploration Report be used?

Topic Exploration Reports can be used to indicate what evidence may be available for a topic, and do not provide definitive guidance on how a technology should be used. The evidence presented within the reports should be interpreted with caution.

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

Topic exploration report number	TER603
Topic	Hydrogel coating to reduce orthopaedic implant-related infection in people at higher risk of infection.
Summary of findings	An antibacterial bio-absorbable hydrogel applied to an implant during surgery may prevent orthopaedic implant-related infection. Defensive antibacterial coating (DAC) is the only commercially available hydrogel indicated for prevention of infection. DAC is provided as a powder and is mixed into a paste with water for application immediately before implantation. DAC may be mixed with additional antibiotics such as vancomycin or gentamycin before application. One health technology assessment, conducted in Australia, and two systematic reviews were identified that included a total of six studies comparing use of DAC with added antibiotics with standard of care in orthopaedic surgery. Four included studies were randomised controlled trials. The secondary evidence concluded that DAC with antibiotics was safe and may reduce orthopaedic implant infections and improve quality of life in some patients. No additional studies comparing DAC with or without added antibiotics with standard of care were identified. The Australian health technology assessment included an examination of costs and DAC was not considered to be cost-effective. An Italian economic evaluation was identified that calculated that use of DAC in a moderately high-risk population would provide cost-savings of €1080 per patient. It is unclear if either evaluation is generalisable to Wales.

Introduction and aims

Orthopaedic implant-related infections, such as periprosthetic joint infection (PJI) and osteosynthesis-associated infection, are uncommon, but serious, complications of joint replacement and surgical fracture repair. Treatments involve debridement, implant replacement, and prolonged intravenous antibiotics, causing pain and discomfort, anxiety and extended hospital stays. Orthopaedic implant-related infections are difficult to diagnose and can occur up to 2 years after surgery. It has been estimated that around 1 to 2% of hip and knee replacements are affected and that infection accounts for 25% of revisions after knee replacement and 15% after hip replacement. In Wales infection rates after orthopaedic surgery are low, with overall rates of any orthopaedic surgical site infection (SSI) reported as 0.22% in 2018 (12 out of 5501 procedures), although data were incomplete for some hospitals. Some patients are at higher risk of orthopaedic implant-related infection. National Joint Registry and Hospital Episode Statistics data identified key PJI risk factors as higher body mass index, diabetes, prior infections, femoral neck fractures, higher American Society of Anaesthesiologist physical status classification grades, certain ethnic groups, drug use, smoking, and patients with mega-prosthesis.

Orthopaedic implant-related infections arise from bacteria which adhere to the implant and form biofilms, making eradication difficult. The application of antibacterial bio-absorbable hydrogels to an implant during surgery may prevent bacterial adhesion, the formation of biofilms and growth of bacteria. Defensive antibacterial coating (DAC™) (Adler Ortho UK Ltd) has been identified by the topic proposer as the only commercially available hydrogel indicated for prevention of infection. DAC is a Class III medical device, CE marked for use with cementless and partially cemented joint prosthesis (hip, knee, shoulder, etc.), fracture fixation devices (plates, nails, screws, etc.) and dental implants. The product is supplied as a powder composed of hyaluronan, poly-D, and L-lactide which are bio-absorbable polymers. The powder is mixed with water to form an adhesive hydrogel and is spread on the surface of an orthopaedic implant immediately before implantation. It acts a temporary physical barrier which is suggested to prevent the formation of bacterial biofilm and reduce infection risk. The hydrogel is completely reabsorbed 72 hours after implantation. If desired the hydrogel can be mixed with antibiotics such as vancomycin or gentamycin before application. The topic proposer has suggested that DAC, with or without antibiotics, should be used in patients at higher risk of infection, alongside recommended asepsis measures and in addition to standard antibiotic prophylaxis (NICE 2020).

Health Technology Wales researchers searched for evidence on DAC, with or without additional antibiotics, for the prevention of infection in orthopaedic implant surgery compared with standard of care.

Evidence overview

We identified one health technology assessment and two systematic reviews. We did not identify any additional comparative primary studies examining effectiveness conducted since the systematic reviews.

Health technology assessment

In 2022 the Medical Services Advisory Committee of Australia (MSAC) examined the comparative safety, effectiveness and cost-effectiveness of DAC to prevent infection in patients at higher risk of developing an orthopaedic implant-related infection (MSAC 2022). Six studies were included in the evaluation, two randomised controlled trials (RCTs) and four case-control studies published between 2016 and 2021. All studies involved DAC with added antibiotics in addition to routine antibiotic prophylaxis. Evidence from the RCTs indicated that there were between 0 to 0.6% SSIs in the DAC group vs 4.7% to 6% in the control group

(p=0.003). Overall, the MSAC considered that the evidence showed that there may be a trend for DAC with antibiotics to reduce orthopaedic implant infections in some patients but considered the reduction to be small and uncertain and concluded that in orthopaedic implant surgery, DAC with antibiotics was non-inferior to surgery without DAC in terms of reduction in infection.

Systematic reviews

Bove et al. (2025) conducted a systematic review examining the efficacy of DAC in hip revision surgery for patients with PJI, published up to October 2024. Three studies, two retrospective case control and one single arm cohort, were included. All studies involved DAC with added antibiotics. The case-control studies reported no infections in the DAC-treated groups compared to 13.9% to 14.8% in the control groups. Quality of life of the treated groups improved and there were no DAC-related side effects reported. The case control studies were also included in the MSAC report. The review concluded that the findings were promising but there was a need for higher quality longitudinal prospective studies.

Pressato et al. (2023) conducted a systematic clinical narrative review of the use of DAC in orthopaedic surgery, published up to February 2023. The aim of the review was to highlight the advantages of DAC in orthopaedics and trauma. Eleven studies were included, of which two were RCTs and four were case controlled studies and the remainder were single arm cohort studies. All the comparative studies were the studies that were included in the MSAC report. The review concluded that DAC was promising, but there was a need for further clinical trials.

Economic evaluations

We identified two economic evaluations.

The MSAC (2022) health technology assessment included an economic evaluation of DAC with antibiotics. MSAC considered that the evidence for effectiveness indicated that DAC was not superior to standard of care but DAC with antibiotics represented additional resource use. MSAC highlighted surgeon time to prepare and apply the hydrogel, the need for sterile water, sterile syringe needles and antibiotics for loading the hydrogel (which are not supplied with DAC). It was concluded that DAC was not cost-effective. The manufacturers disagreed with the appraisal of cost-effectiveness and stated that MSAC relied on incorrect infection rates. The generalisability of the economic evaluation to Wales is uncertain.

Trentinaglia et al. (2018) modelled the potential overall annual healthcare cost savings of three different antibacterial technologies, one of which was DAC. The other two technologies were not hydrogel coatings. Using data from one of the earlier RCTs, the expected reduction in PJIs was estimated as 90%. In a moderately high-risk population of patients with a 5% expected postsurgical infection rate, this meant a cost saving of €1080 per patient (€43,200,000 in total) was estimated. This was an Italian study, and it is unclear as to generalisability to Wales.

The topic proposer has indicated that UK costs for DAC (without antibiotics) for a patient with higher risk of infection would be from £600, based on framework prices for hospitals using over 100 per year and estimated that across the UK, 10,000 to 500,000 patients would be eligible each year. The topic proposer states that costs would be offset by prevention of infection, which is quoted as costing around £35,000 to £42,000 per year, per patient, with higher costs for revision surgery due to PJI.

Ongoing research

Evidence overview
One ongoing randomised trial was identified (Boyer et al. 2025). This study is being conducted in patients with infected total hip arthroplasties and compares 1) two stage surgery where the first stage is to remove infected implants followed by antibiotics without implant, an antibiotic-free period, and then a second surgery to replace the implant with 2) a single stage surgery where a new implant is inserted during the same surgery as removal with the addition of DAC with antibiotics. Primary outcome is the recurrence of clinically diagnosed PJI. The study aims to recruit 440 participants and aims to complete in December 2026. The manufacturer of DAC has indicated that they have data available from a UK-based matched cohort study.

Areas of uncertainty
• All the comparative studies involved DAC mixed with antibiotics in addition to routinely advised antibiotic prophylaxis. The ability of DAC hydrogel to reduce infection without additional antibiotics is unclear. • It appears that not all studies were conducted in groups at higher risk of infection. • We did not identify any UK-based economic evaluations.

Literature search results

Health technology assessments and guidance
MSAC. (2022). Defensive Antibacterial Coating (DAC) 5ml Kit. Medical Services Advisory Committee. Available at: https://www.msac.gov.au/applications/1629 [Accessed 21 May 2025].
Evidence reviews and economic evaluations
Bove A, Braile A, Matino G, et al. (2025). The Efficacy of Defensive Antibacterial Coating (DAC) Periprosthetic Joint Infection Prevention in the Hip: A Systematic Review. J Clin Med. 14(1). doi: https://doi.org/10.3390/jcm14010270 Pressato D, Battista A, Govoni M, et al. (2023). The Intraoperative Use of Defensive Antibacterial Coating (DAC R) in the Form of a Gel to Prevent Peri-Implant Infections in Orthopaedic Surgery: A Clinical Narrative Review. Materials (Basel, Switzerland). 16(15). doi: https://dx.doi.org/10.3390/ma16155304
Individual studies
Trentinaglia MT, Van Der Straeten C, Morelli I, et al. (2018). Economic Evaluation of Antibacterial Coatings on Healthcare Costs in First Year Following Total Joint Arthroplasty. J Arthroplasty. 33(6): 1656-62. doi: https://doi.org/10.1016/j.arth.2018.01.057
Ongoing research
Boyer B, Cazorla C, Carricajo A, et al. (2025). Single-stage surgery with antibiotic-loaded hydrogel-coated implants versus two-stage surgery for chronic periprosthetic hip joint infection in French tertiary referral hospitals: the SINBIOSE-H non-inferiority, randomised, controlled trial study protocol. BMJ open. 15(2): e085146. doi: https://doi.org/10.1136/bmjopen-2024-085146
Other
NICE. (2020). Surgical site infections: prevention and treatment Guidance 125. Available at: www.nice.org.uk/guidance/ng125 [Accessed 21 May 2025].

Date of search	May 2025

Concepts used	Defensive antibacterial coating; antibacterial / antimicrobial hydrogel; DAC hydrogel; hydrogel; biofilm; orthopaedic; surgical site infection

Proposed research question and evidence selection criteria (if selected)

Proposed Research question	**What is the clinical and cost effectiveness of antibacterial hydrogel coatings plus added antibiotics when compared with standard of care in the reduction of orthopaedic implant related infections in people at higher risk?**

	Inclusion criteria	Exclusion criteria
Population	Patients at higher risk of infection	Patients not at higher risk of infection
Intervention	Orthopaedic implant surgery with hydrogel coating +antibiotics	
Comparison/ Comparators	Standard orthopaedic implant surgery without hydrogel coating +antibiotics	Other coatings e.g., silver coating, calcium sulphate beads
Outcome measures	Orthopaedic implant infection rates Revisional surgery rates Adverse events / side effects Health related QoL Resource use Economic outcomes	

Proposed speciality	**Musculoskeletal system, Infectious disease**