BAJIR

BONE & JOINT INFECTION REGISTRY

BAJIR REPORT 2022

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 fourth 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. Use of the registry in routine clinical practice is supported by current BOA standards.

We hope you enjoy reading this annual report. This year we cover insights into the progress made within the registry over the last year, as well as highlighting current practice in the areas of Periprosthetic Joint Infection, Septic Arthritis and Osteomyelitis. Substantial updates have been made to the registry regarding Fracture Related Infections this year, and we look forwards to this becoming an integral part of next years report as data accumulates.

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 2022

Figure 1. Annual submissions to BAJIR
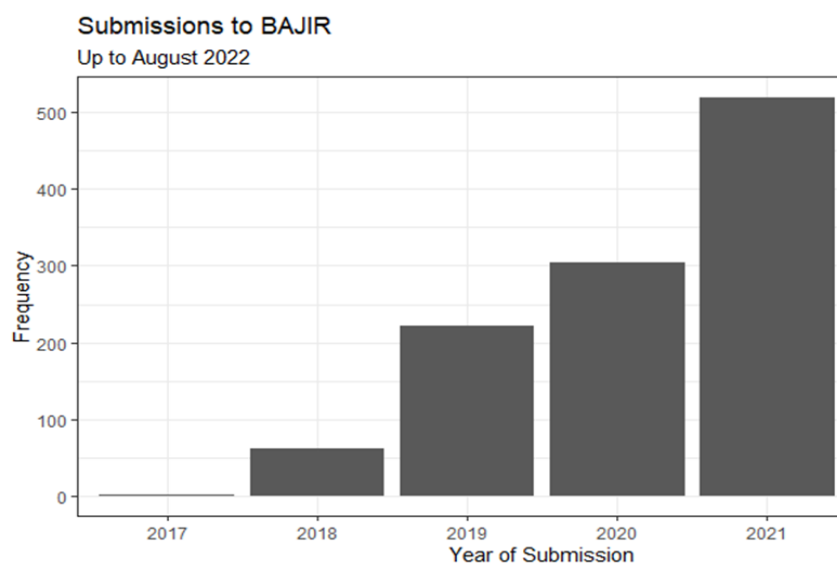
Registry Progress

2021 has seen the registry continue to go from strength to strength, with now over 39 trusts successfully registered to participate in the BAJIR.

There are now over 640 confirmed infections within the registry, with 2021 / 22 seeing the highest annual input into the registry since the BAJIR was formed.

This year has seen significant updates to the way the bone infection is managed in the registry, including the development of two separate pathways for Native Osteomyelitis and Fracture Related Infection. We are indebted to the help of Deepa Bose (British Limb Reconstruction Society) and Will Eardley (Orthopaedic Trauma Society) for their input into this processes. We look forwards to seeing the outcomes of this hard work, which will no doubt form a cornerstone of evidence based treatment for these conditions in future.

Further progress has also been made towards Scottish participation in the registry - where a Public Benefit and Privacy Panel for Health and Social Care (PBPP) application, led by Martin Sarungi (Scotland representative), has now been approved. This has been a massive piece of work, including 3 revisions, 32 supporting documents and 20 months worth of effort to cross the finishing line. The Scotland team are now confirming the next steps to begin roll-out of the registry across the specified pilot sites shortly.

The Hospital Episode Statistics (HES) - BAJIR linkage is also expected to go live in 2023. This will allow participating sites to compare the data held about their patients in the registry to that identified through HES and the Civil Registration of Deaths. This should provide a key check to ensure that data held within the registry is accurate and reflective of an individuals current situation.

2021 / 22 has also seen further refinement of our MDT module, embedded within the BAJIR registry. This is now widely used across a number of NHS Trusts, and allows for seamless addition of patients to BAJIR whilst undertaking MDT processes integral to high-quality patient care.

Periprosthetic Joint Infection

There were 914 patients submitted to BAJIR with suspected periprosthetic joint infection (PJI). Of which, 499 had a confirmed PJI; 270 (54%) hips, 208 (42%) knees, 8 (2%) shoulders, 7 (1%) elbows, and 6 (1%) ankles (Figure 2).

Treatment data was available for 444 (89%) cases. Surgery was performed in 434 (98%) cases. Initial surgical treatment was an open/arthroscopic washout in 20 (5%), DAIR procedure in 192 (43%) cases (137 (31%) with and 55 (12%) without modular exchange), single-stage revision in 93 (21%) cases, and 1st stage of a planned two-stage revision in 124 (27%) cases (Figure 3).
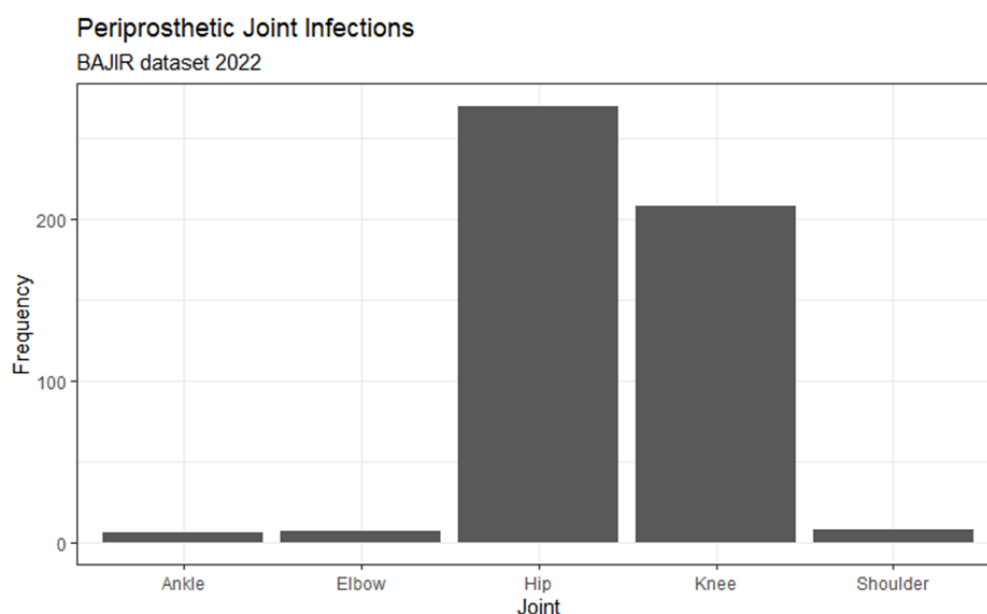
Figure 2. Joint involvement of confirmed periprosthetic joint infection cases recorded in BAJIR.
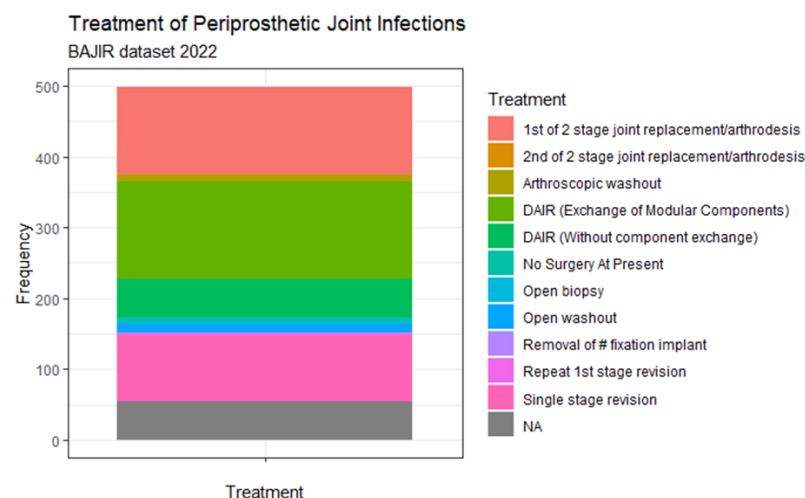
Figure 3. Initial treatment for confirmed periprosthetic joint infection cases recorded in BAJIR. "NA" denotes data "not available.

Septic Arthritis

A total of 153 patients with suspected native joint infection have been submitted to BAJIR. Native joint infection was confirmed in 79 patients, with four cases of polyarticular infection. The most common joints involved were the knee (31/83 (37%)), hip (25/83 (30%)) and shoulder (18/83 (21%) (Figure 4).
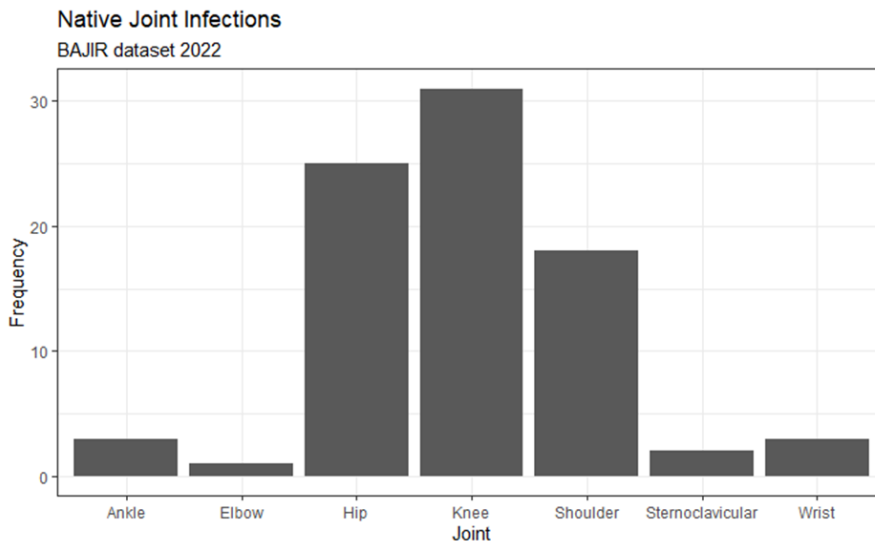

Figure 4. Joint involvement in cases of native joint infection recorded in BAJIR

Acute infection was present in 69/83 (83%) cases, chronic infections were present in 9/83 11%) and acute-on-chronic infections in 4/83 (5%). In 69 (83%) cases there was a documented pre-operative aspiration, of which 64 (93%) patients had positive isolates. Surgery was performed in 69/83 (83%) cases; 28/83 (33%) cases received an arthroscopic washout, 17/54 (28%) open washout, 12/83 (15%) excision and spacer and 4/83 (5%) received a joint replacement (Figure 5).
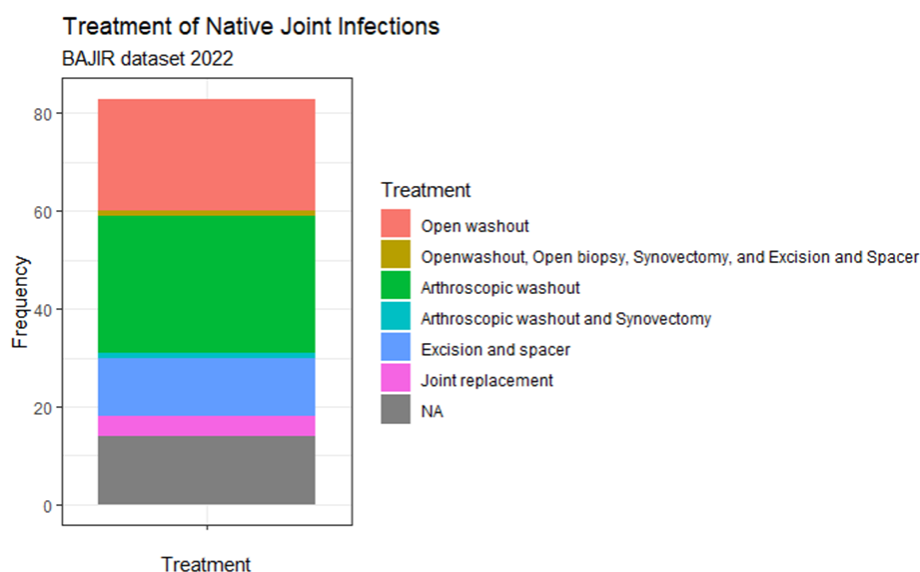
Figure 5. Surgical treatment of native joint infections recorded in BAJIR. "NA" denotes data "not available."

Osteomyelitis

Thus far 113 patients with suspected osteomyelitis have been submitted to BAJIR. Overall 82 patients had confirmed osteomyelitis. Commonly affected bones were the femur (23/82 (28%), tibia (20/82 (24%) and foot (12/82 (15%) (Figure 6).
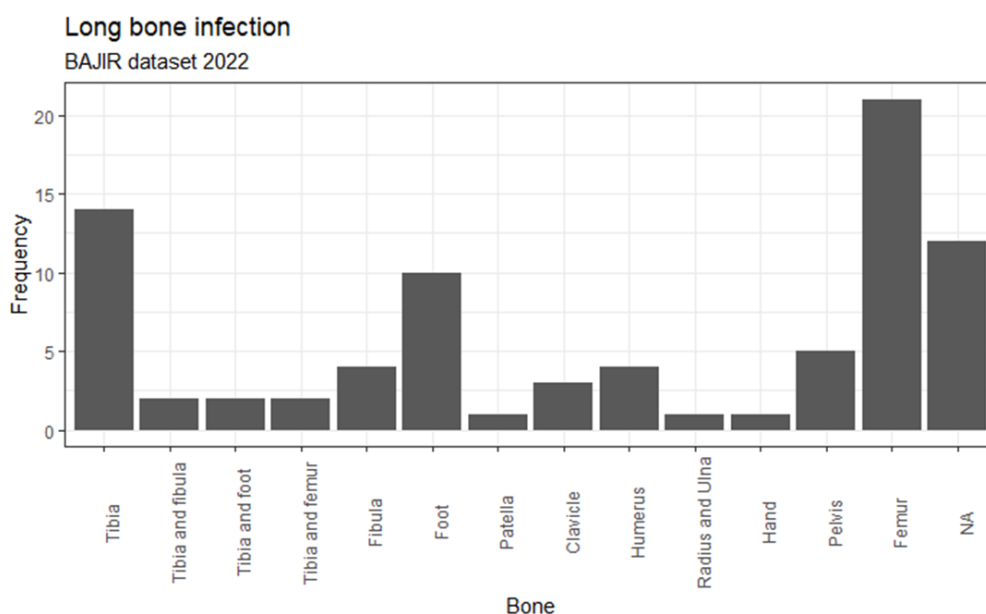

Figure 6. Distribution of long bone infections recorded in BAJIR

In 32 (39%) cases infection was classified as acute, 21 (26%) chronic, and 6 (7%) acute-on-chronic. Microbiological data was available for 67 (82%) patients. Treatment data was available in 46/82 (56%) of cases; 26/82 (32%) patients received an incision and drainage, 9/82 (11%) underwent combined procedures, 6/82 (7%) cortical resection, 2/82 (2%) cortical & medullary resection and 12/82 (15%) removal of metalwork (Figure 7)
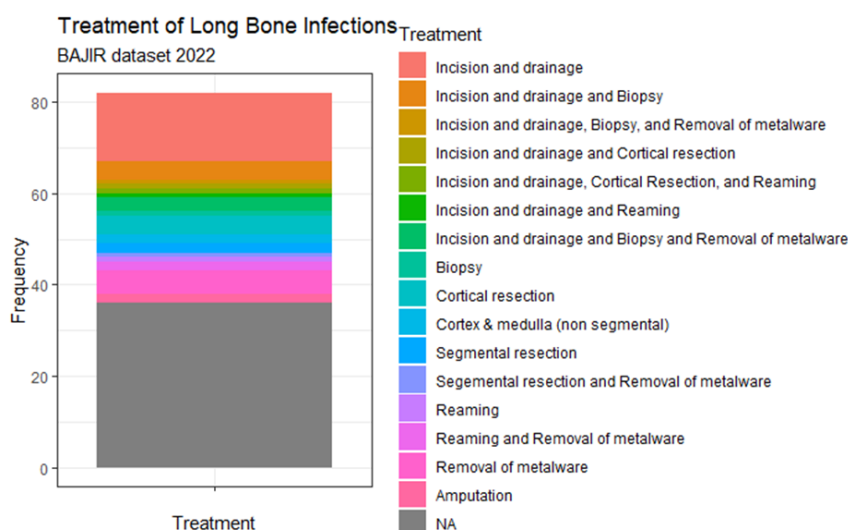
Figure 7. Surgical treatment of osteomyelitis cases recorded in BAJIR. "NA" denotes data "not available."

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 has two parts. The EQ-5D 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 305 cases; EQ5Ddata was complete for 292 (96%) cases and VAS health scores for 288 (94%) cases. Follow-up at 6 months was available for 425 patients; EQ-5D data was complete for 216 (51%) cases and EQ-VAS health scores for 209 (49%) cases. Follow-up at 1 year was available for 397 cases; EQ-5D data was complete for 195 (49%) cases and EQ-VAS health scores for 187 (47%) cases. A state "worse than death" was reported in 81/305 (28%) cases at baseline, with 33/216 (15%) continuing to report negative EQ-5D scores at 6 months of follow-up (Figures 8 and 9).

EQ-5D index scores for patients submitted to BAJIR

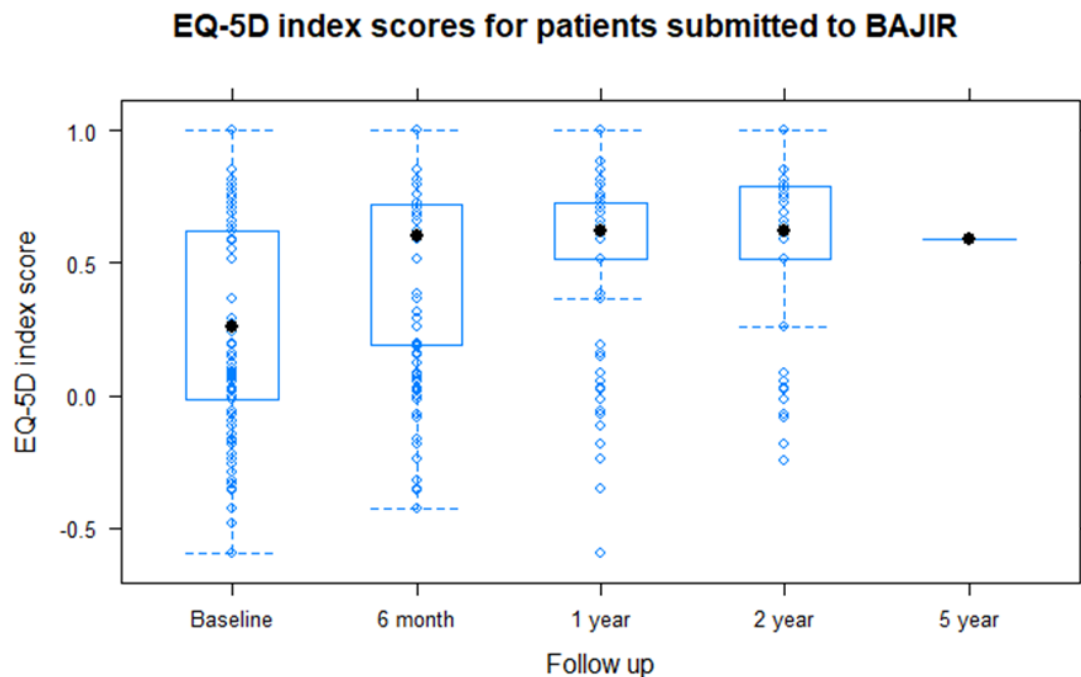**Figure 8.** Box plot of EQ5D index scores for patients submitted to BAJIR.

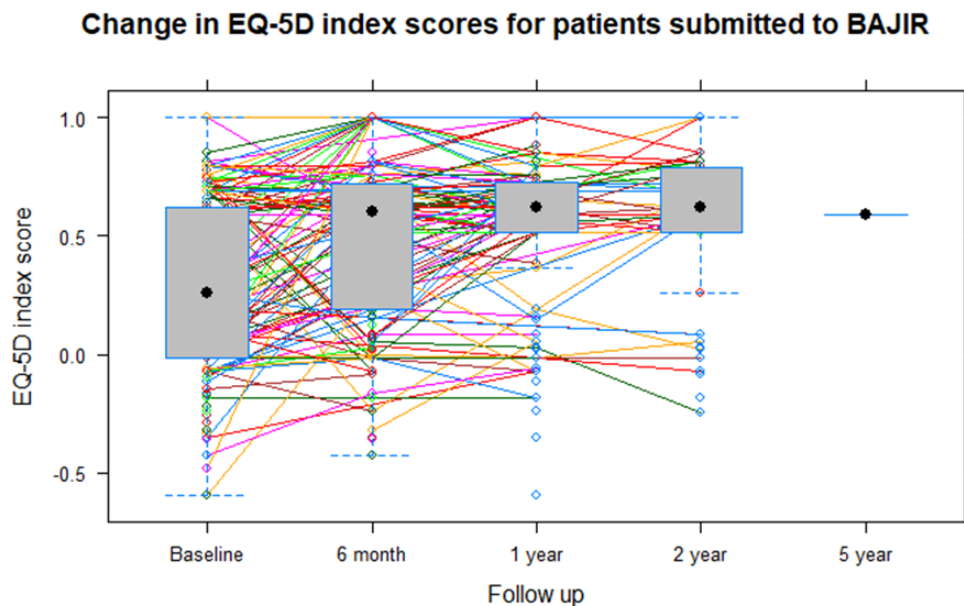### Change in EQ-5D index scores for patients submitted to BAJIR

Figure 9. Change in EQ-5D index scores amongst patients submitted to BAJIR. Each datapoint and line represents a single patient and the change in EQ-5D index score, respectively.

BAJIR MDT Module

The BAJIR MDT Module is being used in a number of Trusts to successfully run both departmental and regional network MDTs. It is now possible for each Trust to run up to 5 separate MDT meetings to support arthroplasty or other sub-specialist MDT, fracture-related infection MDT and regional meetings.

	Description	This Meeting Date	Last Date Finalised	Status	
1	Infection MDT		21 July 2022	Preparing	Go to Meeting
2	Revision Hip MDT				Go to Meeting
3	Revision Knee MDT			Preparing	Go to Meeting
4	Fracture Related Infection MDT				Go to Meeting
5	CHANGE NAMES BY CLICKING ICON TO LEFT				Go to Meeting

Figure 10 Multiple MDT meetings can now be managed through BAJIR

The module is user-friendly and provides a comprehensive summary of the meeting for each patient which can be downloaded and submitted to the patient's medical record.

We have now developed the ability for a free text summary to be added to a patient to provide details and context to why the patient is being discussed.

A preview of the MDT meeting can now be downloaded as a pdf and circulated to MDT members prior to the meeting for pre-reading.

Any previous MDT discussions now form part of the patient summary at any subsequent MDT meeting and are visualized separately and with a date stamp for their previous discussion.

BAJIR MDT Module cont.

Date of MDT	12/07/2022
Patient	PETER RABBIT (Hospital Number: HEI8943284)
Clinicians present	Anji Kingman .. Mike Petrie 7039873 Mike Reed n/a
Referring Clinician	
Referring Trust	North Bristol NHS Trust
Treating Trust	Northumbria Healthcare NHS Foundation Trust
Most recent infection site	Right Hip
Problem/Site	Prosthetic joint infection
Infection	Confirmed Infection
Operation(s)	01/03/2022 DAIR (Exchange of Modular Components) 01/03/2022 02/03/2022 07/03/2022 28/04/2022 1st of 2 stage joint replacement/arthrodesis
Organism (most recent)	CoNS, Streptococcus
Comorbidities	Smoking, Diabetes, PVD
Allergies	No allergies
BMI	28.1
Last antibiotic treatment	Doxycycline 28 days (intended duration)
Patient Summary	---------- 15/04/2022 ---------- Type background summary here.... ---------- 07/06/2022 ---------- New presentation with sinus ---------- 12/07/2022 ----------
Active MDT Discussion	continue antibiotics
Outcome	Discussed and place on Monitoring list

Figure 11 Finalised MDT report

MDT User Guide

A user guide for the MDT module has been produced and is now available in the Documents section of the Registry.

BAJIR Software Updates and Improvements

BAJIR Software Update

Over the past year, a number of improvements have been made to the BAJIR registry, often prompted by insightful feedback from users' of BAJIR. Six online Zoom tutorials have been hosted by Anji Kingman and Mike Petrie for registered users of BAJIR to help with familiarity of the Registry, data entry and how to use the MDT software. The changes described below that have been made to the Registry have also been mirrored on paper forms that can be downloaded from BAJIR home page as an alternative method to support data entry.

The first significant change has been the update of the **Fracture-Related Infection (FRI)** surgery page (see below).

Surgery			
Diagnosis :	**Fracture related infection**		
Date of operation :	**12 July 2022**		
1st stage procedure :	☐ Cortical resection ☐ Incision and drainage ☑ Reaming	☐ Cortex & medulla resection ☑ Removal of metalware ☐ DAIR	☐ Segmental resection ☐ Biopsy
2nd stage procedure :	☐ Cortical resection ☐ Incision and drainage ☐ Reaming	☐ Cortex & medulla resection ☐ Removal of metalware ☐ DAIR	☐ Segmental resection ☐ Biopsy
3rd stage procedure :	☐ Cortical resection ☐ Incision and drainage ☐ Reaming	☐ Cortex & medulla resection ☐ Removal of metalware ☐ DAIR	☐ Segmental resection ☐ Biopsy
Amputation :	○ Transfemoral ○ Syme's	○ Knee disarticulation ○ Other	○ Transtibial
Degree of clearance :	○ N/A ○ Partial clearance	○ Sampling ◉ Clearance of active disease areas	○ Debulking / decompression ○ Clearance of all abnormal bone
Cierny & Mader patient type :	○ Not applicable ○ Type B systemic	◉ Type A ○ Type B local & systemic	○ Type B local ○ Type C
Dead space management :	☐ None ☐ Local flap	☐ Free flap ☐ Non-dissolvable antibiotic carrier	☑ Dissolvable antibiotic carrier
Carrier :	◉ PMMA beads	○ PMMA spacer	
Stabilisation :	☐ Stabilisation internal ☐ Plate (temporary) ☐ Nail (temporary) ☐ Exchange nailing (temporary) ☐ Plaster (temporary) ☑ Pin to bar (temporary) ☐ Ring fixator (temporary) ☐ Hybrid fixator (temporary) ☐ None	☐ Stabilisation external ☐ Plate (definitive) ☐ Nail (definitive) ☐ Exchange nailing (definitive) ☐ Plaster (definitive) ☐ Pin to bar (definitive) ☐ Ring fixator (definitive) ☐ Hybrid fixator (definitive)	
Other surgical procedure :	☑ None ☐ Removal of PMMA	☐ MUA ☐ Other	☐ Fixator Modification

Figure 12 Screen capture of the surgery page for FRI in BAJIR

The heading "Bone Infection" has now been subdivided into "fracture-related infection" and "osteomyelitis". The surgical options for these two subheadings have been designed through consultation with representatives from the Orthopaedic Trauma Society (Will Eardley) and British Limb Reconstruction Society (Jamie Ferguson and Deepa Bose) and include the options to denote form of fracture stabilisation, whether temporary or definitive and whether the procedure was staged.

BAJIR Software Updates and Improvements

User-friendly Registry

We have improved the guidance for users of the Registry by adding information pop-up boxes (below).

Presence of sinus pre-treatment :	◉ No	○ Yes	
Affected side :	○ Left	◉ Right	
Joint involved :	○ Sternoclavicular ○ Wrist ○ Ankle	○ Shoulder ○ Hip	○ Elbow ◉ Knee
Ortho implant / prosthesis present at index site :	○ No	◉ Yes	○ Unknown
Previous ortho surgery to manage infection at this site :	○ No	◉ Yes	○ Unknown
Number of previous operations :	○ 1	◉ 2-4	○ >4 ○ Unknown
Date of most recent surgery at infected site :	01 July 2019 📅		
Chronicity of infection :	○ Acute	◉ Chronic	ⓘ
Surgery :		Yes	1 entry. Scroll down to select or add ⌄
Local medical management at surgery :		Yes	1 entry. Scroll down to select or add ⌄

Anatomical Site

ⓘ Chronicity of Infection ❌

Acute Infection

Classification

- Potential infection presenting within 4 weeks of index surgery, or within 4 weeks from onset of symptoms consistent with infection.
- Clinical features consistent with acute infection - for example: fever, acute pain, new swelling, inability to weight bear, reduced range of motion, persistent or purulent wound leakage.

Chronic Infection

Classification

- Potential infection presenting at least 4 weeks after index surgery, or greater than 4 weeks from onset of symptoms.
- Clinical features consistent with chronic infection - for example: chronic pain, presence of sinus tract, radiological evidence of loosening, and persistent or purulent wound leakage.
- Risk factors for infection should precipitate a high index of suspicion. These include: Revision surgery, Elevated BMI, Male Sex, Diabetes, Immunosuppression (e.g. Rheumatoid/Malignancy), Malnutrition and Multimorbidity.

Adapted from the 2018 International Consensus Meeting on Musculoskeletal infection

Section: *General Questions; Diagnosis: Definitions; Question 1:*

https://icmphilly.com/wp-content/uploads/2018/11/General.pdf

[Close]

nagement : | 1 entry. Scroll down to select or add ⌄

BAJIR Software Updates and Improvements

We have also improved the colour coding of the Registry to show whether the minimum data-set has been completed, and to show that a patient has been confirmed as having an infection. A patient must be confirmed as having an infection on the Registry for them to be seen by the BAJIR administration team. This then allows the admin team to contact the patients for their consent and for their follow up PROMS.

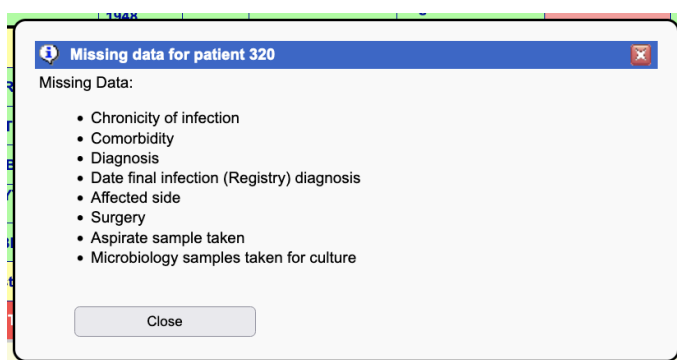| Patient Id	Primary Identifier	Full Name	Date of Birth	Gender	Date of Referral to Service	Most Recent Infection Site	Registered Infection	Additional Information	Time in Follow-up (Days)	Time Lost to Follow-up (Days)	Consent Status	Timeline
320 ⚠	290 720 222 - NHS Number	User Guide	01 Apr 1945	Female	01 Jul 2022			Select Entry	38	15	Not recorded	View
317	120 720 2218 - NHS Number	TTJULY TUTORIAL	12 Jul 1948	Female	06 Jul 2022	Right Tibia	Confirmed	Select Entry	6	42	Not recorded	View
315	r4u 874 385q - NHS Number	N K	26 Oct 1976	Male	01 Jul 2022	Right Hip	⚠	Select Entry	38	15	Not recorded	View
305	070 619 5218 - NHS Number	JUNE TUTORIALTT	07 Jun 1952	Female	02 Jun 2022	Right Knee	Confirmed	Select Entry	67	15	Not recorded	View
302	120 420 2218 - NHS Number	EASTER TUTORIAL	12 Apr 1946	Male	04 Apr 2022	Left Tibia	Confirmed	Select Entry	64	77	Not recorded	View
300	632 938 9834 - NHS Number	PETER RABBIT	01 Apr 1952	Male	01 Mar 2022	Right Hip	Confirmed	Select Entry	160	15	Not recorded	View
299	240 220 2218 - NHS Number	FEBTWENTYTWO TUTORIAL	24 Feb 1952	Female	21 Feb 2022	Left Hip	Confirmed	Select Entry	106	77	Not recorded	View
298	582 654 7391 - NHS Number	ACPA MEMBERS	02 Mar 1972	Female	16 Feb 2022	Right Knee	Confirmed	Select Entry	111	77	Not recorded	View
297 ⚠	040 400 4040 - NHS Number	Dendrite Test-Patient	10 Apr 1967	Female	03 Oct 2021	Left Sternum		Select Entry	134	190	Not recorded	View
296	181 120 2021 - NHS Number	NOVONE TUTORIAL	01 Apr 1953	Male	15 Nov 2021	Left Hip	Confirmed	Select Entry	148	133	Not recorded	View

Colour Coding: Record Complete | Record Incomplete | Patient Deceased | Search Now | Clear Filters

A patient's record will be green once the minimum data set has been completed. It will be red if the patient is deceased. A yellow record highlights that not all of the minimum data set is complete. We have now added a yellow warning triangle to show which parts of the minimum data set are outstanding.

Missing data for patient 320

Missing Data:

- Chronicity of infection
- Comorbidity
- Diagnosis
- Date final infection (Registry) diagnosis
- Affected side
- Surgery
- Aspirate sample taken
- Microbiology samples taken for culture

Close

Is the patient infection free?

We will very shortly be adding the question: Is the patient infection free? to BAJIR. The answer for each patient will need to be updated every 6 months as part of our continued strive towards high quality data entry.

BAJIR Software Updates and Improvements

Regular updates to the Registry

Following consultation with our industry partners, we continue to update our list of local medical management options for bone and joint infection, including carriers and antibiotics.

Local medical management			
Date of local medical management :	**10 July 2022**		
Carrier :	☐ Palacos - G ☑ Copal G + C ☐ Copal G + V ☐ CMW ☐ Cemex ☐ Osteoset ☐ DAC 5ml	☐ Prodense ☐ Herafil ☐ Cerament ☐ Bone graft ☐ 5ml Stimulan RapidCure ☑ 10ml Stimulan RapidCure ☐ DAC 10ml	☐ 20ml Stimulan RapidCure ☐ SMARTSET GMV ENDURANCE GENTAMICIN Bone Cement ☐ SMARTSET GHV GENTAMICIN Bone Cement ☐ DePuy CMW 1 GENTAMICIN Bone Cement ☐ DePuy CMW 2 GENTAMICIN Bone Cement ☐ DePuy CMW 3 GENTAMICIN Bone Cement ☐ Other
Antibiotics in carrier :	☐ None ☐ Azithromycin ☐ Ciprofloxacin ☐ Co-trimoxazole ☐ Flucloxacillin ☐ Meropenem ☐ Pristinamycin ☐ Tobramycin	☐ Amikacin ☐ Benzylpenicillin ☐ Clarithromycin ☐ Daptomycin ☐ Fusidic acid ☐ Metronidazole ☐ Rifampicin ☐ Trimethoprim	☐ Amoxicillin ☐ Ceftazidime ☐ Clindamycin ☐ Doxycycline ☑ Gentamicin ☐ Moxifloxacin ☐ Teicoplanin ☑ Vancomycin ☐ Antifungal ☐ Ceftriaxone ☐ Co-amoxiclav ☐ Ertapenem ☐ Linezolid ☐ Piperacillin tazobactam ☐ Tigecycline ☐ Other

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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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