Medical Services Advisory Committee (MSAC) Public Summary Document

Application No. 1593.2 – Bioinductive implant for the repair of rotator cuff tear

Applicant: **Smith & Nephew Pty Limited**

Date of MSAC consideration: **31 July 2025**

Context for decision: MSAC makes its advice in accordance with its Terms of Reference, visit the MSAC website

1. Purpose of application

A re-application requesting listing of REGENETEN bioinductive collagen implant (BCI) on the Prescribed List of Medical Devices and Human Tissue Products (PL) for the repair of rotator cuff tear was received from Smith & Nephew Pty Ltd by the Department of Health, Disability and Ageing (the department). The application was linked to an application requesting PL listing of BCI to be used in surgical repair of rotator cuff tears in conjunction with existing Medicare Benefits Schedule (MBS) items. The Prostheses List Advisory Committee (PLAC), now the Medical Devices and Human Tissue Advisory Committee (MDHTAC), referred the application to MSAC for health technology assessment to determine the comparative clinical and cost effectiveness of BCI.

2. MSAC's advice to the Minister

After considering the strength of the available evidence in relation to comparative safety, clinical effectiveness, cost-effectiveness and total cost, MSAC did not support REGENETEN™ Bioinductive Implant (BCI) for funding through the Prescribed List as an adjunct for the repair of full-thickness rotator cuff tears (FTRCT) in patients with symptomatic FTRCT where there is no substantial loss of tissue who have failed at least 3 months of conservative medical management (CMM). MSAC considered the updated clinical evidence from the key randomised controlled trial (RCT) demonstrated that surgical repair of FTRCT using BCI did not improve functional outcomes compared with standard surgical repair. MSAC considered functional outcomes, or patient-reported outcome measures (PROMs), the most relevant outcomes because they measure patients' pain and shoulder function. MSAC noted the clinical claim that surgical repair with BCI has superior effectiveness to surgical repair was based on a reduction in retear rate on radiographic imaging. Although a relationship between retear rates on imaging and functional outcomes is clinically plausible, MSAC considered this claim was not supported because although the trial showed that surgery with BCI had a lower retear rate on imaging, functional outcomes were similar between patients who had surgery with BCI and patients who had surgery without BCI. MSAC considered that standard surgical repair with BCI was likely to have non-inferior safety compared to standard surgical repair alone and safety was likely to remain non-inferior over the long term as the implant is resorbed in the months following surgery. MSAC considered surgical repair of FTRCT using BCI was not cost effective as it had similar clinical effectiveness to standard surgical repair but was more costly due to the cost of the implant.

MSAC advised the Medical Devices and Human Tissue Advisory Committee (MDHTAC) it considered the evidence did not support the claim that surgical repair of FTRCT using BCI as an adjunct to standard surgical repair has superior clinical effectiveness compared with standard surgical repair alone as there was no difference in functional outcomes in the key trial. MSAC considered surgical repair of FTRCT using BCI was not cost effective as it had similar clinical effectiveness to standard surgical repair but was more costly due to the cost of the implant. MSAC considered any re-application suitable for reconsideration by MSAC would need to include evidence demonstrating superior functional outcomes in patients who receive BCI compared to standard surgical repair.

Consumer summary
This is a reapplication from Smith & Nephew Pty Limited requesting listing of REGENETEN™ Bioinductive Implant (BCI) on the Prescribed List of Medical Devices and Human Tissue Products (PL) for use in the surgical repair of full thickness rotator cuff tear (FTRCT) in conjunction with existing Medicare Benefits Schedule (MBS) item 48960. The rotator cuff is a common name for the group of 4 muscles and their tendons in the shoulder. The rotator cuff starts on the shoulder blade and extends over the shoulder, with the tendons anchoring on the upper arm bone (humerus) and surrounding the ball of the shoulder like a cuff (hence the term 'rotator cuff'). The rotator cuff muscles are known as stabilising muscles because they hold the ball of the shoulder in the socket when a person moves their arm. Damage to the rotator cuff, such as from a torn tendon, can cause symptoms such as pain and weakness. Rotator cuff tears can happen during an acute injury or trauma (such as a fall on the arm while running), or can occur gradually, which is called a chronic tear. Chronic tears are increasingly common as people age because the tendons can degenerate and fray. Sometimes, tears do not cause any symptoms at all. BCI is a bovine collagen implant that is placed over an injured tendon during shoulder surgery. It is intended to provide a base on which the body can grow new tissue to repair the tendon. This application was for the use of BCI as an adjunct during surgical repair of rotator cuff tears classified as 'full thickness' in people who continue to have symptoms after 3 months of conservative medical management (CMM) (for example, pain relief medications, physiotherapy). FTRCT are when there is a complete detachment of the tendon that attaches the 4 muscles from the shoulder blade to the head of the humerus. MSAC considered that BCI was likely as safe as standard surgery alone and expected this was likely to continue over time as BCI dissolves in the months following surgery and most complications are more likely to occur shortly after the operation. MSAC noted that the results of the main clinical study, Ruiz Ibán et al. 2025, showed that after 2 years follow up, fewer people in the group who had surgery with BCI had evidence of a tendon re-tear (of any size) on their follow-up shoulder scans than people who had surgery without BCI. However, the functional outcomes (measured as patient reported outcomes measures, or PROMs, including pain, function, range of movement and strength), between the group of people who had surgery with BCI and the group of people who had standard surgery, improved in both groups over the follow up period, and the improvement was not better in one group than the other at 2 years. MSAC considered that PROMs are the most important outcomes because they reflect a patient's quality of life, symptoms or function. MSAC also had concerns about the economic evaluation which did not rely directly on the quality of life outcomes as they were measured in the main clinical study, but instead made an assumption (that was not supported by the data) that lower re-tear rates in patients who received a BCI would be associated with improved quality of life. MSAC considered surgical repair of FTRCT using BCI was not good value for money because it is associated with similar

Consumer summary
functional outcomes as standard surgical repair but is more costly than standard surgical repair. **MSAC's advice to the Medical Devices and Human Tissue Advisory Committee** MSAC did not support funding of REGENETEN™ Bioinductive Implant (BCI) on the Prescribed List of Medical Devices and Human Tissue Products for use in the surgical repair of full thickness rotator cuff tear in conjunction with existing MBS item 48960. MSAC considered that while BCI was likely as safe as standard surgery alone, the evidence did not support that BCI as an adjunct to surgical repair was more effective than standard surgical repair alone.

3. Summary of consideration and rationale for MSAC's advice

MSAC noted that this was a reapplication from Smith & Nephew Pty Limited requesting listing of REGENETEN™ Bioinductive Implant (BCI) on the Prescribed List of Medical Devices and Human Tissue Products (PL) for use in the surgical repair of full thickness rotator cuff tear (FTRCT) in conjunction with an existing MBS item (MBS item 48960).

MSAC noted that rotator cuff tears are increasingly common with age. The clinical need claim was that standard surgical repair (standard suture or anchor repair, an established procedure in Australia) has a high failure rate due to frayed or retracted tendons. The eligible population are those patients with FTRCT who fail 3 months of conservative medical management (CMM). The intervention is BCI as an adjunct to arthroscopic or mini-arthrotomy repair of the tendon performed by an orthopaedic surgeon and requires an arthroscopic theatre and an anaesthetist.

The applicant was granted a hearing at the MSAC meeting. At this hearing, representatives of the applicant advised that tendon healing was a focus of the reapplication as it is a key challenge and determinant of success in rotator cuff repair. The representatives reiterated that published literature, which aligns with the American Academy of Orthopaedic Surgeons (AAOS) guidelines (2019), supports the link between tendon healing and improved patient outcomes. Additionally, the representatives considered that the economic model and financial analysis presented were conservative and align with clinical experience. MSAC noted that an applicant-sponsored 2022 multicentre RCT (NCT04450342)[1] had been terminated by the applicant. At the hearing, representatives of the applicant advised that the RCT had been terminated because the trial study design was based on early experience with BCI and had enrolled participants with various risk factors for retear, the number and variability of which made it impractical to achieve a sample size necessary to statistically account for all risk factors and evaluate the influence of augmentation. MSAC acknowledged the representatives' concerns, also made in the pre-MSAC response, regarding what they interpreted as errors of fact in the ESC report and potential misrepresentation and emphasis of public consultation input. MSAC agreed the omission of reference to the published article in the commentary was an error of fact and would be corrected in the PSD. MSAC considered that none of the other matters raised in the hearing or pre-MSAC response constituted materially important errors of fact. The concerns are addressed throughout the PSD.

MSAC noted that feedback was received from 24 clinicians and 5 consumers. As the closing date for MSAC consultation fell during the ESC meeting, only feedback received *prior* to ESC was considered by ESC and described in the ESC Report. However, all feedback was considered by

[1] REGENETEN™ Bioinductive Implant System in Full-thickness Tears. ClinicalTrials.gov. 2025

MSAC. MSAC noted 3 of the consumers had experienced rotator cuff tears and 2 of those had received BCI.

MSAC noted the pre-MSAC response regarding the reference to the Ruiz Ibán et al. 2025 RCT in the commentary as 'unpublished'. MSAC acknowledged that this study had been published just prior to ESC's consideration. MSAC also accepted the Ruiz Ibán et al. 2025 RCT as the primary source of clinical evidence for the FTRCT population. However, MSAC did not agree with the pre-MSAC response characterising RCTs as 'Level 1 evidence' as RCTs are Level 2 evidence according to the Australian National Health and Medical Research Council (NHMRC) framework with Level 1 evidence being derived from a systematic review of RCTs[2,3].

MSAC considered that the safety of BCI was likely to be non-inferior to standard surgery alone. MSAC considered surgery with BCI was likely to have non-inferior safety to standard surgery in the longer term as the BCI graft is absorbed within 6 months.

MSAC noted the clinical claim that surgical repair with BCI has superior effectiveness, based on a reduction in retear rate on radiographic imaging. MSAC recalled its previous concerns regarding the reliance on radiological differences such as a reduction in retear rate to support the claim of superior effectiveness for BCI (see PSD for Application 1593.1). MSAC considered functional outcomes (also known as Patient-Reported Outcome Measures or PROMS) that measure a patient's pain, activities of daily living and shoulder function are the most relevant outcomes for assessing whether BCI provides better outcomes than standard surgical care. MSAC noted that Ruiz Ibán et al. 2025 included the Constant Murley Score (CMS) and the American Shoulder and Elbow Society (ASES) score as functional outcomes, and that neither measure demonstrated a difference at any time point between the BCI and standard surgical care groups. MSAC noted that this was consistent with the authors' own conclusions in that there was a lack of "clear difference in clinical outcomes between groups at 2-year follow up". MSAC noted the discussion in Ruiz Ibán et al. 2025 hypothesised that longer-term follow-up of the subjects would be required to observe any between-group differences in clinical outcomes.

At the hearing, representatives of the applicant reiterated that BCI results in clinically meaningful higher rates of tendon healing than standard surgical repair. The applicant highlighted a post hoc analysis that combined the Ruiz Ibán et al. 2025 participants. This analysis reported that people with healed tendons had better outcomes after 2 years compared to those with tendons that fail to heal, irrespective of treatment group. MSAC considered this post hoc analysis of trial participants from Ruiz Ibán et al. 2025 was a lower level of evidence than the comparison of PROMs between the randomised groups. MSAC considered this post hoc analysis has a higher risk of bias because it was no longer making a comparison between randomised groups.

MSAC noted the applicant-developed assessment report (ADAR) did include functional outcomes and included a list, but not an analysis, of observational and experimental evidence to support the claims of tendon regeneration (mostly histology studies), reduction of retear risk (mix of observational and clinical studies) and improvement in functional outcomes (mix of observational and clinical studies).

MSAC considered the ADAR did not establish that either radiographic retears (which may or may not be symptomatic) or tendon regeneration are surrogate outcomes for longer-term functional

[2] National Institute of Clinical Studies, National Health and Medical Research Council (NHMRC) - Designations of levels of evidence according to type of research question

[3] Technical Guidance 12 Linked evidence – change in management (p.188) – Guidelines for preparing assessments for the Medical Services Advisory Committee

outcomes, as per the MSAC Guidelines[4]. MSAC noted that although retear rates for the BCI graft at 24 months were 12% compared to 35% for the standard treatment group, the PROMs were not significantly different between groups at 6, 12 or 24 months. MSAC also noted that there was no difference in CMS pain domain score at any time point between the BCI and standard surgical repair groups.

Overall, MSAC considered that a relationship between retear rates on imaging and functional outcomes was not supported because higher quality, direct evidence from the Ruiz Ibán et al. 2025 randomised trial showed that while surgery with BCI had a lower retear rate on imaging, functional outcomes were similar between patients who had surgery with BCI or standard surgery.

MSAC noted that the economic evaluation included both a cost-effectiveness analysis (CEA) and a cost-utility analysis (CUA) based on CMS outcomes with BCI claimed to be cost-effective based on healing and an average minimal clinically important difference (MCID) of 10.4 points for CMS. MSAC noted that the model assumes that a proportion of patients with retears will undergo revision or reverse total shoulder arthroplasty regardless of whether the tears are symptomatic or not, and it is unclear whether this would occur in practice. MSAC noted there was no information provided in the ADAR on the proportions of radiographically detected retears in Ruiz Ibán et al. 2025 that were symptomatic.

The QALYs derived in the model were based on a post-hoc analysis of 112 participants from the Ruiz Ibán et al. 2025 RCT that claimed a relationship between radiographically detected retears and lower CMS, and unvalidated transformations of the EQ-5D Visual Analogue Scale (VAS) scores to derive values that were used as utility weights. MSAC noted that the Ruiz Ibán et al. 2025 RCT collected EQ-5D-5L descriptive scores but that these were not used to derive utility values. MSAC considered the EQ-5D-5L results from the trial could have been used to derive utility weights (using an Australian value set). MSAC considered this would be the standard approach to derive trial-based utility values, and consistent with recommended methods for deriving utility weights, according to the MSAC Guidelines[5]. The use of EQ-5D VAS scores to derive utility weights was not an accepted use of the VAS scores, and the use of these scores was neither explained nor justified in the ADAR. MSAC considered the 'transformations' of the EQ-5D VAS scores assumed without justification that:

- VAS scores can simply be divided by 100 to make them 'utility weights'
- a linear correlation exists between CMS and VAS scores
- the average utility can be apportioned equally based on the CMS.

MSAC also considered that use of the EQ-5D-5L descriptive score was well suited for the target population with FTRCT, as the 5 domains of this multi-attribute utility instrument (MAUI) are highly relevant to the patient population with FTRCT: mobility, self-care, usual activities, pain and discomfort, and anxiety and depression. MSAC noted there was no between-group statistical difference in the EQ-5D-5L VAS at any time point in the Ruiz Ibán et al. 2025 RCT.

MSAC noted that the pre-MSAC response argued that the 'MCID methodology' used in the ADAR was based on 'ESC's own methodology' from Application 1593.1. However, MSAC recalled that, in its consideration of Application 1593.1, MSAC had considered that a more meaningful measure would be the incremental cost per responder who achieved a MCID difference in one or more functional outcomes, also known as a 'responder analysis'. MSAC noted that the ADAR did

[4] Medical Services Advisory Committee – Appendix 12: Translating comparative treatment effects of proposed surrogate measures to target clinical outcomes (p.291) - Guidelines for preparing assessments for the Medical Services Advisory Committee

[5] Medical Services Advisory Committee - Technical Guidance 21: Health outcomes (p.177) - Guidelines for preparing assessments for the Medical Services Advisory Committee

not describe such a responder analysis for the main Ruiz Ibán et al. 2025 RCT, despite providing responder analyses from the Camacho-Chacón 2024 RCT (based on the functional outcomes of CMS (ADAR table 37) and ASES (ADAR table 35)). MSAC considered that the 'MCID analysis' of Ruiz Ibán et al. 2025 that was provided in the ADAR as the basis of a CEA was not informative.

MSAC noted the incremental cost-effectiveness ratio (ICER) from the CUA ranged from $**redacted** per quality-adjusted life year (QALY) gained in the base-case analysis up to $**redacted** per QALY gained in sensitivity analyses. MSAC considered the economic model was unreliable because it was based on a claim of superior clinical effectiveness that was not supported with the evidence provided.

MSAC noted the utilisation of BCI was estimated to be **redacted** in year 1 (**redacted**% of the population with FTRCT being eligible) to **redacted** in year 6 (**redacted**% of the population with FTRCT being eligible). Utilisation is affected by the age of the population with tear (due to higher prevalence with increasing age) and the proportion of patients with private health insurance, with MBS service volumes anticipated to remain the same as they are currently. In the ADAR, the net cost of listing BCI on the PL to private health insurance was estimated at $**redacted** in year 1 to $**redacted** in year 6. MSAC considered the estimated utilisation to be reasonable, based on the pre-MSAC response and utilisation data from Japan that showed that uptake of BCI stabilised after approximately 12 months of availability. However, MSAC considered that there remained a risk for leakage beyond the FTRCT population as the TGA indication is broader than the proposed FTRCT population.

MSAC noted the claim that the use of BCI would result in a cost savings to the MBS of $0.2 million in year 1 to $1.3 million in year 6, resulting from cost offsets from reduced revision surgery due to the use of BCI. MSAC noted that there would be cost savings only if BCI was successful in reducing arthroplasty and rehabilitation costs, which MSAC considered to be uncertain.

MSAC noted that the proposed fee for MBS item 48960 was unchanged with the addition of BCI. However, the price of the BCI kit was $**redacted**, which would likely be paid by private health insurance. MSAC considered that there was a risk of patient out-of-pocket costs in the private sector for uninsured patients.

MSAC advised the MDHTAC the safety of BCI with surgery was likely to be non-inferior to standard surgery alone in FTRCT however the claim of superior effectiveness of BCI plus surgical repair in FTRCT compared to surgical repair alone was not supported due to the lack of difference in functional outcomes at any timepoint in the main RCT. Additionally, MSAC considered the economic evaluation was not suitable for decision-making as it was not based on functional outcomes (PROMs) but on the unproven surrogate measure of radiographically detected retears, and used a non-standard and unjustified derivation of utility weights to derive QALYs.

MSAC considered that to be suitable for reconsideration by MSAC, any new application would need to provide RCT data that demonstrated BCI plus surgical repair had superior effectiveness (based on functional outcomes) compared to surgical repair alone, including over the longer-term.

4. Background

The MSAC previously considered BCI for the repair of rotator cuff tear in July 2020 (Application 1593), and August 2024 (Application 1593.1). MSAC did not support funding for BCI for the repair of rotator cuff tear in the two previous applications. For Application 1593, MSAC advised the PLAC, now MDHTAC, that the evidence for comparative safety, effectiveness and

cost-effectiveness was highly uncertain relative to standard surgical repair in both subpopulations (i.e., Population 1: patients with PTRCT and Population 2: patients with FTRCT[6]).

For Application 1539.1, MSAC did not support funding for BCI for rotator cuff tears due to limited and uncertain evidence. While two new RCTs for FTRCT were deemed more reliable than previous data, concerns about long-term effectiveness, cost-effectiveness, and underestimated uptake persisted. For PTRCT, MSAC considered the evidence was weak, with only one small trial and no comparison against CMM[7]. MSAC advised MDHTAC on these findings. The key matters of concern from the previous MSAC consideration of Application 1593.1 are provided in Table 1.

Table 1 Summary of key matters of concern

Component	Matter of concern	How the current ADAR addresses it
Clinical place in therapy	MSAC highlighted numerous issues with the comparative safety and efficacy of BCI in PTRCT. MSAC also noted the applicant had expressed a willingness to discuss restricting the use of REGENETEN to a narrower patient population (pg3-5, PSD for MSAC application 1593.1, Aug 2024 MSAC meeting).	Addressed. PTRCT has been removed from the proposal for public funding.
Clinical safety	MSAC considered that the claim of non-inferiority in comparative safety was likely but uncertain due to limited long-term safety data. (pg4, PSD for MSAC application 1593.1, Aug 2024 MSAC meeting).	Addressed. The ADAR presented longer term (2 year) follow up from Ruiz Ibán (2023)
Clinical effectiveness	MSAC noted the Ruiz Ibán (2023) trial showed superiority in imaging-based outcomes such as retear rates but no significant differences in patient-reported outcomes (PROs) compared to standard of care (surgery without augmentation). (pg4, PSD for MSAC application 1593.1, Aug 2024 MSAC meeting). MSAC considered an updated ADAR should provide RCT evidence with non-radiological measures as primary outcomes. (pg4-5, PSD for MSAC application 1593.1, Aug 2024 MSAC meeting).	Not adequately addressed. The ADAR presented longer term follow up from Ruiz Ibán (2023), which maintained the retear rates as the primary outcome and no statistically significant differences in patient-reported outcomes were noted. The ADAR presented long term follow up from Camacho-Chacon (2023) which demonstrated statistically significant differences in ASES and CMS. The ADAR argued that 'Radiographic retears, while considered a surrogate outcome, are strongly supported by a robust body of evidence underscoring their significant clinical relevance. The concerns raised by MSAC are addressable, especially when considering the robust combined evidence from RCTs outlined in the literature alongside the updated two-year Ruiz Ibán data (available in the CSR and submitted manuscript), which strengthens the case for this outcome's clinical significance.'

[6] Public Summary Document, MSAC Application No. 1593 – Bovine bioinductive collagen implant (REGENETEN™) for repair of rotator cuff tear; https://www.msac.gov.au/applications/1593

[7] Public Summary Document, MSAC Application No. 1593.1 – Bioinductive implant for repair of rotator cuff tear; https://www.msac.gov.au/applications/1593-1

Component	Matter of concern	How the current ADAR addresses it
	MSAC considered that the updated ADAR should consider a focus on the clinical claim that REGENETEN reduces time to recovery (pg5, PSD for MSAC application 1593.1, Aug 2024 MSAC meeting).	Not addressed. The applicant did not consider that changes in time to recovery were relevant to the FTRCT population.
Economic Evaluation	MSAC considered that the updated ADAR should consider respecifying the economic evaluation for FTRCT with the inclusion of appropriate downstream costs, use of trial-based or time trade-off utility weights and shortening the time horizon to 1 year (as retear rates were only available at 12 months).	Not adequately addressed. The economic evaluation maintained a two-year time horizon; however, this was supported by longer trial follow up. The utilities were updated based on VAS results from the pivotal trial, however, the method in which they were utilised may not have been appropriate.
	MSAC considered it inappropriate that the ADAR model relied heavily on imaging outcomes (pg3, PSD for MSAC application 1593, July 2020 MSAC meeting).	Not adequately addressed. The ADAR provided an additional CEA that utilised MCID for CMS. However, the method used to calculate the difference in MCID may not have been appropriate.
Financial impact	MSAC considered that the financial estimates were uncertain and that the likely uptake and utilisation of BCI was significantly underestimated.	Partially addressed.

Source: Compiled during evaluation.
Abbreviations: ADAR = applicant developed assessment report; ASES = American Shoulder and Elbow Society; CMS = Constant Murley Score; FTRCT = full-thickness rotator cuff tears; MCID = Minimal Clinical Important Difference; MSAC = Medical Services Advisory Committee; PSD = Public Summary Document; PTRCT = partial-thickness rotator cuff tears.

5. Prerequisites to implementation of any funding advice

The REGENETEN bioinductive implant was included in the Australian Register of Therapeutic Goods (ARTG) by the Therapeutic Goods Administration (TGA) as Class III Medical Device in July 2020. There have been some variations from application 1593.1 which were not highlighted in the 1593.2 ADAR. ARTG ID 340095 and 340096 were cancelled under Section 41GL(d) of the Act - Cancellation by sponsor. The intended purpose for the above inclusion was for “the management and protection of tendon injuries”.

The remaining ARTG entry 384118 for REGENETEN Bioinductive Implant with Arthroscopic Delivery System, effective date 2 May 2024, has the intended purpose:

- The REGENETEN Bioinductive Implant is a medical device intended for the management and protection of tendon injuries.
- The REGENETEN Bioinductive Implant is indicated for the management and protection of rotator cuff tendon injuries in which there has been no substantial loss of tendon tissue.

The TGA indication is broader than the proposed FTRCT population and may provide potential for leakage outside of the FTRCT population.

The device is currently available in Australia.

6. Proposal for public funding

This application is seeking funding on the PL for BCI use as an adjunct in the surgical repair of FTRCT. This application also reduced the requested PL benefit for the BCI kit to $**redacted** (previously $**redacted** in Application 1593.1).

This application does not seek a new MBS item or to amend an existing MBS item number as there are already relevant and clinically appropriate MBS items available that allow the use of BCI in the surgical repair of FTRCT.

The PICO Advisory Sub-Committee (PASC) identified MBS item 48960 as the most suitable option for arthroscopic rotator cuff repair, which is more commonly performed than the mini-open technique. Although both techniques attract the same MBS fee under item 48960, evidence indicates arthroscopy is costlier and takes more time than the mini-open approach. Orthopaedic surgeons, already trained in these procedures, do not require additional training to use BCI for appropriate patients.

The existing MBS items relevant for this application are MBS item 48960 for shoulder surgical repair and MBS items 17610, 21622 and 17615 for the use of anaesthesia. MBS item 48960 is not restricted to services comprising FTRCT repairs. The department developed a potential new MBS item (489XY(3)) for the repair of a FTRCT using BCI with a frequency limitation of one service per shoulder per lifetime. This was done at the request of ESC to provide an option for MSAC consideration to address the specific concerns about potential leakage:

Category 3 – Therapeutic Procedures

489XY(3)

Shoulder, repair of rotator cuff with insertion of implant, by open, arthroscopic, arthroscopic assisted or mini open means if;

a. a full-thickness rotator cuff tear with no substantial loss of tissue is demonstrated on imaging; and
b. the patient has completed at least three months of conservative medical management; and
c. the patient remains symptomatic after conservative medical management; and
d. the implant is included on the prescribed list of medical devices and human tissue; and
e. including any of the following (if performed):
    i) decompression of subacromial space by acromioplasty;
    ii) excision of coraco-acromial ligament, distal clavicle and acromioclavicular joint;
    iii) excision of the bursa;
    iv) biceps tenodesis;

other than a service associated with a service to which any open or arthroscopic procedure of the same shoulder applies
Applicable only once per shoulder per lifetime (H)

(Anaes.) (Assist.)

Fee: $1,098.25 Benefit: 75% = $823.70

The ADAR included MBS item 17615 based on the procedure time of 15-30 minutes. In ADAR 1593.1, ESC considered that both anaesthesia consultation (MBS item 17615) and anaesthesia items (MBS 23010, 23025, 23035) may be associated with the surgical repair. These items were not directly used in the economic evaluation in Application 1593.1 or 1593.2. In addition, MBS item 51303, surgical assistant, has not been included in this application with no reason given.

The MSAC previously expressed concern (PSD for MSAC 1593) that device insertion could occur multiple times despite the device being designed for single-use only and the intervention of device insertion to occur once per shoulder. Commentary for Application 1593 suggested that private health insurers could address this potential misuse by implementing restrictions, such as a lifetime usage limit. In the Application 1593.1 ADAR, it was stated that BCI was considered to be a 'once-only' procedure per tendon with PASC noting that the applicant stated its willingness to work with the relevant authorities to ensure a "once-per-shoulder" restriction (MSAC 1593.1 Ratified PICO Confirmation, pg10-11). In the current ADAR, the applicant confirmed and agreed that limiting the intervention to one use per shoulder per lifetime was appropriate.

7. Population

The population is patients with symptomatic FTRCT where there is no substantial loss of tendon tissue and who have failed at least 3 months of CMM and are considered eligible for (or indicated for) surgical repair.

Patients with symptomatic FTRCT should fail CMM (i.e., pain relief, modified daily activities, and physical therapy) for at least 3 months to become eligible for surgery. PASC noted that, according to clinician advice, the time from the onset of symptoms to presentation to an orthopaedic surgeon is highly variable. However, the time frame of a minimum of 3 months of CMM was deemed reasonable given the nature of rotator cuff tears.

The commentary highlighted that the ADAR included amended current and proposed clinical management algorithms, which were different from both the previous 1593.1 ADAR (removal of PTRCT) and the PASC-recommended algorithm (PICO 1593.1). The revised algorithm is more consistent with the previous ADAR than with the PICO algorithm, yet the same issues raised in the previous commentary persist in this ADAR. The PASC algorithm suggested that patients in the "no surgery" group would eventually undergo arthroscopic surgery. Conversely, the ADAR argued that it would be unrealistic for patients initially opting for "no surgery" to later proceed with arthroscopic or mini-open surgery (with or without BCI). The ADAR proposed that the clinical management algorithm failed to consider cases where patients improve after CMM, relapse, and re-enter the treatment pathway. However, the Application 1593.1 and current commentary noted that the PASC algorithm already accounted for this by including a treatment arm for relapsed CMM patients, whereas the amended algorithm reset the treatment pathway entirely. Additionally, relapsed CMM patients were not viewed as needing re-establishment of cuff disease, reinforcing the appropriateness of the PASC algorithm.

8. Comparator

The ADAR identified standard surgical repair (take-down and repair, using suture anchors alone) as the comparator. This approach represents the current standard of care for patients who have not responded to 3 months of CMM, including pain relief, modified daily activities, and physical therapy, and are eligible for surgical intervention. The comparator is already funded through the

MBS. (Refer to Section 5 for the relevant MBS item applicable to both the comparator and the intervention).

9. Summary of public consultation input

At the time of ESC consideration, feedback had been received from 15 health professionals and 3 consumers however, all feedback was considered by MSAC. Total consultation input was welcomed from:

1593.2 – Bioinductive implant for the repair of rotator cuff tear (Smith & Nephew Pty Ltd)	No. of Inputs Received
Health Professionals (24)	
I am a health professional or health academic working in the area.	24
Consumers (5)	
I have the health condition that this health service or technology is for.	1
I have the health condition that this health service or technology is for and have experience with the proposed health service or technology.	2
I am a parent, partner or another person caring for someone from the above two groups.	2
Grand Total	**29**

Level of support for public funding

All consumers who provided input were supportive of this application. Of the health professionals who provided input, 23 provided their support for its funding, with one noting they did not support the application due to a lack of evidence to support that BCI is more effective than standard repair.

Comments on PICO

- Many health professionals described the proposed population as appropriate and aligning with clinical practice. One health professional noted there was no mention of use of BCI in revision surgery in the application and noted this is an area where the technology may be most useful.
- Many health professionals agreed with the proposed approach, noting it reflected standard methods for rotator cuff repair surgery in Australia. Two health professionals suggested the technology would not be required for patients with small to medium tendon tears with good quality tissue, small one-tendon FTRCTs, or PTRCTs. One health professional noted they rely on intraoperative findings and patient-specific factors to guide the use of BCI.
- Many health professionals described the comparator as appropriate and reflective of Australian clinical practice.
- Many health professionals agreed with the proposed outcomes, with many noting they reflect the real-world benefits observed in practice, as well as aligning with the 'growing body' of international evidence.
- One health professional expressed concerns over the evidence provided in the application, noting 'not one randomised control trial (RCT) is published on this topic'. Both Ruiz Ibán et al. 2025 and Camacho-Chacón 2024 are published RCTs. Other health professionals referred to RCTs conducted in Europe, and noted the data is 'long-term' and providing 'clinical and radiological certainty confidence' that patients who undergo treatment with the technology maintain positive outcomes over time.

- Some health professionals suggested the procedure would need its own MBS number to analyse use and need for revision surgery more easily, as well as to facilitate a different fee for the increased time and expertise required in its implementation. Others stated the application would use an existing MBS item descriptor, noting the technology will often be used to supplement complex or massive repairs.
- Some health professionals stated they had not seen information about the fees in the application. Many stated they would support a fee that appropriately reflects the value of the technology, as well as the additional clinical judgment and intraoperative decision-making required for its proper use. Others said they agreed with the fee, noting it will provide greater accessibility for a wider variety of patients.

Perceived Advantages

- Consumers who had experience with the technology expressed that they were pleased with the outcome of their surgery with BCI. One consumer described their outcomes had exceeded their expectations, including: full range of movement; a return to sports, outdoor and family activities without restrictions; faster regaining of function and strength.
- Consumers who had discussed the technology with their surgeon or conducted their own research described perceived advantages of the technology, including; assisting the body's natural healing process; speeding up recovery time; reducing and potentially eliminating pain; reducing dependence on others; reducing medical appointments and hospitalisations; improving self-esteem; continuation of sport and outdoor activities.
- Health professionals mentioned many of the same advantages as consumers, as well as additional benefits of the technology, including: improved healing rates documented in those whom the technology is used versus those who only have a surgical repair; improved clinical and imaging outcomes in patients; preservation of the shoulder and improved tendon quality; reduced need for future surgeries; easy and efficient use, only adding an extra 10-20 minutes to surgery; improved flexibility in surgery, allowing for a real-time assessment about whether the implant is needed; and reduced post-operative pain for patients.

Perceived Disadvantages

- Both consumers and health professionals noted the current costs of the technology as prohibitive.
- Some health professionals noted the cost of the technology will be offset downstream through selective use of the technology, as well as by the faster recovery rates, reduced rehabilitation needs, and potentially lowered re-tear or revision rates associated with its use.

Support for Implementation and Issues

- Consumers noted the need for physiotherapy or appropriate exercises to assist in recovery.
- Many health professionals stated they already use this technology in practice, noting current costs restrict its use to only those willing to self-fund or participate in clinical studies. Many expressed a willingness to use it once publicly funded.
- One health professional noted the need for training programs to ensure surgeons are proficient in using the implant effectively, as well as adequate hospital and clinic support to ensure adequate provision of the service. Another noted the utilisation of this technology should be limited to surgeons trained in its use.
- Another health professional noted the need for clear clinical guidelines to support appropriate patient selection, as well as to ensure consistent, evidence-based use.

10. Characteristics of the evidence base

The ADAR provided evidence for using BCI in the repair of FTRCT based on RCTs identified through a systematic literature search, and included literature made available by the manufacturer or lead investigator to the applicant as it was unpublished at the time of ADAR lodgement but has since been published. The ADAR provided evidence related to FTRCT based on two RCTs (Ruiz Ibán et al.,2025[8],[9] and Camacho-Chacon et al.,2024[10],[11]) and stated that supplementary evidence to support safety claim was provided based on one Australian PTRCT RCT (Wang et al., 2023[12]). However, no data from Wang et al., (2023) was presented in the ADAR, nor was the CSR report. Table 2 summarised the key features of the included evidence based on RCTs.

Table 2 Key features of the included evidence

References	N	Design/ duration	Risk of bias*	Patient population	Outcome(s)	Intervention	Comparator	Use in economic evaluation
Ruiz Ibán et al. (2023); and (Ruiz Ibán et al., 2025 (CSR)	120	Prospective, MC, triple blinded RCT of one year's duration.	Low	Non-acute symptomatic (>3 months) posterosuperior FTRCT with anteroposterior size between 1 and 4 cm	CMS; ASES Score; EQ-5D-5L; Brief Pain Inventory; MRI – integrity of repaired tendon using the Sugaya score; AEs	Transosseous -equivalent full-thickness tendon repair with Bioinductive Implant	Surgical procedure only: transosseous equivalent repair without augmentation	Yes
Camacho-Chacon et al., (2024)	60	Prospective, patient-blinded, single surgeon RCT of two-year duration.	Low	Patients presenting with a small to medium size posterosuperior rotator cuff tear confirmed by MRI	ASES Score; VAS; CMS; Biopsy; MRI; Satisfaction; Work Status; AEs	Isolated Bioinductive implant	Surgical procedure only: transosseous equivalent repair without augmentation	No

Source: Table 17 p 81 , Table 21 p 90 and text of the ADAR.
Abbreviations: AEs = Adverse Events'; ASES = American Shoulder and Elbow Society Score; CMS = Constant-Murley Score; GRC = Global Rating of Change Scale; MRI = Magnetic Resonance Imaging; MC = multicentre; RCT = randomised control trial; SANE = Single Assessment Numeric Evaluation Score; VR-12 = Veterans Rand – 12 score

Ruiz Ibán et al.,2023 and Wang et al.,2023 were provided sponsorship by the applicant – the ADAR stated, "While they may obtain some level of support they have been independently designed, derived and maintained by the researcher". Ruiz Ibán et al., (2025) was unpublished at the time of ADAR lodgement and made available by the lead investigator upon the applicant's request. Camacho-Chacon et al., 2024 and Ruiz Ibán et al., 2025 were conducted in Spain. Both RCTs are now published.

Camacho-Chacon, (2023); and Camacho-Chacon *et al.,* (2022) were included in the previous ADAR in support for PTRCT as the Isolated Bioinductive repair technique does not use sutures

[8] Ruiz Ibán. (2025). Clinical Activity Report: Final Analysis. Clinical Trial on the Effect of REGENETEN Bioinductive Implant in the Supraspinatus Tendon Repair. Smith & Nephew.
[9] Ruiz Ibán *et al.* (2025). Manuscript Draft: Augmentation with A Bioinductive Collagen Implant of A Posterosuperior Cuff Repair is Safe and Effective. A Brief Update of The Results of A Randomized Controlled Trial. The Journal of Arthroscopic and Related Surgery.
[10] Camacho-Chacon J. A. (2023). Investigator Initiated Clinical Report: Final Two-Year Results (Camacho-Chacon and colleagues). Smith & Nephew.
[11] Camacho-Chacon, J. A. *et al*. (2022). Bioinductive collagen implants facilitate tendon regeneration in rotator cuff tears. J Exp Orthop, 9(1), 53.
[12] Wang A. *et al.* (2023). Investigator Initiated Study Clinical Report: Interim Results (ACTRN12620000926932). Smith & Nephew.

and anchors and therefore this procedure is more like the PTRCT procedure. However, the patient population in the RCT was FTRCT and the ADAR provided this evidence in support of their claim. The Camacho-Chacon trial was a single-surgeon, patient blinded RCT designed to evaluate tendon integrity following surgical treatment for FTRCT. Participants in Camacho-Chacon trial had small-to-medium size posterosuperior FTRCT confirmed by MRI (supraspinatus full-thickness tear (either small (<1cm) or medium (1-3cm)) based on Cofield Classification). In the previous ADAR the applicant argued that the trial was more in line with PTRCT then FTRCT as the procedure used REGENETEN without underlying suture anchors which was similar to the procedure used to repair PTRCT. The Camacho-Chacon trial was a single surgeon trial, and therefore, the use of PTRCT technique to repair FTRCT might not reflect actual practice in the clinical setting. Thus, the previous commentary considered the study population in the Camacho-Chacon 2023 trial was in line with FTRCT.

The comparator arms for the RCTs are similar and in line with the PICO - standard surgical repair performed without BCI, using standard sutures and anchors via arthroscopic or 'mini-open' approaches.

Alongside the evidence presented in the RCTs, the ADAR reported the combined incidence of adverse events exclusively for the BCI group. This involved integrating data from single-arm trials and RCTs, although the ADAR did not clearly detail the implementation process. Additionally, single-arm studies lacked comparative evidence for safety outcomes between the BCI and control groups. The commentary noted that the safety outcomes in the reapplication ADAR were derived from studies with a relatively short follow-up duration of less than two years (this was in line with the two previous assessment reports).

The ADAR also presented data from two systematic reviews examining studies on bioinductive collagen implant Warren et al (2024)[13] and Hurley et al (2025)[14] to support the safety profile. All the FTRCT studies in Hurley et al (2025) were also included in the ADARs commentary and added nothing more to the data. Warren et al (2024) also included the same studies, however, the authors conducted meta-analyses for complications and retear rates. In addition, the authors presented a naïve comparison for Complication rate, Retear rate, Revision surgery, and Shoulder stiffness in FTRCT repair. The commentary considered this comparison to have a high risk of bias, as the meta-analysis for complication and retear rate had high heterogeneity and there was no information provided as to how the studies for the standard repair arm were identified.

11. Comparative safety

Key evidence

The ADAR provided extended follow up for Ruiz Ibán (CSR), 2025 and Camacho-Chacon, 2024 as the key comparative safety data for BCI in FTRCT compared to standard surgical care. In the updated evidence, no patients presented any further complication in the second year of follow-up.

The main safety outcomes presented were adhesive capsulitis, symptomatic re-tear/failure to heal, infection (deep/superficial), death, superficial skin issues (burn), mass (defined as an 8x2x4mm mass on one-year MRI) and extrusion of anchor.

[13] Warren, J. R., Domingo-Johnson, E. R., Sorensen, A. A., Cheng, A.-L., Latz, K. H., & Cil, A. (2024). Bioinductive patch as an augmentation for rotator cuff repair, a systematic review and meta-analysis. Journal of Shoulder and Elbow Surgery, 33(11), 2515-2529.

[14] Hurley, E. T., Twomey-Kozack, J., Doyle, T. R., Meyer, L. E., Meyer, A. M., Lorentz, S. G., Bradley, K. E., Dickens, J. F., & Klifto, C. S. (2025). Bioinductive Collagen Implant Has Potential to Improve Rotator Cuff Healing: A Systematic Review. *Arthroscopy*, *41*(2), 333-342.e332.

The results from Ruiz Ibán et al., 2025 indicated that there was no difference in incidence of safety outcomes in the intervention and control groups. The ADAR claimed that BCI was deemed to be no less safe than standard of care rotator cuff repair based on the Ruiz Ibán et al., 2025 trial. Overall, the commentary noted that the approach to comparative safety seems reasonable; however, no attempt was made to conduct statistical analysis in the ADAR (comparative analyses was conducted during commentary evaluation) and incidence rates were low, making it difficult to draw comparative conclusions.

Table 3 Comparative safety of BCI vs Standard of Care.

Complication	Intervention Groups; % (n/N)	Control Groups; % (n/N)	RR (95 CI%)	Study	Quality[a]
Adhesive capsulitis	3.3% (1/30)	6.7% (2/30)	0.50 (0.02,5.22)	Camacho-Chacon, 2023	⊕⊕⊕⊙ MODERATE
Symptomatic retear/failure to heal	0% (0/61)*	3.2% (2/63)	0.21 (0.01, 4.28)	Ruiz Ibán (CSR), 2023	⊕⊕⊕⊙ MODERATE
Deep Infection	1.6% (1/61)	1.6% (1/63)	1.03 (0.07, 16.1)	Ruiz Ibán (CSR), 2023	⊕⊕⊕⊙ MODERATE
Superficial Infection	1.6% (1/61)	1.6% (1/63)	1.03 (0.07, 16.1)	Ruiz Ibán (CSR), 2023	⊕⊕⊕⊙ MODERATE
Death**	1.6% (1/61)	0% (0/63)*	3.10 (0.13, 74.6)	Ruiz Ibán (CSR), 2023	⊕⊕⊕⊙ MODERATE
Superficial Skin issues (burn)	0% (0/61)*	1.6% (1/63)	0.34 (0.01, 8.29)	Ruiz Ibán (CSR), 2023	⊕⊕⊕⊙ MODERATE
Mass	1.6% (1/61)	0% (0/63)*	3.10 (0.13, 74.6)	Ruiz Ibán (CSR), 2023	⊕⊕⊕⊙ MODERATE
Extrusion of anchor	0% (0/61)*	1.6% (1/63)	0.34 (0.01, 8.29)	Ruiz Ibán (CSR), 2023	⊕⊕⊕⊙ MODERATE

Source: Table 41 p 118 of the ADAR, Commentary Table 1 p129, of MSAC 1593.1 – ADAR + in-line commentary and compiled during evaluation
Abbreviations: CSR = Clinical Study Report; n = number of cases; N = total number; RR = relative risk
* relative risk estimated using a continuity correction of 0.5.
** Patient died due to unrelated cardiac episode eight months after index procedure.
[a] ⊕⊕⊕⊕ High quality: Very confident that the true effect lies close to that of the estimate of effect. ⊕⊕⊕⊙ Moderate quality: Moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different. ⊕⊕⊙⊙ Low quality: Confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect. ⊕⊙⊙⊙ Very low quality: Very little confidence in the effect estimates: The true effect is likely to be substantially different from the estimate of effect.

Supplementary Evidence

The ADAR presented supplementary evidence for FTRCT in the form of a systematic review and meta-analysis (Warren et al., (2024)) and single arm studies. In addition, the ADAR provided single arm studies for PTRCT and a systematic review that combined both FTRCT and PTRCT (Hurley et al., 2025). Hurley et al., 2025 included all studies that were identified by the ADAR and has not been expanded on here. Only FTRCT evidence is presented below. Table 4 presents the comparative analysis presented in Warren et al (2024).

Table 4 Overall complication rate adapted from (Warren et al., 2024) for FTRCT patients vs standard rotator cuff repair

Complication type	Bioinductive collagen implant	Standard surgical repair
Complication rate	15.5%*	15.8%†
Retear rate	8.3%*	21%ϕ
Revision surgery	8.5%	9.6%β
Shoulder stiffness	1.8%	7.6%†

Source: Table 45 p 122 of the ADAR
* Results of meta-analysis.
† Registry of 1661 rotator cuff repairs
ϕ Level II meta-analysis.
β Humana insurance claims database.

Overall, the commentary noted that the data from Warren et al (2024) was difficult to interpret due to the high risk of bias and the variability across the study designs.

Table 5 presents the single arm evidence provided by the ADAR and modified during commentary evaluation. The commentary noted that the approach used by the ADAR to combine study results to form a point estimate was not stated in the evidence presented and could not be replicated; therefore, the following table includes the raw data from the clinical studies.

Table 5 Overall complication rate adapted from the single arm studies (and the bioinductive repair arm of Ruiz Ibán (CSR) 2023) presented in the ADAR

Complication	Publications reporting complication (n/N)
Symptomatic retear/failure to heal	Thon et al., 2019 (1/23)[15] McIntyre et al., 2021 (11/192) [16] Bushnell et al., 2021 (7/115) [17]
Adhesive capsulitis	Bokor et al., 2015 (1/9) [18] Bokor et al., 2019 (1/11) [19] McIntyre et al., 2021 (3/192)
Bursitis/swelling	McIntyre et al., 2021 (1/192) Bushnell et al., 2021 (1/115)
Bicep tendinitis	Micheloni et al., 2020 (4/4)
Postoperative stiffness	McIntyre et al., 2021 (1/192)
Postoperative pain	Bushnell et al., 2021 (1/115) Micheloni et al., 2020 (4/4)
Serious non-implant related adverse event	Ruiz Ibán (CSR), 2023 (1/30)
Postoperative deep infection	McIntyre et al., 2021) (3/192) Ruiz Ibán (CSR), 2023 (1/30)
Superficial Infection	Ruiz Ibán (CSR), 2023 (1/30)
Mass	Ruiz Ibán (CSR), 2023 (1/30)

Source: Table 43, p 120 of the ADAR + in-line commentary and compiled during commentary.
Abbreviations: CSR = Clinical Study Report; n = number of cases; N = total number; RR = relative risk

Overall, the single arm evidence was considered by the commentary to have a high risk of bias and added little to the comparative safety of bioinductive collagen implant versus standard of care.

12. Comparative effectiveness

The ADAR provided the effectiveness evidence for FTRCT based on two RCTs; the Ruiz Ibán et al., 2023 (and updated CSR 2025) trial and the Camacho-Chacon et al 2024 trial. Table 6 presents the data where both studies measured the same outcomes. Both Ruiz Ibán (2025) and Camacho-Chacon (2024) reported a statistically significant improvement in the following outcomes from baseline to post intervention in both trial arms; pain scores, CMS, ASES score and tendon thickness. Ruiz Ibán (2025) demonstrated no statistically significant differences (in improvement) between BCI and the control group in those outcomes at any timepoint. However, Camacho-Chacon (2024) demonstrated a significant difference between groups in CMS, ASES score and tendon thickness at all timepoints post intervention.

[15] Thon, S. G., O'Malley, L., 2nd, O'Brien, M. J. & Savoie, F. H., 3rd 2019. Evaluation of Healing Rates and Safety With a Bioinductive Collagen Patch for Large and Massive Rotator Cuff Tears: 2-Year Safety and Clinical Outcomes. Am J Sports Med, 47, 1901-1908.

[16] McIntyre, L. F., McMillan, S., Trenhaile, S. W., Bishai, S. K. & Bushnell, B. D. 2021. Full-Thickness Rotator Cuff Tears Can Be Safely Treated With a Resorbable Bioinductive Bovine Collagen Implant: One-Year Results of a Prospective, Multicenter Registry. Arthrosc Sports Med Rehabil, 3, e1473-e1479.

[17] Bushnell, B. D., Connor, P. M., Harris, H. W., Ho, C. P., Trenhaile, S. W. & Abrams, J. S. 2021. Retear rates and clinical outcomes at 1 year after repair of full-thickness rotator cuff tears augmented with a bioinductive collagen implant: a prospective multicenter study. JSES Int, 5, 228-237.

[18] Bokor, D. J., Sonnabend, D., Deady, L., Cass, B., Young, A., Van Kampen, C. & Arnoczky, S. 2015. Preliminary investigation of a biological augmentation of rotator cuff repairs using a collagen implant: a 2-year MRI follow-up. Muscles Ligaments Tendons J, 5, 144-50.

[19] Bokor, D. J., Sonnabend, D. H., Deady, L., Cass, B., Young, A. A., Van Kampen, C. L. & Arnoczky, S. P. 2019. Healing of partial-thickness rotator cuff tears following arthroscopic augmentation with a highly-porous collagen implant: a 5-year clinical and MRI follow-up. Muscle Ligaments and Tendons Journal, 09.

Table 6 Comparative efficacy results of BCI vs. SSR in both randomised control trials

		Camacho-Chacon (N=60)				Ruiz Ibán (N=124)			
		Base	**6M**	**12M**	**24M**	**3M**	**6M**	**12M**	**24m**
ASES score (SD)	BCI	49.0 (4.0)	82.0 (5.0)	87.0 (5.0)	88.0 (5.0)	53.0 (18.0)	71.0 (20.8)	78.4 (23.0)	84.2 (21.7)
	SSR	48.0 (2.0)	68.0 (5.0)	75.0 (2.0)	80.0 (5.0)	53.9 (18.9)	70.8 (20.8)	78.7 (24.5)	81.9 (24.4)
	p-value for Dif*		**<0.0001**	**<0.0001**	**<0.0001**	None	None	None	None
CMS score (SD)	BCI	59.0 (2.0)	76.0 (4.0)	86.0 (5.0)	88.0 (2.0)	44.6 (16.5)	65.3 (18.9)	75.8 (20.2)	80.5 (19.8)
	SSR	57.0 (4.0)	63.0 (5.0)	72.0 (4.0)	72.0 (3.0)	46.3 (16.0)	64.7 (19.0)	77.2 (18.5)	76.2 (21.2)
	p-value for Diff*	**0.0013**†	**<0.0001**	**<0.0001**	**<0.0001**	None	None	None	None
Tendon Thickness by Group (mm)	BCI	4.19 (0.03)	6.21 (0.32)	6.28 (0.29)	6.25 (0.25)	NR	NR	Footprint: 4.52	Footprint: 3.92
	SSR	4.18 (0.03)	5.01 (0.22)	5.04 (0.14)	5.04 (0.15)	NR	NR	Footprint: 3.9	Footprint: 3.5
	p-value for Diff*		**<0.0001**	**<0.0001**	**<0.0001**	NR	NR	**0.024**	**0.035**

Source: Table 20 p 89 of the ADAR + in-line commentary., Figure 4, p 8 of Ruiz Ibán (CSR) 2023, Figure 4, p 16 of Ruiz Ibán (CSR) 2025, and compiled during evaluation.

Abbreviations: ASES = American Shoulder and Elbow Society; BCI = Bioinductive collagen implant; CMS = Constant Murley Score; Dif = difference between groups; GRC = Global Rating of Change Scale; mm = Millimetre; M = Months; NR = not reported; SD = Standard Deviation; SSR = standard surgical repair;

* The p value for difference relates to the comparison of the groups at the difference time points, i.e. a p value of <0.05 demonstrates that at that time point there is a significant difference between the BCI arm and the control arm.

† Regardless of the significant difference in CMS scores at baseline, there was a statistically significant improvement in CMS scores at each time point in the BCI arm.

Numbers in **bold** indicate statistical significance between the two arms.

In addition, Ruiz Ibán (2025) reported a significant improvement in EuroQol-five-dimension scale (EQ-5D-5L) from baseline in the intervention and control groups, again with no difference between groups. Table 7 presents the data on outcomes presented in Ruiz Ibán (2025). The retear rates from Ruiz Ibán (2025) trial were used in the economic evaluation.

Table 7 Comparative efficacy results of BCI vs. SSR in Ruiz Ibán (2025)

		Ruiz Ibán (N=124)			
		3M	**6M**	**12M**	**24m**
Retear Rates n/N (%)	BCI	NR	NR	5/60/8.3%	12.3%
	SSR	NR	NR	16/62/25.8%	35.1%
	Relative retear risk (95% CI)			**0.32 (0.13 -0.83)**	**0.35 (0.16 - 0.76)**
Pain Progression mean (SD)	BCI	NR	NR	1.50 (2.07)	NR
	SSR	NR	NR	1.52 (2.27)	NR
	Dif	None	None	None	None
TTO EQ-5D-5L (SD)	BCI	2.1 (0.7)	1.8 (0.6)	1.6 (0.6)	1.5 (0.5)
	SSR	2.1 (0.6)	1.8 (0.7)	1.6 (0.6)	1.6 (0.7)
	Dif	None	None	None	None
VAS EQ-5D-5L (SD)	BCI	73.2 (15.2)	77.0 (16.9)	78.1 (16.5)	78.8 (18.6)
	SSR	68.0 (17.5)	74.2 (17.3)	74.9 (20.8)	73.9 (21.8)
	Dif	None	None	None	None

Source: Table 20 p 89 of the ADAR + in-line commentary and compiled during evaluation.
Abbreviations: BCI = Bioinductive collagen implant; Dif = difference between groups; EQ-5D-5L = EuroQol-five-dimension scale-five level; M = Months; N = number of participants; n = number with an event; NR = not reported; SD = Standard Deviation; SSR = standard surgical repair; TTO = time trade off; VAS = Visual Analogue Scale.
Notes: **Bold** indicates significant differences between groups

In terms of imaging-based outcomes, Ruiz Ibán (2025) reported a significantly lower retear rate (8.3 vs 25.8%; p=0.01), a three times lower risk of re-tear (Relative risk (RR)=0.32; 95% CI:0.13–0.83). The commentary noted that the improvement in the imaging-based outcomes in Ruiz Ibán (2025) for BCI did not result in an improvement in PROMs. However, as noted in Camacho-Chacon (2023) (Table 8), there was a statistically significant difference in pain at 6 and 12 months, but not 24 months. There was a statistically significant difference in satisfaction at 12 and 24 months.

Table 8 Comparative efficacy results of BCI vs. SSR in Camacho-Chacon (2023)

	Camacho-Chacon (N=60)				
	Baseline		**6M**	**12M**	**24M**
VAS Pain (SD)	BCI	7.0 (1.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
	SSR	6.5 (1.0)	1.0 (1.0)	1.0 (1.0)	0.0 (0.0)
	Dif		**<0.0001**	**0.0003**	0.1346
Satisfaction* (Neu/S/VS)	BCI	NR	NR	0/3/27	0/3/27
	SSR	NR	NR	2/22/6	0/19/11
	Dif			**<0.0001**	**<0.0001**

Source: Table 20, p89 of the ADAR + in-line commentary and compiled during evaluation.
Abbreviations: BCI = Bioinductive collagen implant; Dif = difference between groups; N = number of participants; Neu = neutral; S = Satisfied; SD = Standard deviation; SSR = standard surgical repair; VAS = Visual Analogue Scale; VS = Very Satisfied
Notes: **Bold** indicates significant differences between groups.

In addition to the effectiveness evidence from the Ruiz Ibán (2025) and Camacho-Chacon (2023) trials, the ADAR presented data from single-arm studies indicating improved tendon integrity and thickness, reduced retear rates, and enhanced quality of life (QoL) with BCI. However, the commentary observed that, apart from the Ferreira Barros (2022) trial, which reported interim findings, single-arm studies did not offer comparative evidence between the BCI and control groups.

Minimal clinical important difference (MCID) for CMS

To calculate the difference in MCID between the groups, the ADAR used the MCID score for CMS from Kukkonen et al (2013)[20] of a change in CMS of 10.4 representing a MCID. The ADAR calculated the mean change in CMS from baseline to 24 months from the Ruiz Ibán (2025) trial. The ADAR then divide this mean change by 10.4 to calculate the mean change in MCID. This led to a mean change in MCID of 0.3971. The commentary considered that this approach was unreasonable as, the average change in CMS is not clinically meaningful as a change in MCID, as the change in MCID is an individual patient approach. A more appropriate method would be to calculate the patients achieving an MCID change in CMS (i.e. A 'responder analysis') and compare those results across treatment arms. The number of patients achieving a MCID in CMS in the Ruiz Ibán 2025 RCT was not available in the clinical evidence provided.

Patient reported outcomes between healed and retorn tendons at 24 months

The ADAR included a post hoc analysis of ASES and CMS score between healed and retorn tendons at 24 months from Ruiz Ibán et al. 2025 participants as shown below in Table 9.

Table 9 Outcome comparison between healed and retorn tendons at 24 months

	Healed	Retear	p-value	MCID (Harris et al., 2023)
Number of patients	87	25		
ASES	84.4±21.1	71.7±30.2	0.0069	12.8
Constant Murley	80.2±19.0	66.2±27.6	0.0150	11.2

The values are given as mean ± standard deviation. ASES = American Shoulder and Elbow Society. MCID = Minimally clinical important difference. P-value represents significant difference between healed and retorn tendons.
Source: Table 25, p 94 of the ADAR (Ruiz Iban et al., 2025 (CSR))

In their pre-MSAC response, the applicant claimed the statistically significant improvements in ASES and CMS at 24 months for healed tendons compared to those with retears, and the fact that the MCID threshold had been exceeded, supported the claim that imaging-confirm healing is a valid and relevant surrogate marker for patient benefit.

MSAC considered that this post hoc analysis of trial participants from Ruiz Ibán et al. 2025 was a lower level of evidence with a higher risk of bias because it was no longer making a comparison between the BCI and standard surgical repair groups in the randomised trial. MSAC considered a relationship between retear rates on imaging and functional outcomes was not supported because higher quality, direct evidence from the Ruiz Ibán et al. 2025 randomised trial showed that while surgery with BCI had a lower retear rate on imaging, functional outcomes were similar between patients who had surgery with BCI or standard surgery.

Clinical claim

The clinical claim is that the BCI results in superior health outcomes for patients with FTRCT through improved efficacy and non-inferior safety in comparison standard surgical repair.

The commentary considered the clinical claim of noninferior safety reasonable with safety outcome data available for up to 24 months post-surgery. However, adverse event incidence

[20] Kukkonen, J., Kauko, T., Vahlberg, T., Joukainen, A., & Aarimaa, V. (2013). Investigating minimal clinically important difference for Constant score in patients undergoing rotator cuff surgery. J Shoulder Elbow Surg, 22(12), 1650-1655. https://doi.org/10.1016/j.jse.2013.05.002

rates were low, leading to large confidence intervals in the comparative analysis.

The commentary considered the clinical claim of superior effectiveness was uncertain because:

- The results from the main trial, Ruiz Ibán (2025), showed superiority only in imaging-based outcomes such as retear rates. The ADAR argued that 'The concerns (around imaging outcomes and PROs raised) by MSAC previously are addressable, especially when considering the robust combined evidence from RCTs outlined in the literature alongside the updated two-year Ruiz Ibán data, which strengthens the case for this outcome's clinical significance.'
- The ADAR stated that radiographic retears are strongly supported by a robust body of evidence underscoring their significant clinical relevance, although no evidence was presented in the ADAR to support this statement. In Ruiz Ibán (2025) no significant differences were reported in PROs compared to standard of care (e.g., the CMS, ASES score or EQ-5D-5L).
- There were differences between the two trials, with Camacho-Chacon (2023) demonstrating significant differences in outcomes where Ruiz Ibán (2025) did not, suggesting that there may be some issues with the sample sizes and the different surgical approaches in the two trials.
- There was no significant difference in the MCID of CMS between the treatment groups.

13. Economic evaluation

The ADAR included an economic evaluation utilising a decision tree model with a two-year time horizon. A CUA and CEA was performed by integrating retear rates from clinical literature and assigning utility values to patients with successful treatment outcomes and those experiencing retears. The ADAR justified the two-year time horizon as adequate to account for most retears and the associated treatment costs.

Table 10 summarised the economic evaluation presented in the current ADAR.

Table 10 Summary of the economic evaluation

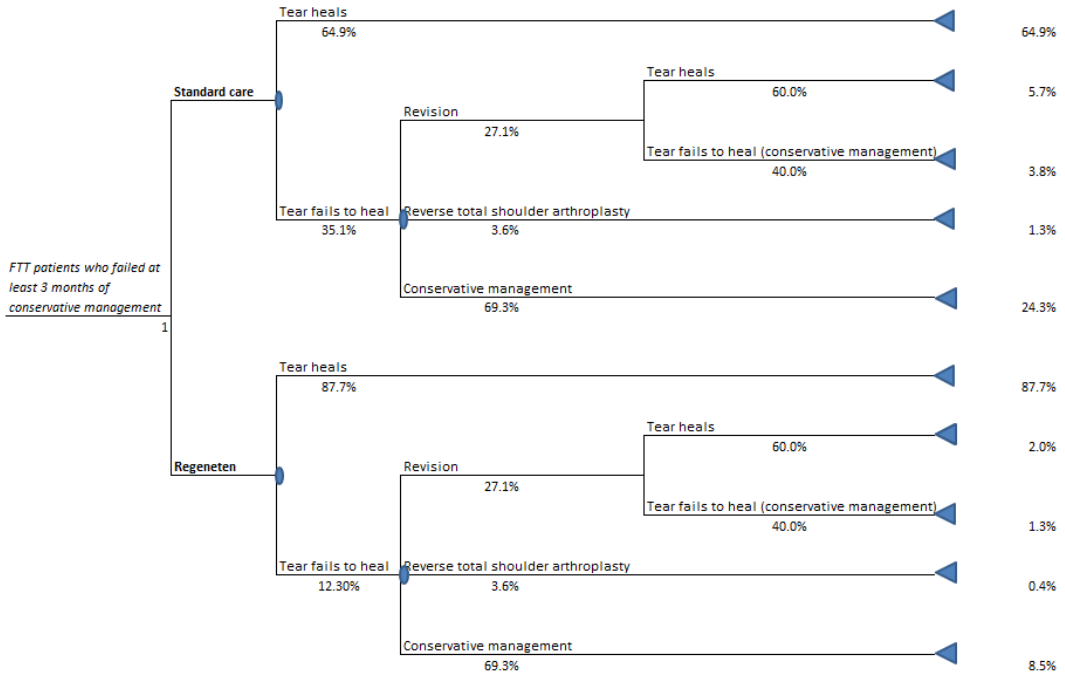
	Description
Perspective	Australian health care system perspective
Population	Patients with diagnosed symptomatic FTRCT where there is no substantial loss of tendon tissue: that have failed at least 3 months of conservative management (not responded to pain relief, modified daily activities and physical therapy); and considered eligible for (or indicated for) surgical repair.
Comparator	Standard surgical repair (without BCI), with repair performed using standard sutures or anchors, performed arthroscopically or with 'mini-open' approach
Type(s) of analysis	Cost-utility analysis (CUA), Cost-effectiveness analysis (CEA)
Outcomes	Quality-adjusted life years (QALYs) and cost per healed tear, minimal clinically important difference (MCID)
Time horizon	2 years
Computational method	Decision tree
Generation of the base case	Modelled
Health states	1. Tear heals 2. Tear fails to heal 2.1. Revision surgery 2.1.1. Tear heals 2.1.2. Tear fails to heal 2.2. Reverse total shoulder arthroplasty 2.3. Conservative management
Cycle length	Not applicable (decision tree model)
Discount rate	5% for both costs and outcomes
Software	Microsoft Excel

The model structure was derived from McIntyre et al., (2023)[21], an applicant-sponsored study that assessed the cost-effectiveness of adding resorbable BCI to conventional rotator cuff repair (RCR), compared to RCR alone, in treating FTRCT over a one-year time horizon. Figure 1 illustrates the decision tree structure used in the economic evaluation. The decision tree model aligned with the economic model in McIntyre et al. (2023), except for differences in the retear rates following revision surgery provided the structure of the decision tree for the economic evaluation.

The ADAR used the pivotal trial by Ruiz Ibán (2025) to drive the clinical parameters in the model. Patient characteristics, employment status, retear rates (transition probabilities to the health states, "tear fails to heal" and "tear heal") as well as utility values and MCID change in the CMS score were all sourced from Ruiz Ibán (2025). Transition probabilities for post-surgical tear repair/management were taken from multiple sources, as they were not available in the trial. As Ruiz Ibán et al. (2023) did not report the mean time to retear, the ADAR applied an assumed average time to retear of 6 months within the model. This assumption was derived from the Bushnell et al. (2022) [22] study, which focused on the double-row repair technique and observed that patients typically experienced a retear midway through their follow-up period. Bushnell et al. (2022) was a multicentre cohort study providing two-year outcomes for a BCI utilised in the repair of FTRCT.

[21] McIntyre, L. F., L. M. Nherera and T. F. Schlegel (2023). "Resorbable Bioinductive Collagen Implant Is Cost Effective in the Treatment of Rotator Cuff Tears." Arthrosc Sports Med Rehabil 5(2): e367-e374.
[22] Bushnell, B. D., Connor, P. M., Harris, H. W., Ho, C. P., Trenhaile, S. W., & Abrams, J. S. (2022a). Two-year outcomes with a bioinductive collagen implant used in augmentation of arthroscopic repair of full-thickness rotator cuff tears: final results of a prospective multicenter study. J Shoulder Elbow Surg, 31(12), 2532-2541

Figure 1: Decision tree structure of the economic evaluation for FTRCT



Source: Figure 13, p132 of the ADAR
Abbreviations: FTT = Full-thickness tear.

Following a retear, patients may undergo revision RCR, reverse shoulder arthroplasty, or CMM. As neither trial nor Australian-specific data on treatment distribution is available, the ADAR used probabilities from a number of sources. The PearlDiver Mariner dataset (Truong et al. 2021)[23] was used to query the revision surgery and reverse total shoulder arthroplasty rates. This was achieved by using the unhealed rate from Ruiz Ibán (2025) and the cohort from Truong et al (2021). In the paucity of data this may be the only way of achieving these probabilities; however, the commentary notes that the unhealed rate in Ruiz Ibán (2025) may be substantially different to that in Truong et al (2021).

Health Outcomes

In response to feedback from MSAC (MSAC PSD 1593.1 p32), the ADAR for 1593.2 changed the approach to utilities by incorporating the health related QoL data collected alongside the Ruiz Ibán (2025) trial in the economic evaluation. However, rather than using the EQ-5D-5L descriptive scores from different time points to "tear heals" and "tear fail to heal" in the trial, the ADAR developed an approach that adjusted the trial EQ-5D-5L VAS scores and applied these to the CMS.

Using the EQ-5D-5L VAS the ADAR calculated 'adjusted VAS scores' and applied these as different utility weights healed and unhealed patients in Year 1 and Year 2 of the model. For each individual year, the ADAR calculated an "average CMS" using the combined treatment populations = (% Healed for that year × CMS for a healed patient) + (% Unhealed for that year × CMS unhealed). The calculation estimated that the average CMS in Year 1 for both populations combined was 0.77813. Then the ADAR calculated an adjusted VAS for the different populations

[23] Truong, N. M., Cevallos, N., Lansdown, D. A., Ma, C. B., Feeley, B. T., & Zhang, A. L. (2021). Arthroscopic Rotator Cuff Repair Results in Lower Two-Year Reoperation Rates Compared With Open Rotator Cuff Repair in a Large Cross-sectional Cohort. Arthrosc Sports Med Rehabil, 3(6), e2015-e2023

(healed and unhealed). This was done as follows - Adjusted VAS=Initial VAS × (average CMS score (for the grouped e.g. healed)/Average CMS (for the year)).

The commentary noted that this approach may not be appropriate as there is no mapping of utility to health state, and the ADAR assumed that the overall average utility could be apportioned equally based on the CMS score. For this to be true, there needs to be an assumption that there is a linear correlation between CMS score and quality of life. There is no justification provided by the ADAR for this and the commentary noted that this assumption is unlikely to be true. In addition, the ADAR did not present the utility value results for the EQ-5D-5L (VAS) (or TTO), making it difficult to interpret the results presented in the ADAR and whether the difference in QALY gained in the model is appropriate. With the available data from the Ruiz Ibán (2025) trial the commentary considered that it would be possible to determine the utilities of the different health states and to compare across trial arms. The approach taken by the ADAR is likely to favour the intervention, given that there was no statistical difference noted between treatment arms in the clinical trial.

The ADAR used a disutility of 0.03 for revision surgery and reverse arthroplasty citing that it was based on the Dornan et al (2017)[24]. This disutility calculation in Dornan et al (2017) assumed that revision surgery would have a disutility of 1.5 times that of arthroscopic rotator cuff repair with the disutility of arthroscopic rotator cuff repair coming from Mather et al (2013). It is unclear from Mather et al (2013) whether this disutility was assumed or based on patient data. A higher disutility would favour the intervention.

The ADAR model also presents cost effectiveness data for cost per healed tear and cost per MCID. The approach of using the average change in CMS for the total population as a change in MCID was not considered reasonable by the commentary. The commentary considered that this approach was unreasonable for two key reasons. Firstly, there was no statistical difference in the change of CMS between the treatment arms, therefore it is likely that there is no statistical difference between the mean MCID. Secondly, the change in MCID should be applied as the number of patients achieving an MCID change in CMS and compare those results across treatment arms. The appropriate approach should be to calculate the number of patients achieving a MCID of 10.4 for CMS. The health data for healed tear were taken directly from the Ruiz Ibán (2025) trial. This was considered appropriate by the commentary.

Health care resource use and costs

The ADAR included relevant device and material costs in both intervention and comparator arms and the commentary considered these costs appropriate. The ADAR did not include cost for the standard suture anchor repair in either arm as the use of BCI was additional to the standard suture anchor repair in the FTRCT population. The main costs for the FTRCT population were associated with the management of patients following a retear. Patients could undergo a rotator cuff tear revision or reverse total shoulder replacement (RTSP), or stay in conservative management (e.g., physiotherapy session, pain medication, etc.). The ADAR sourced these cost data from different sources (Table 11). Overall, the commentary considered the majority of sources to be appropriate.

[24] Dornan, G. J., Katthagen, J. C., Tahal, D. S., Petri, M., Greenspoon, J. A., Denard, P. J., Burkhart, S. S., & Millett, P. J. (2017). Cost-Effectiveness of Arthroscopic Rotator Cuff Repair Versus Reverse Total Shoulder Arthroplasty for the Treatment of Massive Rotator Cuff Tears in Patients With Pseudoparalysis and Nonarthritic Shoulders. Arthroscopy, 33(4), 716-725.

Table 11 Inputs used in the economic evaluation for FTRCT

Parameter	Value	Source
Unit Costs		
BCI	$**redacted**	Proposed benefit from S+N
Workers' compensation payout per week	$1,399	ABS: Average weekly earnings Australia (May 2023)
Cost of physiotherapy sessions	$110	Oneflare, sourced from; < https://www.oneflare.com.au/costs/physiotherapist>
Cost of corticosteroid injection	$65	Green Square Health, sourced from: < https://gshealth.com.au/service/surgical-procedures/corticosteroid-injections>
Shoulder MRI	$331.10	Shoulder MRI, MBS item #63325 (Benefit 75%)
Total cost of revision surgery after tear fails to heal		
Surgery revision	$9,798 *$12,290#*	Private Health Insurance Medibank, sourced from: < https:// www.medibank.com.au/health-support/hospital-assist/costs/rotator-cuff-repair/ > *Department of Health and Aged Care. Medical Cost Finder "Shoulder reconstruction or repair including rotator cuff repair". 2022-2023*
Cost of physiotherapy sessions for rehabilitation	$1,980	Calculation based on 18 physiotherapy sessions
Total cost of revision	$11,590 *$14,270#*	Sum of two cost items above
Total cost of reverse total shoulder replacement after tear fails to heal		
Reverse total shoulder replacement	$26,656 *$28,700#*	Private Health Insurance Medibank, sourced from: < https:// www.medibank.com.au/health-support/hospital-assist/costs/shoulder-replacement/ > Department of Health and Aged Care. Medical Cost Finder "Shoulder reconstruction or repair including rotator cuff repair". 2022-2023
Cost of physiotherapy sessions for rehabilitation	$1,980	Calculation based on 18 physiotherapy sessions
Total cost of reverse total shoulder replacement	$28,636 *$30,680#*	Sum of two cost items above
Total cost of clinical management per year		
Clinical management costs per year	$1,311	MSAC: Review of MBS items for subacromial decompression
Cost of physiotherapy sessions for rehabilitation per year	$1,320	Calculation based on the cost of 12 physiotherapy sessions per year (number of physiotherapy session sourced from Cederqvist et al. (2021))
Cost of corticosteroid injection per year	$390	Calculation based on the cost of 6 corticosteroid injections per year (number of corticosteroid injections sourced from Cederqvist et al. (2021))
Total cost of Clinical management (per year)	$3,021	Sum of the three cost items above

Source: Table 54, p 144 of the ADAR.
Abbreviations: MBS = Medicare Benefits Schedule, MRI = Magnetic Resonance Imaging; MSAC = Medical Services Advisory Committee
ESC noted misalignment in costs inputs presented in Table 11. Costs in *italics* used in the model and results of the economic evaluation. These costs were not able to be independently verified.

In addition to the cost estimated by MSAC for CMM [25], the ADAR claimed that an additional 12 physiotherapy sessions and 6 corticosteroid injections were needed per year and were added to CM in both arms. This was based on The ShoulderStudy.com. However, this relates to the non-operative protocol of a USA based study and was not related to post operative care, so may not be applicable in this setting. In addition, Cederqvist et al., (2021) [26] is a Finish study, and the commentary could not confirm where the ADAR estimates (12 physiotherapy sessions and 6 corticosteroid injections) were in this study as the study protocol had only four visits over five years (3, 6, 12, 24 months, and 5 years), and only 8% of patients received corticosteroid injections. The true rate of physiotherapy and corticosteroid injections for both these health states is unknown for Australia. While the associated costs are assumed to be identical by the ADAR, as the control arm has a higher percentage of tear fail to heal patients any overestimation in the costs of treating these patients will favour BCI.

Results of the economic evaluation

Table 12 summarised the base-case results for the economic evaluation of the 3 outcomes (cost per tear healed, cost per MCID, and cost per QALY)

Table 12 Results of the stepped economic analysis

Step	BCI	Standard of care	Increment	ICER
Base-case results of the model - Cost effectiveness analysis for tears healed. Time horizon: 2 years				
Costs	**$redacted**	$3,037	**$redacted**	
Outcome 1 (tears healed)	0.877	0.649	0.228	**$redacted**
Base-case results of the model - Cost per MCID in CMS				
Costs	**$redacted**	$3,037	**$redacted**	
Outcome 1 (MCID)	3.71	3.31	0.40	**$redacted**
Base-case results of the cost utility analysis				
Costs	**$redacted**	$3,037	**$redacted**	
Outcome 3 (QALYs)	1.55	1.49	0.064	**$redacted**

Source: Tables 56 to 58, p144 of the ADAR
Abbreviations: CMS = Constant Murley Score; ICER = incremental cost-effectiveness ratio; MCID = minimal clinical important difference; QALY = quality-adjusted life year.

The commentary noted that the results of the base case analysis were uncertain given the uncertainty in key model parameters as discussed above including health state utilities, post-surgical care costs and MCID.

Table 13 presents the key drivers in the economic evaluation.

[25] Public Summary Document, MSAC Application No. 1711 – Review of MBS items for subacromial decompression https://www.msac.gov.au/applications/1711

[26] Cederqvist S, Flinkkilä T, Sormaala M, et alNon-surgical and surgical treatments for rotator cuff disease: a pragmatic randomised clinical trial with 2-year follow-up after initial rehabilitation. Annals of the Rheumatic Diseases 2021;80:796-802.

Table 13 Key drivers of the model

Description	Method/Value	Impact Base case: $redacted /QALY gained $redacted /MCID gained $redacted /tear healed
Utilities	Low values for model health states post heal failure (conservative management health) taken from adjusting the utility scores in Ruiz Ibán (2025) by CMS score. In addition, the same approach was used for the revision surgery health states in a multivariate sensitivity analysis.	*High, favours BCI.* *Use of 20% increase in year 1 utility for conservative management leads to an ICER of* $**redacted** */QALY gained. If this 20% increase is applied to all years and the reverse total shoulder arthroplasty health state, the ICER increases to* $**redacted** */QALY*
Probabilities	Percentage of patients with tear fails to heal in BCI group was based on retear rates	*Moderate, favours standard care* *Use of 14.8% value for the BCI increases the ICER to* $**redacted** */QALY gained*
Probabilities	Percentage of patients with tear fails to heal in standard care group was based on retear rates	*Moderate, favours BCI* *Use of 28.1% lower value for the standard care increases the ICER to* $**redacted** */QALY gained*

Abbreviations: BCI = bioinductive collagen implant; CMS = Constant Murley Score; ICER = incremental cost-effectiveness ratio; MCID = minimal clinical important difference; QALY = quality-adjusted life year.

The results of key univariate and multivariate sensitivity analyses are summarised below (Table 14). During the commentary evaluation, an additional sensitivity analysis was conducted to assess the impact of using higher utility values for all post tear health states. This was conducted due to the considerable uncertainty in the extrapolation of health states from the Ruiz Ibán et al., 2023 trial to the economic model. A 20% increase was tested in the sensitivity analysis. While it was unclear whether this can be achieved in clinical practice, it demonstrates the sensitivity of the model to utility inputs. Applying these utility values to the model increased the ICER to $redacted /QALY.

Table 14 Sensitivity analyses for BCI

Variable or assumption	Base case value	Plausible alternative(s) or range of values		Cost per QALY	Cost per healed tear	Cost per MCID
Base case				**$redacted**	**$redacted**	**$redacted**
Health state: tear fails to heal (BCI)	12.3%	20% increase:	14.8%	**$redacted**	**$redacted**	**$redacted**
		20% decrease:	9.8%	**$redacted**	**$redacted**	**$redacted**
Health state: tear fails to heal (Standard of care)	35.1%	20% increase:	42.1%	**$redacted**	**$redacted**	**$redacted**
		20% decrease:	28.1%	**$redacted**	**$redacted**	**$redacted**
Utility value (Y1) of conservative management after tear fails to heal	0.664	20% increase:	0.797	**$redacted**	N/A	N/A
		20% decrease:	0.531	**$redacted**	N/A	N/A
Utility value (Y2) of conservative management after tear fails to heal	0.679	20% increase:	0.815	**$redacted**	N/A	N/A
		20% decrease:	0.543	**$redacted**	N/A	N/A
Annual cost of conservative management	$3,021	20% increase:	$3,625	**$redacted**	**$redacted**	**$redacted**
		20% decrease:	$2,417	**$redacted**	**$redacted**	**$redacted**
Cost of BCI kit	**$redacted**	20% increase:	**$redacted**	**$redacted**	**$redacted**	**$redacted**
		20% decrease:	**$redacted**	**$redacted**	**$redacted**	**$redacted**
Multivariate analysis						
Utility value for all tear fails to heal health states	0.679	20% increase:	Y1 - 0.797 Y2 - 0.815	**$redacted**	N/A	N/A
		20% decrease:	Y1 – 0.531 Y2 - 0.543	**$redacted**	N/A	N/A

Source: Table 62, pg147-148 of the ADAR
Abbreviations: BCI = bioinductive collagen implant; ICER = incremental cost-effectiveness ratio; MCID = minimal clinical important difference; QALY = quality-adjusted life year; Y = year.

The commentary noted that the modelled economic evaluation still has uncertainties based on the sensitivity analysis and should be interpreted with caution.

14. Financial/budgetary impacts

The ADAR evaluated the financial impact of including BCI on the PL for private health insurers (PHIs), the MBS and Australian patients. It proposed utilising existing MBS items 48960, 48906,

and 48909, which pertain to rotator cuff repair surgeries, for BCI. However, since 2 of these MBS items are also applicable to other procedures, such as shoulder reconstruction, resection, and replacement, the ADAR employed an epidemiological approach to estimate the financial implications, as a market share approach was not feasible. This was considered a reasonable approach by the commentary. The methods and data used in the financial implications remain mostly unchanged from the previous model. However, the ADAR did make changes to address the key issues highlighted by MSAC (MSAC 1593.1 PSD) and updated the costs to current values.

The ADAR derived data on the percentage reduction in health resource utilisation from the same source as the economic model. Consequently, the issues identified in the transition probability inputs also applied to the financial calculations. For instance, the ADAR adjusted the Ruiz Ibán (2025) data using the Truong et al. (2021) cohort study to estimate the probability of undergoing revision RCR or reverse shoulder arthroplasty.

Net financial impact on Private Health Insurance

The financial implications to the private health insurance system resulting from the proposed listing of BCI are summarised in Table 16.

Table 15 Predicted use and costs of BCI in rotator cuff surgical repair

	Parameter	Year 1 (2025)	Year 2 (2026)	Year 3 (2027)	Year 4 (2028)	Year 5 (2029)	Year 6 (2030)
Estimated use of BCI							
A	Australian population aged ≥18 years	21,522,798	21,905,670	22,277,628	22,641,368	22,989,790	23,327,752
B = A × (225 ÷ 100,000)	Incident population undergoing rotator cuff repair	48,426	49,288	50,125	50,943	51,727	52,487
C = B × 45.0%	Total rotator cuff repairs in the private setting	21,792	22,179	22,556	22,924	23,277	23,619
D = C x 61.0%	Total FTT rotator cuff repairs in the private setting	13,293	13,529	13,759	13,984	14,199	14,408
E	Uptake rate	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**
F = D x E	Estimated utilisation of BCI	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**
Estimate cost impact to PHI							
G = F × $redacted	**Estimated cost of REGENETEN to PHIs**	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**

Source: Table 66 p 158 of the ADAR
Abbreviations: BCI = bioinductive collagen implant; CM = conservative management; FTT = Full thickness tear; PHI = Private health insurer; RCT = rotator cuff tear; RTSA = reverse total shoulder arthroplasty

The estimated cost for PHIs to fund BCI is projected to increase from approximately $**redacted** in Year 1 to $**redacted** in Year 6. Accounting for cost-offsets, the net costs to PHIs are anticipated to start at $1.4 million in Year 1, rising to $8.4 million by Year 6. Cost-offsets are expected to lower the total financial impact by roughly $**redacted** in Year 6. Table 16 provides a summary of the net financial impact to PHIs resulting from BCI use.

Table 16 Net financial implications of BCI to the private health insurance system

	Parameter	Year 1 (2025)	Year 2 (2026)	Year 3 (2027)	Year 4 (2028)	Year 5 (2029)	Year 6 (2030)
Estimated use and cost of the proposed health technology							
A	Number of people undergoing rotator cuff repair in the private setting	21,792	22,179	22,556	22,924	23,277	23,619
B	Number of people who receive BCI in the rotator cuff repair	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**
	Cost to the Private Health Insurance - ($,000)	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**
Change in use and cost of other health technologies							
	Change in use of resources related to revision of RCT repair - ($,000)	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**
	Change in use of resources related to RTSA - ($,000)	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**
	Change in use of physiotherapy sessions as part of CM - ($,000)	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**
	Net change in costs to the Private Health Insurance system - ($,000)	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**
	Net financial impact to the Private Health Insurance system - ($,000)	**$1,352**	**$2,673**	**$4,039**	**$5,444**	**$6,891**	**$8,372**

Source: Table 68 p 162 of the ADAR
Abbreviations: BCI = bioinductive collagen implant; CM = conservative management; RCT = rotator cuff tear; RTSA = reverse total shoulder arthroplasty

Net financial impact to other health budgets

The ADAR asserted that the introduction of BCI would not affect the number of patients undergoing surgical repair for rotator cuff tears. Consequently, MBS service volumes and costs for items 48960, 48906, and 48909 were anticipated to remain unchanged. However, the ADAR projected cost-savings for the MBS due to a reduction in retears with BCI. This reduction was 6.2%, based on reduction of patients requiring revision RCR with BCI (3.3%) and standard of care (9.5%). The ADAR also predicted that there would be a reduction in RTSA (0.9%) based on clinical evidence.

Table 17 outlined the net financial impact of BCI on the MBS, with total savings estimated at $0.2 million in Year 1, increasing to $1.3 million by Year 6.

Table 17 Net financial implications of BCI to the MBS

	Parameter	Year 1 (FY 2025-26)	Year 2 (FY 2026-27)	Year 3 (FY 2027-28)	Year 4 (FY 2028-29)	Year 5 (FY 2029-30)	Year 6 (FY 2030-31)
A	Estimated utilisation of BCI	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**
Revision of RCT repair							
B = A x 6.2%	Proportion of avoided revision RCT repairs with BCI	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**
C = B x $1,352	Estimated savings to MBS with avoided revision RCT repair - ($,000)	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**
Reverse total shoulder arthroplasty							
D = A x 0.9%	Proportion of patients that do not need RTSA with BCI	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**
E = D x $3,157	Estimated savings to MBS with RTSA when using BCI - ($,000)	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**
Conservative management (first year)							
F = A x 15.8%	Proportion of avoided patients requiring CM (physiotherapy) with BCI in the first year	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**
G = F × $1,311	Estimated savings to MBS with CM (physiotherapy) when using BCI in the first year - ($,000)	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**
Conservative management (second year)							
H	Estimated utilisation of BCI in their second year	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**
I = H x 18.3%	Proportion of avoided patients requiring CM (physiotherapy) with BCI in the second year	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**
J = I × $1,311	Estimated savings to	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**

	MBS with CM (physiotherapy) when using BCI in the second year - ($,000)						
Shoulder MRI in patients with retear							
K = A x 22.9%	Proportion of patients that avoid MRI shoulder due to retear with BCI	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**
L = K x $331	Estimated savings to MBS with avoided MRI when using BCI due to less retear rate - ($,000)	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**
M = C + E + G + J + L	**Total savings to MBS when using BCI - ($,000)**	**$199**	**$458**	**$685**	**$918**	**$1,158**	**$1,332**

Source: Table 69 p 163 of the ADAR
Abbreviations: BCI = bioinductive collagen implant; CM = conservative management; RCT = rotator cuff tear; RTSA = reverse total shoulder arthroplasty

In addition, the ADAR outlined the financial impact of BCI on patients, attributing savings to a reduced proportion of individuals needing revision rotator cuff repair, reverse total shoulder arthroplasty, or conservative management. It estimated that patients could save approximately $63,000 in out-of-pocket expenses in Year 1, rising to $0.54 million in Year 6, as BCI adoption increases (Table 18).

Table 18 Net financial implications of BCI to the patient

	Parameter	Year 1 (2025)	Year 2 (2026)	Year 3 (2027)	Year 4 (2028)	Year 5 (2029)	Year 6 (2030)
A	Estimated utilisation of BCI	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**
Revision of RCT repair							
B = A x 6.2%	Proportion of patients that do not need RCT revision with BCI	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**
C = B x $1,966	Estimated cost offset to PHI with revision surgery when using BCI – ($,000)	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**
Reverse total shoulder arthroplasty (RTSA)							
D = A x 0.9%	Proportion of patients that do not need RTSA with BCI	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**

E = D x $861	Estimated cost offset to PHI with RTSA when using BCI - ($,000)	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**
Conservative management – CM (first year)							
F = A x 15.8%	Proportion of patients that do not need corticosteroid injections as part of CM with BCI in the first year	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**
G = F × $390	Estimated cost offset to patients (out-of-pocket) with CM (corticosteroid injections) when using BCI- first year - ($,000)	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**
Conservative management – CM (second year)							
H	Estimated utilisation of BCI in their second year	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**
I = H x 18.3%	Proportion of patients that do not need corticosteroid injections as part of CM with BCI in the first year	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**	**redacted**
K = I × $390	Estimated cost offset to patients (out-of-pocket) with CM (corticosteroid injections) when using BCI- second year - ($,000)	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**
K = C + E + G + J	**Total savings to patients when using BCI - ($,000)**	**$63**	**$153**	**$246**	**$341**	**$439**	**$540**

Source: Table 70 p 164 of the ADAR
Abbreviations: BCI = bioinductive collagen implant; CM = conservative management; RCT = rotator cuff tear; RTSA = reverse total shoulder

The financial impact on PHI, MBS, and patients was uncertain as the data used to estimate the proportion of patients undergoing different management options following a retear—such as revision rotator cuff repair, reverse total shoulder arthroplasty, and conservative management—was based on Truong et al, 2021 and relied on an assumption of underlying difference in clinical outcomes between treatments which was not supported by evidence from the key clinical trial (Ruiz Ibán et al 2025).

Uncertainty analyses of financial estimates

The ADAR presented uncertainty analyses based on key input parameters (Table 19).

Table 19 Sensitivity analysis of the total costs to private health insurers to fund BCI

Parameter	Year 1 (2025)	Year 2 (2026)	Year 3 (2027)	Year 4 (2028)	Year 5 (2029)	Year 6 (2030)
Base case						
Net financial impact to the Private Health Insurance system	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**
Higher incidence: 250 rotator cuff repairs per 100,000 population						
Net financial impact to the Private Health Insurance system	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**
Higher BCI uptake 1: from 5% in Year 1 to 30% in Year 6						
Net financial impact to the Private Health Insurance system	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**
Higher BCI uptake 2: from 10% in Year 1 to 60% in Year 6						
Net financial impact to the Private Health Insurance system	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**
Lower proportion of Full Thickness Tear patients: from 61% (base case) to 40%						
Net financial impact to the Private Health Insurance system	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**
Higher proportion of Full Thickness Tear patients: from 61% (base case) to 80%						
Net financial impact to the Private Health Insurance system	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**
Higher proportion of RCR performed by PHI: from 45.1% (base case) to 70%						
Net financial impact to the Private Health Insurance system	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**	**$redacted**

Source: Table 72 p 166 of the ADAR
Abbreviations: BCI = bioinductive collagen implant; RCR = rotator cuff repair.

The primary sources of uncertainty in the financial analysis were the incidence of rotator cuff repair rate (potentially increasing costs to $redacted in Year 6) and the projected uptake of BCI (potentially increasing costs to $redacted in Year 6). The commentary highlighted problems with the data used to determine these parameters, noting that they were either assumption-based or introduced uncertainty to the parameter in question. As a result, the commentary deemed the financial estimates in the ADAR to be uncertain.

15. Other relevant information

Nil.

16. Key issues from ESC to MSAC

Main issues for MSAC consideration

Clinical issues:

- The clinical claim of superior health outcomes for surgery with BCI was not convincingly demonstrated by the evidence presented in the ADAR as the key trial did not consistently demonstrate an improvement in patient-relevant functional outcomes compared with standard surgical repair. The Camacho-Chacon (2024, N=60) trial demonstrated a significant difference between treatment arms for functional outcomes at baseline and all timepoints post-intervention. The study by Ruiz Ibán et al. 2025 (N=124) demonstrated no statistically significant differences (in improvement) between BCI and the control group in those outcomes at any timepoint.
- ESC considered the most relevant patient-relevant health outcomes were the functional outcomes (the CMS and the ASES score) and the EQ-5D-5L questionnaire as these are more directly relevant to the patient (compared with imaging outcomes) and reflect improvements in QoL. ESC considered that although a relationship between radiographic retears and patient-relevant clinical outcomes was biologically plausible, this was not supported by the evidence that was presented in the ADAR.

Economic issues:

- The economic evaluation inappropriately applied the VAS results from the EQ-5D-5L questionnaire in Ruiz Ibán et al. 2025 as utility values to calculate QALYs.
- ESC considered the use of CMS adjustments rather than the utility values derived directly from Ruiz Ibán et al. 2025 was unvalidated and unjustified as to why EQ-5D-5L utility weights from trial participants were not used. It is likely that the ADAR's approach favours the intervention.
- To address MSAC's previous concerns about the model's reliance on imaging outcomes rather than functional outcomes, the reapplication provided an additional CEA that used an average change in the CMS to calculate the average MCID achieved over the trial population. However, the method used to calculate the difference in the MCID was not appropriate. ESC considered that a more informative approach would have been to calculate the proportion of patients who achieved an MCID change in the CMS and compare those results across treatment arms.
- Overall, ESC considered the validity of the estimated outcome gains (particularly QALYs) was highly uncertain and the ICER is likely to be substantially higher than the estimate in the ADAR.

Financial issues:

- The estimated financial impact used total population averages for a condition that is much more prevalent in older people. This likely underestimated factors such as the higher rates of private health insurance in the older population when considering the relevant population likely to receive BCI. The impact of this is that the financial implications are likely underestimated.

Policy issues:

- MSAC is requested to provide advice to the MDHTAC regarding the comparative clinical effectiveness and comparative cost-effectiveness of the technology and the PL benefit amount at which the device would be considered to be cost-effective.
- There is the potential for utilisation of BCI beyond the FTRCT population. The listing of BCI on the PL may be subject to the condition, limiting the nondiscretionary obligation, placed on

private health insurers to pay the PL benefits for the devices listed under the billing codes, to certain circumstances prescribed in the condition. However, PL conditions do not restrict the use of the devices in clinical practice, which may result in claims for the PL benefit for BCI being used outside the intended population. As such, MSAC may wish to consider a new MBS item that restricts use of the technology to FTRCT.

ESC discussion

ESC noted that this is a reapplication from Smith & Nephew Pty Limited requesting listing of BCI on the PL for use in the surgical repair of FTRCT in conjunction with existing MBS items. This application is not seeking a new MBS item or to amend an existing MBS item as there is a relevant and clinically appropriate MBS item already available that allows the use of BCI (MBS item 48960). MSAC is requested to provide advice to MDHTAC on the comparative clinical effectiveness and cost-effectiveness of the device via the Tier 3 full health technology assessment (HTA) pathway.

ESC noted that rotator cuff lesions are common with increasing age and can become painful. Conservative treatment usually lasts 3 months and includes medication, injections and physiotherapy. If unsuccessful, surgical management (either arthroscopic or mini-open) is considered to restore the rotator cuff with or without subacromial decompression. However, standard surgical care does not address the underlying degenerative tendinopathy. Rates of rotator cuff retear vary between 15–96% (Mandaleson 2021), due to a number of factors including poor tissue quality and fatty infiltration, increased tear size and retraction, age and comorbidities, and chronic pathology and biomechanical dysfunction.

ESC noted that BCI is a bioengineered implant composed of highly purified type I collagen derived from bovine achilles tendon. It is manufactured into a highly porous scaffold that is placed on top of the tendon to actively support the body's healing response and is fully absorbed within 6 months (Schlegel et al. 2018)[27]. BCI has been approved by the TGA as a Class III Medical Device and included in the ARTG under ARTG 384118, since 24 July 2020.

ESC noted that this was the third time MSAC has considered this application. The applicant initially applied to MSAC on advice from the PLAC as the device (REGENETEN', Smith and Nephew's brand of BCI) was a new technology and the proposed benefit was comparatively high. PLAC suggested the sponsor seek MSAC's assessment of comparative clinical and cost effectiveness to inform consideration of the device for listing on the PL. In its consideration of the original application (Application 1593) in July 2020, MSAC advised the PLAC that the evidence for comparative safety, effectiveness and cost-effectiveness was highly uncertain relative to standard surgical repair in both subpopulations, those being patients with PTRCT and patients with FTRCT.

ESC noted that MSAC considered the first reapplication (Application 1593.1) in August 2024. The reapplication aimed to address or partially address several of MSAC's previous concerns. In the 1593.1 reapplication, the follow-up from Ruiz Ibán et al. (2023) maintained retear rates as the primary outcome, and no statistically significant differences in PROMs were reported. Another long-term follow-up study from Camacho-Chacón (2023) presented in the 1593.1 ADAR demonstrated significant differences in patient-reported outcomes (the ASES score and the CMS). In its consideration of 1593.1, MSAC advised MDHTAC that BCI's comparative effectiveness, safety and value for money were all uncertain due to uncertain benefit in patient-related functional outcomes and over the long-term (1593.1 PSD, p2). MSAC considered that a reapplication should focus on the clinical claim that BCI reduces time to recovery, provide RCT

[27] Schlegel TF, Abrams JS, Bushnell BD, Brock JL, Ho CP. Radiologic and clinical evaluation of a bioabsorbable collagen implant to treat partial-thickness tears: a prospective multicenter study. Journal of Shoulder and Elbow Surgery. 2018;27(2):242-51.

evidence with non-radiological measures as primary outcomes and consider respecifying the economic evaluation for FTRCT with the inclusion of appropriate downstream costs, use of trial-based or time trade-off utility weights and shortening the time horizon to 1 year (as retear rates were only available up to 12 months).

ESC noted that the current application removed the PTRCT subpopulation from the proposed population and provided more evidence from observational studies and 2 years of further follow-up data from Ruiz Ibán et al. 2025 and Camacho-Chacón 2024 which included updated evidence for safety and adverse events, risk of postoperative tears, and functional outcomes. ESC noted the applicant had provided investment and support for both the Ruiz Ibán et al. and Camacho-Chacón RCTs. ESC noted that the Camacho-Chacon (2024, N=60) trial demonstrated a significant difference between treatment arms for functional outcomes at baseline and all timepoints post-intervention. For the 2-year follow-up, the study from Ruiz Ibán et al. (2025, N=124) reported higher rotator cuff retear rates with standard surgical care (35%) compared with BCI (12%), which the authors stated had a significant impact on the overall outcome. However, ESC noted that the clinical outcomes (PROMs) between treatment arms were not statistically significant at any timepoint up to and including 2 years. ESC noted that the trial was powered to detect a difference in the primary outcome of retear rates rather than a difference in functional outcomes. ESC considered that although a relationship between radiographic retears and patient-relevant clinical outcomes was biologically plausible, the ADAR did not present any evidence to support the link between radiographic tears as a surrogate for patient-relevant functional outcomes, as outlined in Appendix 12 of the MSAC guidelines[28].

ESC noted that public consultation feedback for the current application received prior to the ESC meeting where this application was considered, was received from 8 orthopaedic surgeons, all of whom supported funding. ESC noted from that feedback that 20–30% of patients who receive standard of care (SOC; arthroscopy and decompression) have a recurrent tendon tear. It was claimed in the feedback that BCI improves healing rates and helps patients return to work sooner. However, ESC noted that one piece of feedback was critical of the main evidence presented in Ruiz Ibán et al. 2025: that it is not high quality, and further longer follow-up is needed. Another piece of consultation feedback also expressed concern that there could be leakage to patients with PTRCT.

ESC noted that, in 2022, the applicant sponsored a prospective, multicentre RCT in targeted global regions to evaluate the safety and efficacy of arthroscopic rotator cuff repair augmented with the REGENETEN BCI in the repair of full-thickness tears versus arthroscopic rotator cuff repair alone (NCT04450342). ESC noted that the study results would be used to support product registration in China; post-market clinical follow-up primarily in Europe, Australia and New Zealand; and reimbursement in relevant countries. However, this study was not mentioned in the ADAR. ESC considered an update on the progress of this study and the preliminary results if available would be useful for MSAC decision making. Post-ESC the department identified that the RCT has been terminated due to 'Sponsor decision not related to safety'[29].

For comparative safety, ESC considered that BCI had a comparable safety profile to standard suture anchor repair, with no increase in complication rates.

Regarding comparative effectiveness, ESC noted that in Ruiz Ibán et al. (2025) the relative reduction in retear risk at 24 months was 0.35 (95% CI:0.161-0.762) while achieving similar functional outcomes. Camacho-Chacón (2024) directly compared isolated bovine repair (BCI

[28] Medical Services Advisory Committee – Appendix 12: Translating comparative treatment effects of proposed surrogate measures to target clinical outcomes (p291) - Guidelines for preparing assessments for the Medical Services Advisory Committee

[29] REGENETEN™ Bioinductive Implant System in Full-thickness Tears. ClinicalTrials.gov. 2025

without suture anchors) to the current SOC of suture anchor repairs for small and medium FTRCT. It found that isolated BCI repair resulted in superior tendon healing, improved functional outcomes, less pain and greater patient satisfaction.

ESC noted that the economic evaluation included both a CUA and a CEA. The CUA had been amended from the previous application to rely on the CMS rather than the ASES score. The cost-effectiveness analysis was based on the cost per healed tear over a 2-year time horizon and defined an MCID as a 10.4-point change in the CMS. The analysis used a decision tree where a retear resulted in revision, reverse total shoulder arthroplasty or conservative management, with all given the same probability in each arm. The BCI arm was given a lower probability of tear heal failure compared to SOC. The probability of initial tear healing was derived from Ruiz Ibán et al. 2025. The analysis was not based on Australian data however, ESC noted that there did not appear to be any other source studies. ESC considered the structure and health states of the analysis to be reasonable but also considered that a simpler within-trial economic evaluation should have been presented given that Ruiz Ibán et al. 2025 collected the EQ 5D-5L.

ESC acknowledged that the current application attempted to address some of the key economic issues previously raised by MSAC. MSAC had considered that a reapplication should respecify the economic evaluation to use trial-based or time trade-off (TTO) utility weights and shorten the time horizon to 1 year (as retear rates were only available at 12 months). The reapplication maintained a 2-year time horizon which was supported by longer trial follow-up data. However, rather than deriving utility weights from the EQ-5D-5L questionnaire, utilities were derived from the EQ-5D-5L VAS results from the pivotal trial. ESC considered that using VAS results as utilities was not appropriate. ESC noted that no justification was given as to why the EQ-5D-5L utility weights, derived from a published Australian algorithm such as Norman et al (2023)[30] were not used, or at least attempted to be used. ESC acknowledged that the Norman weights used a discrete choice experiment design rather than a TTO, but that this would not have precluded use in the current application

ESC noted that MSAC had also previously raised concerns about the model's reliance on imaging outcomes rather than functional outcomes. This reapplication attempted to address this by providing an additional cost-effectiveness analysis that used an average change in the CMS to calculate the average MCID achieved over the trial population. However, ESC agreed with the commentary that the method used to calculate the difference in the MCID was not informative. ESC agreed with the commentary that a more appropriate method would be to calculate the proportion of patients achieving an MCID change in the CMS and utilities and compare those results across treatment arms.

ESC noted that the model assumed the same utilities for healed and unhealed tears following revision for both BCI and SOC. ESC queried the validity of this, as it is expected that healed tears following revision would result in improved utilities. ESC also considered that some improvement over time would generally be expected for all unhealed rotator cuff tears.

ESC noted that the model in this reapplication used the same structure as that in application 1593.1, with the difference being the definition of functional benefit. However, ESC considered the utility derivation was unvalidated and unjustified. ESC noted that the model assumed a linear relationship between the VAS and the CMS but provided no justification supporting this. Further, there was no justification as to why utilities sourced from study participants could not be used. ESC considered that the ADAR should have used a simpler approach rather than an adjustment upon adjustment approach.

[30] Norman, R., Mulhern, B., Lancsar, E., Lorgelly, P., Ratcliffe, J., Street, D., & Viney, R. (2023). The use of a discrete choice experiment including both duration and dead for the development of an EQ-5D-5L value set for Australia. PharmacoEconomics, 41(4), 427–438.

ESC queried the disutilities used for revision surgery, which were 1.5 times that of arthroscopic rotator cuff repair. ESC noted that the values used to determine the disutilities were from Dornan et al. 2017, with the source utility from Mather et al. 2013. However, it appears that this was based on the Short-Form 6-Dimension (SF-6D) utility measure, not the EQ-5D-5L, and these measures are not directly comparable. ESC also queried why the utilities remained low for shoulder replacement for the entire 2-year time duration, as it would be assumed that there would be some functional recovery. ESC considered that the approach taken in the ADAR favours the intervention.

ESC noted that the cost of BCI in this application ($**redacted**) was a reduction from Application 1593.1 ($**redacted**). The costs of initial surgery were assumed to be the same for the intervention and comparator groups, with the main additional costs accruing when surgery fails (which was given a higher probability in the comparator group) or retear occurs. ESC noted that the economic summary (Table 10) referenced workers compensation costs (based on weekly earning) However, ESC noted these were appropriately not included in the base-case as they are non-health costs.[31] ESC noted a misalignment between the unit costs in the Excel model and base-case results, and the cost inputs (Table 11). These were updated in Table 11 following ESC.

ESC noted that the estimated base case ICER was $**redacted** per QALY gained. ESC noted that the method used to estimate the ICER was based on a previous sensitivity analysis conducted by the commentary for Application 1593.1. This analysis applied VAS values from Ruiz Ibán et al. 2023 as utility values for conservative management and successful surgery (first and second year). The utility for conservative management following retear was assumed to be the same as the utility at baseline. However, ESC recalled that, in its consideration of Application 1593.1, MSAC had not considered this sensitivity analysis to be clinically plausible.

ESC noted the sensitivity analyses in the commentary using low values for model health states post–heal failure (conservative management health), taken from adjusting the utility scores in Ruiz Ibán et al. (2025) by the CMS, and using the same approach for the revision surgery health states, had a high impact on the ICER and favoured BCI. Using a 20% increase in year 1 utility for conservative management resulted in an ICER of $**redacted** /QALY; if this 20% increase is applied to all years and the reverse total shoulder arthroplasty health state, the ICER increased to $**redacted** /QALY. Additionally, adjusting healed revision utilities to higher 'healed rates' (noting the face validity concern) increases the ICER to $**redacted** /QALY. Adding higher utilities for shoulder arthroscopy increased the ICER to more than $**redacted** /QALY. Other factors such as the percentage of tear fails to heal in the BCI and SOC groups had moderate impacts on the ICER.

Overall, ESC considered the validity of the estimate's gains (particularly QALYs) remained highly uncertain and the ICER is likely to be substantively higher than the estimate in the ADAR. ESC also questioned whether there were any QALY gains more generally given the non-significant results of the functional outcomes in Ruiz Ibán et al (2025).

ESC noted that an epidemiological approach was used to estimate the financial implications. ESC noted that MSAC had previously expressed concerns about the assumed uptake rate (which remains unchanged in this application), the incidence rate, and the probability of revision or reverse total shoulder arthroplasty surgery. ESC noted that the application used higher estimated incidence rates based on an older international study but it considered this was reasonable due to the difficulty in obtaining exact Australian estimates as MBS procedures can be used for injuries other than rotator cuff tear. Regarding the probability of revision or reverse total shoulder

[31] Medical Services Advisory Committee – Technical Guidance 17: Overview and rationale of the economic evaluation (p.155 – 162) - Guidelines for preparing assessments for the Medical Services Advisory Committee

arthroplasty surgery, ESC noted that this application based its higher estimates on Truong et al. 2021 (rather than Parikh et al. 2021 from the previous application); however, ESC considered that the unhealed rates in Truong et al. may differ from those from Ruiz Ibán et al. 2025 and are therefore uncertain. ESC also noted that this application does not consider the older population in any estimates, using population averages as key assumptions. Since rotator cuff lesions are more prevalent in older people, this approach would likely underestimate factors such as the higher rates of private health insurance in the older population and hence the financial impacts may be underestimated. As such, ESC considered that this introduces uncertainty regarding the financial impact, potentially underestimating uptake. The pre-ESC response stated that the eligible population and total cost of the intervention took a more conservative approach than previous applications however ESC considered that some parameters were not conservative. For example, the assumption of no recovery (hence constant lower utility values) in the "revision tear heals" arm of the model favours the intervention arm since more people in the standard of care arm will receive revision care.

ESC noted that the uptake rate of redacted% was assumed without supporting justification. ESC noted that the pre-ESC response stated that recent Japanese data showed a higher uptake rate of 10% but that the response also noted differences between Japan and Australia regarding its ageing populations. The pre-ESC response also noted that Australian surgeons are already using BCI, such as via workers compensation claims and public hospitals. ESC considered that if BCI is currently available in some public hospitals, there may be cost shifting to the private sector if it were to be listed on the PL.

ESC noted that the estimated net financial costs to the private health insurance system were $1.35 million in Year 1 increasing to $8.37 million in Year 6. The primary sources of uncertainty in the financial analysis were the incidence rate of rotator cuff repair (potentially increasing costs to $redacted in Year 6) and the projected uptake of BCI (potentially increasing costs to $redacted in Year 6). The commentary highlighted problems with the data used to determine these parameters, noting that they were either assumption based or introduced uncertainty to the parameter in question. As a result, ESC agreed with the commentary that the financial estimates in the ADAR were uncertain.

ESC noted that differentiating between PTRCT and FTRCT can be difficult using imaging. ESC considered that if BCI is listed on the PL, there could be leakage to patients outside the FTRCT population which could result in increased costs to the private sector. ESC noted that the PL provides opportunities to specify restrictions that may minimise leakage however, ESC suggested that MSAC may wish to consider if a potential new MBS item that restricts the use of BCI to FTRCT was needed.

17. Applicant comments on MSAC's Public Summary Document

Smith+Nephew remains committed to supporting patient access to innovative technologies like REGENETEN. The pivotal Ruiz Ibán 2025 triple blinded, multi-centre RCT demonstrated a substantial 65% relative reduction in retear rates at 2 years compared with standard repair, an objective outcome strongly preferred by surgeons. Post hoc analysis further confirmed that healed tendons, where REGENETEN achieved substantially more, were associated with significantly better clinical outcomes than retears ($p \leq 0.015$), consistent with extensive literature identifying tendon healing as the critical determinant of long-term function. Internationally, REGENETEN is nationally funded in multiple countries and has received the highest

recommendation (4 of 4 stars) from the American Academy of Orthopaedic Surgeons[32][33], the world's largest musculoskeletal medical association, while peer-reviewed economic evaluations in the USA[34] and Italy[35] confirm it is cost-effective and generates overall cost savings once broader societal costs are considered. In Australia, patients covered under workers' compensation insurance and those able to self-fund are already benefiting from REGENETEN, reflecting its real-world acceptance and impact. With near-unanimous clinical and consumer support for this application, with 28 of 29 submissions in favour, it is disappointing that access to BCI remains without a minimum benefit insurers must pay for privately insured Australians undergoing full thickness rotator cuff tear repair.

18. Further information on MSAC

MSAC Terms of Reference and other information are available on the MSAC Website: visit the MSAC website.

[32] https://www.orthoguidelines.org/guideline-detail?id=1894&tab=all_guidelines

[33] https://www.aaos.org/aaos-home/newsroom/press-releases/aaos-updates-clinical-practice-guideline-for-the-management-of-rotator-cuff-injuries/

[34] McIntyre, L. F., Nherera, L. M., & Schlegel, T. F. (2023). Resorbable Bioinductive Collagen Implant Is Cost Effective in the Treatment of Rotator Cuff Tears. Arthroscopy, Sports Medicine, and Rehabilitation. https://doi.org/10.1016/j.asmr.2023.01.002

[35] Rognoni, C., Nherera, L. M., Garofalo, R., Guerra, E., Longo, U. G., Taverna, E., & Tarricone, R. (2023). Economic Evaluation of a Bioinductive Implant for the Repair of Rotator Cuff Tears Compared with Standard Surgery in Italy. Adv Ther, 40(12), 5271-5284. https://doi.org/10.1007/s12325-023-02686-9