



BAJIR

BONE & JOINT INFECTION REGISTRY

BAJIR REPORT 2021

Introduction



Mission statement

Our aim is to capture all Bone and Joint Infection cases presenting to UK hospitals, allowing us to improve the care of patients with these conditions through analysis of collected data on their illnesses and treatments.

This is the third annual report from the Bone and Joint Registry (BAJIR).

The BAJIR database is the UK Bone and Joint Infection Registry. The objective of the BAJIR is to collect information on patients who are diagnosed with, and treated for, a bone or joint infection in the UK. Obtaining this data will help provide an understanding of the burden of disease in the UK, the current treatment strategies and the outcomes of those treatments.

The data will eventually be used to inform best practice, direct research and provide information for commissioners of healthcare in the UK.

We are delighted to report on the ongoing growth and development of the registry, especially throughout the challenging times we find ourselves in with ongoing restriction of orthopaedic activity secondary to the Coronavirus (COVID-19) pandemic.

2021 has seen the launch of the new embedded Multi Disciplinary Team (MDT) module within BAJIR, which has been received warmly by the many trusts which are now running their infection MDT through this software. The MDT module not only provides trusts with an easy method of adding patients into the registry, it also allows for clear documentation of MDT processes and outcomes within each individual's healthcare record.

We also demonstrate the first basic output from the registry, with data that will be presented at the British Orthopaedic Association Annual Congress. This work is designed to showcase the potential power of the registry in providing high quality research that can help guide future care for those with bone and joint infection.

One of the challenges for the registry from this past year has come in the form of raised concerns over governmental use of routine healthcare data, which has seen significant media attention and a vast number of patients opting out of allowing routine use of their healthcare data. This provides significant issues for registries like the BAJIR, as we rely on these mechanisms to include patient data. It is integral that as a community we continue to highlight the potential benefit of providing safe access to this data and how this important research that utilises routinely collected data is for improving healthcare outcomes.

Thanks to all for supporting us, we hope you enjoy reading the annual report.

Tim Petheram, Luke Farrow, Mike Petrie, Jerry Tsang

Authors of the BAJIR REPORT 2021

Registry Progress



The registry has seen significant growth over the last year, both in terms of the number of patients held within the registry, and also the number of sites actively submitting patients.

There are now over 450 confirmed infections within the registry, spanning Periprosthetic Joint Infection, Septic Arthritis, Native Osteomyelitis and Fracture Related Infection. Over 20 trusts are now also fully registered and actively submitting patients, with several more awaiting final information governance (IG) clearance to begin active participation. We are again indebted to Mike Petrie (engagement lead) for his hard work in generating further registry interest and supporting trusts in this process.

This year has seen the release of some new updated IG documentation to help smooth the registration process, with thanks to Anji Kingman (clinical outcomes manager), and Jonathan Walmsley (IG lead Northumbria Healthcare NHS Foundation Trust) for their efforts in developing this documentation and also their work managing the national data-opt out process.

This progress has seen the first registry output as detailed later in this report. As development continues further data will be provided to highlight current national practice.

Currently the registry continues to only include participating sites within England and Wales, but there has been significant further development with regards to Scottish participation - where a Public Benefit and Privacy Panel for Health and Social Care (PBPP) application has been submitted to allow use of the registry within Scotland. If approved this will initially start with a 7 site pilot before further national rollout.

We are very grateful to those involved in this process, led by Martin Sarungi (Scotland representative), who have put in a considerable amount of time and effort to organise the PBPP submission. We are very hopeful that this will be completed within the next year and that 2022 will see the first Scottish patients included in the registry.

The Hospital Episode Statistics (HES) - BAJIR linkage, led by Luke Farrow (2020-2021 fellow), also continues to develop and we hope to have the first run of this output within 2022. This process should allow for a safety net to ensure complete data submission and accuracy of registry information.

2021 has also seen the addition of a new fellow - Jerry Tsang, who has already proved his worth by supporting some of the ongoing background work required to support the registry, as well as providing the report of preliminary results from the BAJIR.

Periprosthetic Joint Infection



There were 503 patients submitted to BAJIR with suspected periprosthetic joint infection (PJI). Of which, 302 had a confirmed PJI; 174 (57%) hips, 112 (37%) knees, 6 (2%) shoulders, 5 ankles (2%) and 6 elbows (2%) (Figure 1).

Regarding the Musculoskeletal Infection Society (MSIS) 2013 criteria for PJI, 247/303 (82%) met the major criteria for PJI: 55/303 (18%) had a sinus tract communicating with the prosthesis and 231/303 (76%) had a pathogen is isolated from at least 2 separate tissue or fluid samples (Figure 2).

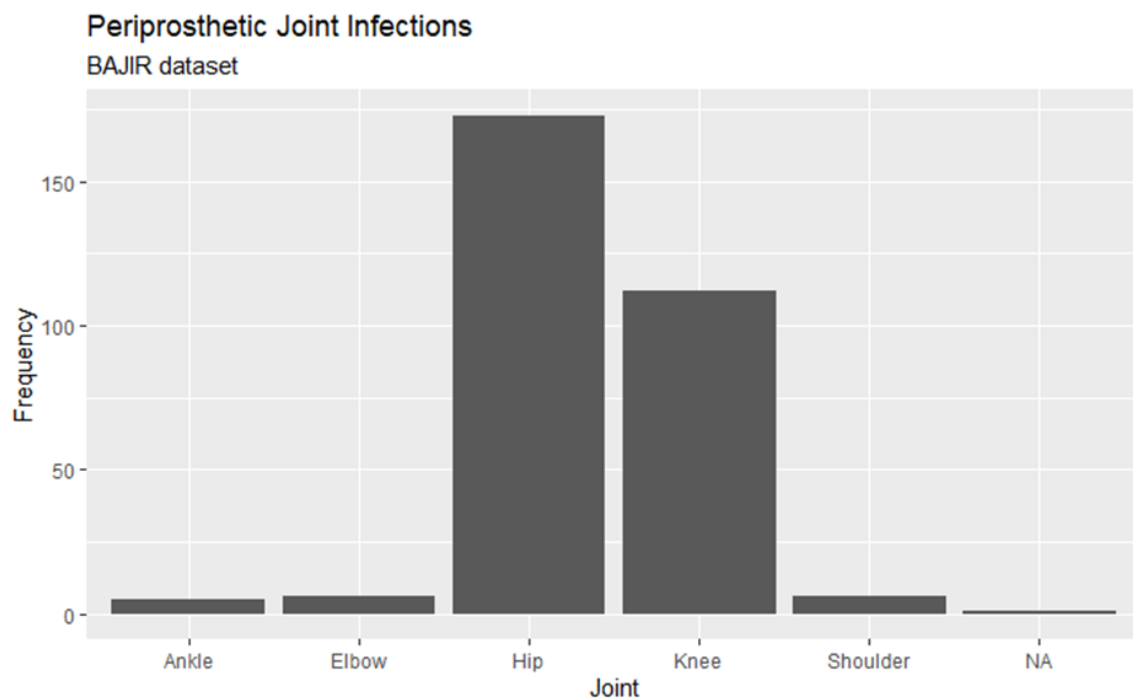


Figure 1. Joint involvement of confirmed periprosthetic joint infection cases recorded in BAJIR.

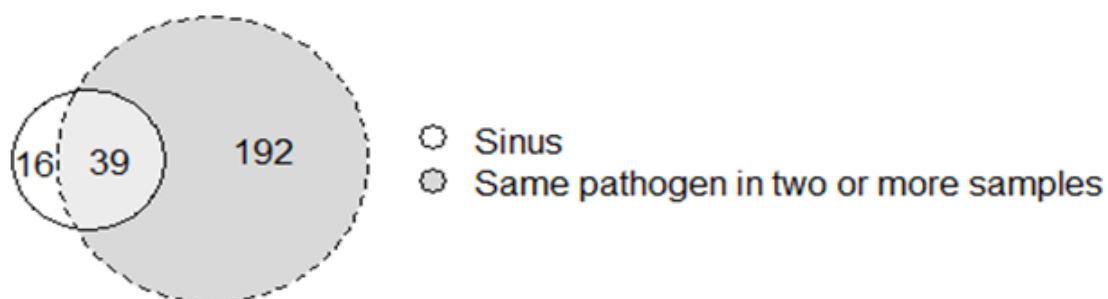


Figure 2. Positive MSIS major diagnostic criteria for confirmed periprosthetic joint infection cases recorded in BAJIR.

Periprosthetic Joint Infection



Regarding the minor criteria: 229/303 (75%) had a raised CRP, 177/303 (66%) had a raised ESR, 12/303 (4%) had an elevated synovial leukocyte count/neutrophil percentage, 215/303 (71%) had at least one positive culture sample, and 10/303 (3%) had a positive leukocyte esterase test (Figure 3). The remaining 37/303 (9%) cases which did not meet the MSIS conditions were confirmed using the Infectious Disease Society of America (IDSA) criteria for PJI which includes a clinical judgement assessment.

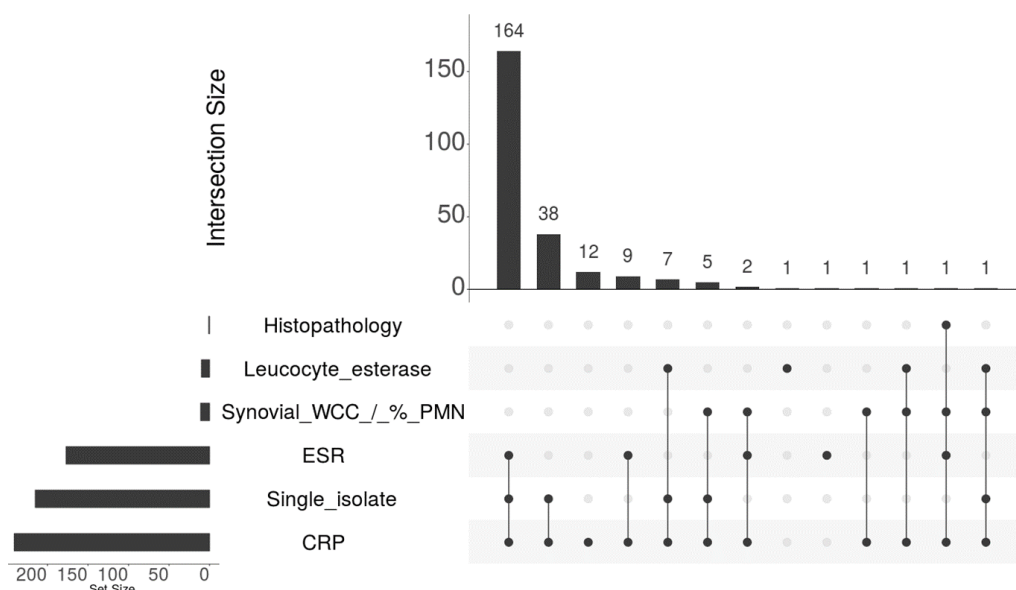


Figure 3. Positive MSIS minor diagnostic criteria for confirmed periprosthetic joint infection cases recorded in BAJIR.

Treatment data was available for 271 (89%) cases. Surgery was performed in 266 (98%) cases. Initial surgical treatment was an open/arthroscopic washout in 11 (4%), DAIR procedure in 123 (45%) cases (90 (33%) with and 33 (12%) without modular exchange), single-stage revision in 66 (24%) cases, and 1st stage of a planned two-stage revision in 62 (23%) cases (Figure 4)

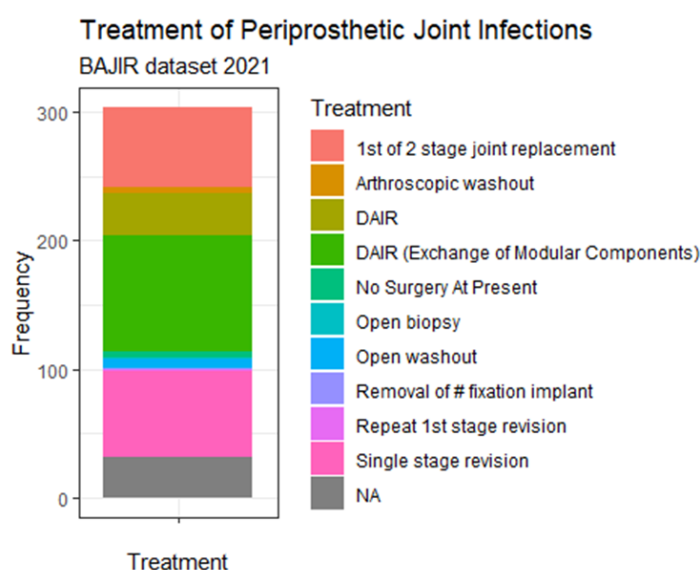


Figure 4. Initial treatment for confirmed periprosthetic joint infection cases recorded in BAJIR. "NA" denotes data "not available."

Septic Arthritis



A total of 81 patients with suspected native joint infection have been submitted to BAJIR. Native joint infection was confirmed in 50 patients, with four cases of polyarticular infection. Common joints involved were the knee (18/54 (33%)), hip (15/54 (28%)) and shoulder (14/54 (26%)) (Figure 5).

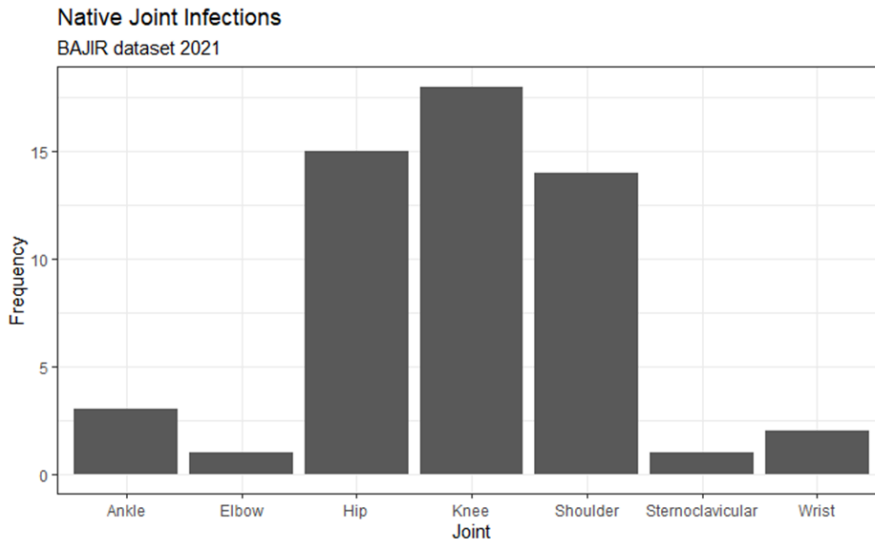


Figure 5. Joint involvement in cases of native joint infection recorded in BAJIR

A sinus was present in 5/54 (9%) of cases. The majority (50/54 (93%)) had no history of prior surgery at the site of infection. Acute infection was present in 44/54 (81%) cases, chronic infections were present in 4/54 (7%) and acute-on-chronic infections in 4/54. 39 (72%) cases had a documented pre-operative aspiration, of which 37 (95%) patients had positive isolates.

Surgery was performed in 43/54 (80%) cases; 20/54 (41%) patients received an arthroscopic washout, 17/54 (31%) open washout, 12/54 (22%) excision and spacer and 8/54 (15%) received a joint replacement (Figure 6).

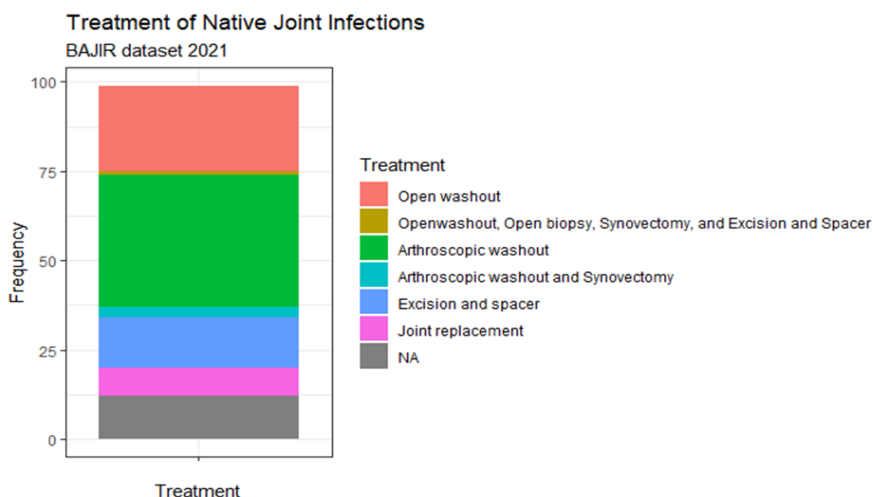


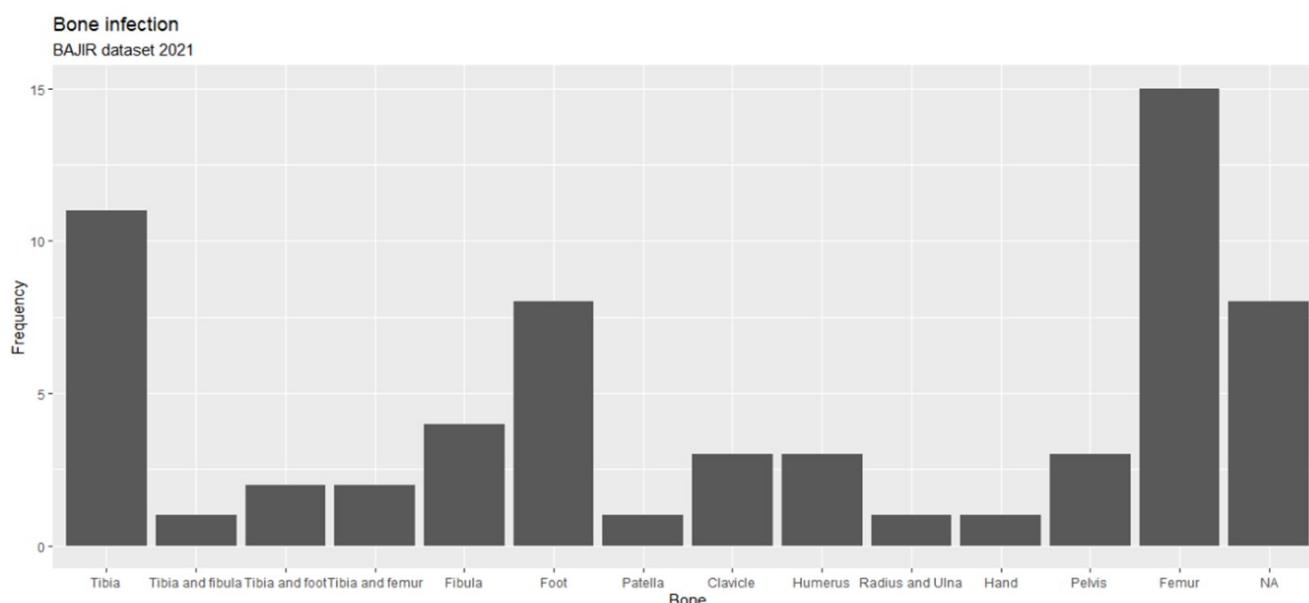
Figure 6. Surgical treatment of native joint infections recorded in BAJIR. "NA" denotes data "not available."

Osteomyelitis



Thus far 83 patients with suspected osteomyelitis have been submitted to BAJIR. Overall 63 patients had confirmed osteomyelitis. In 43/63 (68%) patients two or more culture positive samples were obtained, 35/63 (56%) a pathogenic organism, and 19/63 (30%) had frank pus. Commonly affected bones were the femur (17/63 (27%), tibia (16/63 (25%) and foot (10/63 (16%) (Figure 7).

Figure 7. Distribution of long bone infections recorded in BAJIR



In 11 (17%) patients previous surgery for bone infection of the same site had been undertaken, with 7 (63%) of these patients having undergone >1 previous procedure. In 27 (43%) patients infection was classified as acute, 20 (32%) chronic, and 4 (6%) acute-on-chronic. Microbiological data was available for 51 (81%) patients. However comorbidity data were available for only 6 (10%) patients; 1/6 (77%) were current smokers, 2/6 (33%) had diabetes mellitus.

Surgery was performed in 41/63 (65%) of cases; 22/63 (35%) patients received an incision and drainage, 6/63 (10%) underwent combined procedures, 6/63 (10%) cortical resection, 2/63 (3%) cortical & medullary resection and 10/63 (16%) removal of metalwork.

Patient Recorded Outcome Measures (PROMs)



Patient reported outcome measures (PROMs) were collected at baseline, 6 months, and annually from patients submitted to BAJIR. The outcome measure is the EuroQol five-dimension (EQ-5D-3L™) score, as this aligns with the outcome measure used in the NHS PROMs programme.

The EQ-5D-3L has two parts. The EQ-5D-3L index (TTO) self classifier asks patients to self-score five dimensions of health: mobility, selfcare, usual activities, pain/discomfort, and anxiety/depression. Each dimension has three levels of severity (mild, moderate, severe), giving 243 possible health profiles. These profiles can then be converted into a single score as a global summary of a perceived health by the patient. These scores have validated for different national populations to account for cultural differences of perceived health. For the United Kingdom, scores range from -0.594 to 1, with a score of 1 (full health) and 0 (death). Negative scores are defined as a state “worse than death.” Of the 243 possible health states amongst the UK population, 84 have negative utility scores and hence are deemed “worse than death”. The ability to score health states “worse than death” reduces the floor effect of this score, allowing greater granularity when quantifying severe disability and poor health. The measure is reliable, responsive, and validated in a number of populations and musculoskeletal pathologies.

The EQ-visual analogue scale (EQ-VAS) is a vertical visual analogue scale that takes values between 100 (best imaginable health) and 0 (worst imaginable health), on which patients provide a global assessment of their health. The EuroQol Group, which developed and owns the copyright to the EQ-5D, recommends that both of these parts be used. The data can be analysed and reported in terms of the profile itself, an index number derived from the profile using a standard set of weights, or the EQ-VAS.

Baseline PROMs data were available for 239 patients; EQ-5D--3L index data was complete for 230 (96%) patients and VAS health scores for 228 (95%) patients. Follow-up at 6 months was available for 102 (43%) patients; EQ-5D--3L index data was complete for 99 (97%) patients and EQ-VAS health scores for 100 (98%) patients. Follow-up at 1 year was available for 76 (32%) patients; EQ-5D--3L index data was complete for 76 (100%) patients and EQ-VAS health scores for 71 (93%) patients.

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Patient Recorded Outcome Measures (PROMs)



... A state “worse than death” was reported by 66/239 (28%) patients at baseline, with 16/102 (16%) continuing to report negative EQ-5D-3L scores at 6 months of follow-up (Figure 9). However an analysis of variance of complete paired data, with Bonferroni correction, revealed an improvement, greater than the minimum clinically important difference, in the EQ-5D-3L index (Baseline 0.29 (95% confidence interval (CI) 0.27-0.31 vs 6 month 0.51 (95% CI 0.47-0.55), $p < 0.001$) and EQ5D-VAS (Baseline 54.3 (95% CI 52.9-53.7) vs 6 month 63.9 (95% CI 61.6-66.2), $p = 0.0024$) scores between baseline and 6 month follow-up (Figure 10)

EQ-5D index scores for patients submitted to BAJIR

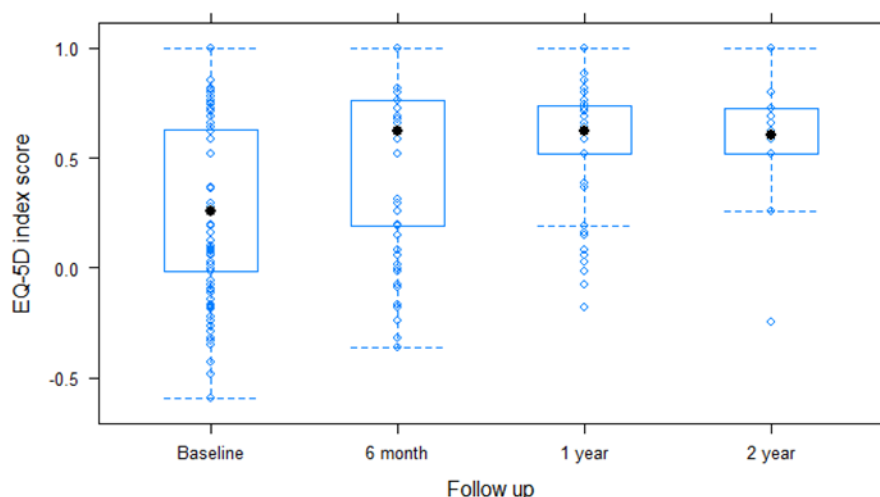


Figure 9. Box plot of EQ-5D-3L index scores for patients submitted to BAJIR.

Change in EQ-5D index scores for patients submitted to BAJIR

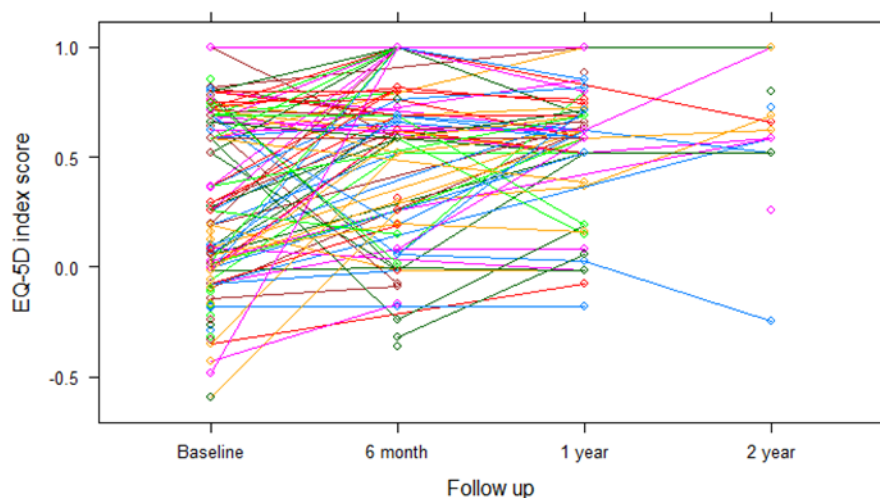


Figure 10. Change in EQ-5D-3L index scores amongst patients submitted to BAJIR. Each datapoint and line represents a single patient and the change in EQ-5D-3L index score, respectively.

BAJIR MDT Module



The BAJIR MDT module (Figure 12) was launched earlier this year and is now being used in a number of units to successfully run both departmental and regional network MDT discussions. The software is primarily used for patients with bone and joint infection but can also be used to support MDT discussion of all complex arthroplasty or trauma cases. This information is only for local clinical use to support clinical care and cannot be seen by the registry centrally.

Northumbria Healthcare NHS Foundation Trust Orthopaedic Infection MDT Meeting		
<input type="button" value="Add New Patient to BAJIR"/> <input type="button" value="Search and Add Patient to Pending"/>		
Pending	Monitoring	Active <input type="button" value="Start MDT Meeting"/>
<input type="checkbox"/> James Carruthers Hospital Number: T09999999 <input type="checkbox"/> Bill Smithly Hospital Number: 9ghhj23	<input type="checkbox"/> David Reed Hospital Number: hosp123	<input type="checkbox"/> Caroline Potts Hospital Number: t876697696 <input type="checkbox"/> Richard Martin Hospital Number: t808080 <input type="checkbox"/> bill smith Hospital Number: 19

Figure 12. MDT module

The module is user-friendly and provides a comprehensive summary of the meeting which can then be inserted into the patients' paper or electronic record. Any patient uploaded to BAJIR from an individual Trust can be added to their MDT list for discussion. Once added to the MDT list patients can be moved between three lists; Pending, Monitoring and Active. The pending list is a list of all patients for future MDT discussion. The monitoring list is for those patients who do not necessarily require discussion but may require regular review, *i.e.* for monitoring blood tests whilst on antibiotic therapy. The active list is for those patients to be discussed in the next MDT meeting.

The software also allows for patients to be referred to the BAJIR MDT module of another hospital to support the imminent hip and knee revision networks. However, for this to be possible all the units within a given network need to be registered with BAJIR. Once referred the patient will appear in the other hospital's pending list and their BAJIR record is accessible and editable by both Trusts.

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BAJIR MDT Module



The module allows for all clinicians present at the meeting to be recorded (Figure 13) (which means that all members of the MDT ideally should have a BAJIR user account, although they can be added manually). This information can then be used for individual appraisal.

Figure 13. Record of Clinicians Present

During MDT discussion the patient's record can be accessed and updated accordingly, the discussion is summarised and a patient outcome confirmed (Figure 14).

Figure 14. Active MDT Discussion (* - please note included patient details are artificial)

Caroline Potts	Hospital Number: t876697696	Outcome: Discussed and place on Monitoring list	Download Patient MDT Report	Edit Patient MDT
Richard Martin	Hospital Number: t808080	Outcome: Discussed and remove from MDT list	Download Patient MDT Report	Edit Patient MDT
bill smith	Hospital Number: 19	Outcome: Discussed and remove from MDT list	Download Patient MDT Report	Edit Patient MDT

At the conclusion of the meeting the MDT is finalised and a summary document produced for each patient (Figure 15). This documented can by uploaded to a patient's electronic medical record or printed to be filed within their paper medical notes. If the patient has been referred to a different unit for MDT discussion, then the MDT discussion will automatically be updated on their BAJIR record. BAJIR provides an audit log of all MDT meetings, including all patients discussed, their outcomes and the clinicians present.

The MDT Dashboard provides an audit trail of the meeting to satisfy individual revalidation and has been designed to support the revision arthroplasty BOASTs (Figure 16).

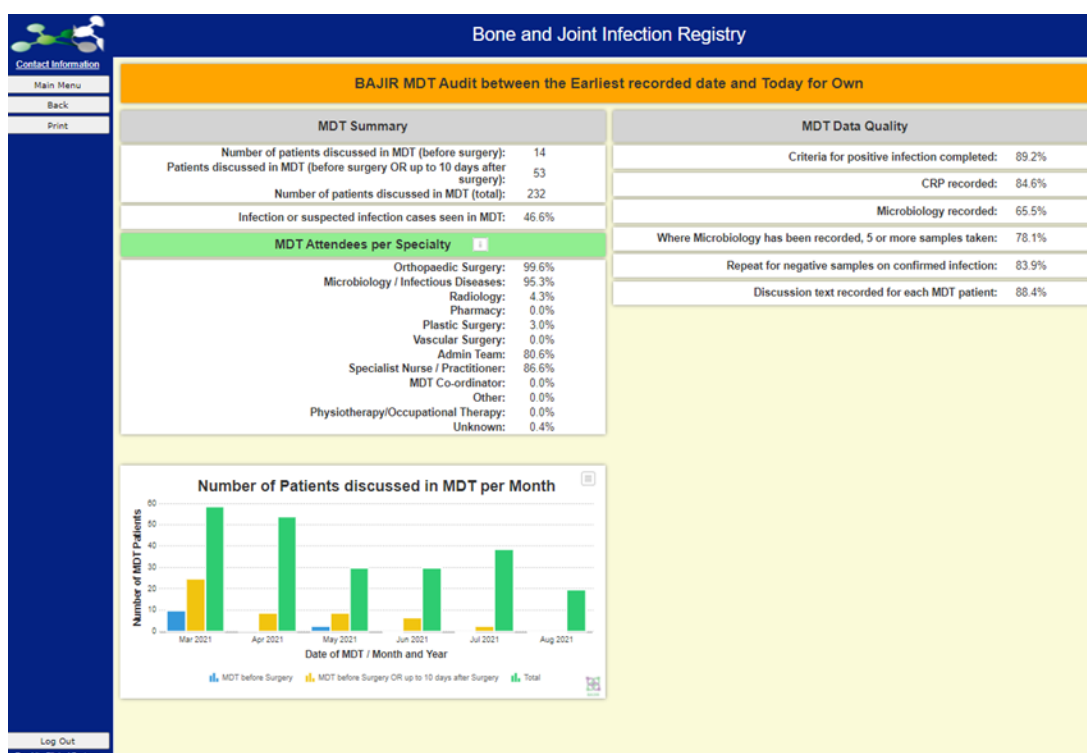
BAJIR MDT Module



Date of MDT	10/09/2021
Patient	April Tutorial (Hospital Number: T28042021)
Clinicians present	Anji Kingman .. Mike Petrie 7039873 Mike Reed n/a Graeme Smith 9999999 Graeme Testing Nicola Watson (admin)
Referring Clinician	
Referring Trust	Northumbria Healthcare NHS Foundation Trust
Treating Trust	Northumbria Healthcare NHS Foundation Trust
Most recent infection site	Left Hip
Diagnosis	Prosthetic joint infection
Infection	Confirmed Infection
Operation(s)	28/04/2021 Single stage revision 05/05/2021 26/08/2021
Organism (most recent)	CoNS, Streptococcus,
Comorbidities	No comorbidities
Allergies	No allergies
BMI	
Last antibiotic treatment	Meropenem, Vancomycin 7 days (intended duration)
Patient Summary	Patient presented with chronic infection left hip. Previous aspiration has confirmed a coag neg staph and strep infection - sensitive to most antibiotics. Underwent single stage on 28/4/21.
Active MDT Discussion	Patient doing well. Tissue samples concordant with pre-op aspiration. Thorough surgical debridement and organism-specific antibiotics in cement. Has completed 7 days of Vanc and Mero post op. For IV Teic and PO Rif for further 5 weeks through OPAT.
Outcome	Discussed and leave on Pending MDT list

Figure 15. Individual patient MDT report

Figure 16.
MDT
Dashboard



Future directions



We are confident that units in Scotland will soon be able to join counterparts in England and Wales in submitting data to BAJIR. With increasing data submission, we are now focusing efforts on the development of bioinformatic pipelines to streamline data analysis to allow more frequent updates from the registry.

Data quality is extremely important to any registry and we are developing a process to double check for further procedures using the patient's Hospital Episode Statistics (HES) data. If a further procedure appears on HES then the local team will be notified and can update the clinical record, if appropriate.

We also now feature in the BASK Knee Revision BOAST on infected TKR management and in the upcoming BHS Surgical Standards document on management of infected hip replacement. We look forwards to working with the revision arthroplasty networks as they grow to support MDT work, data collection and audit.

Financial Support

We are incredibly grateful to the ongoing support of our industry partners, who continue to be crucial to our success. The generous support to this point has funded the ongoing development of the registry, including the recent MDT module release. With the ongoing support of our sponsoring companies we can continue to grow and develop BAJIR. Many thanks to all those companies listed below.



Steering Committee



The BAJIR Executive are grateful to the following members of the steering committee for their help and guidance in continued growth of the registry

BAJIR STEERING COMMITTEE 2021

Mike Reed (Chair)	Luke Farrow (BAJIR Fellow)
Tim Petheram (Treasurer)	Jerry Tsang (BAJIR Fellow)
Iain McNamara (Secretary)	Mike Petrie (Engagement lead)
James Masters (Governance)	Anji Kingman (Clinical Outcomes Manager)
Andy Toms (BASK)	Deepa Bose (Member at large)
Mike Hutton (BASS)	Simon Jameson (BHS)
Rhidian Morgan-Jones (BOA / PJI UK)	Amar Rangan (BESS)
Will Eardley (BTS)	Ian Sharpe (BOFAS)
Lucinda Barrett (Microbiologist)	Setor Kunutsor (Scientist)
Martin Sarungi (Scotland)	Neil Jenkins (Microbiologist)
Jamie Ferguson (Member at large)	Nigel Westwood (Patient representative)
Pedro Foguet (Member at large)	Abtin Alvand (Member at large)

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