Non-Arthroplasty Hip Registry

9th Annual Report 2024

Chairman's Foreword

It is a pleasure and an honour to present the 9th Annual Report from the UK **Non-Arthroplasty Hip Registry (NAHR)**. My predecessors Ajay Malviya, Vikas Khanduja, and Marcus Bankes have steered the board to build and shape the registry into the World's leading hip preservation registry. This is witnessed by the already large but ever increasing number of publications on registry data, as well as the international interest in the registry that has stimulated others to follow our lead.

The registry now has almost **23,000 active pathways** and even though the number of surgeons contributing to the registry does seem to have fallen, there are several reasons why this trend should change in the coming year.

- **9th Annual Report** – I am indebted to Justin Green, Inderpaul Samra, Callum McBryde and Ajay Malviya for their hard work in producing this report. As you will see, for the first time we report on the individual PROM score outcomes for Triple Pelvic Osteotomies and PAOs. Both procedures are associated with an improvement in PROM scores at all follow-up points. The association between increased BMI and poorer outcomes is again identified in this year's report and should serve to help counsel patients prior to surgery.

- **MDS 3.0** – This has allowed the collection of data on other aspects of the non-arthroplasty hip procedures, and as those data sets mature, future reports will then highlight their importance. The user group continues

to evaluate the data sets and consider what enhancements may be appropriate. We would welcome any feedback from the BHS membership on what other data we should aim to capture.

- **Education** – Registry data has continued to be presented at meetings nationally as well as internationally. Several papers on **NAHR** data will be presented at the BHS meeting in Belfast. The case-based discussion format of the NAHR session at the BHS meeting last year was so successful that it is being repeated this year. NAHR board members continue to be involved with education at meetings all over the world

- **The NAHR research fellow** – Justin Green has been very busy this year. He presented his work at the **ISHA – The Hip Preservation Society** annual scientific meeting in Cape Town, South Africa, and won an award for the **Best Standard Free Paper Oral Presentation.** He was also on the shortlist for a prize at the **European Hip Society** meeting. We continue to be indebted to ORUK and the BHS for supporting this post.

- **The Medical Device Outcomes Registry** – this NHS England programme is headed up by Scott Pryde, and the **NAHR** board have been in discussions with him and his team to determine how the **NAHR** data can be incorporated into **MDOR.** Terms of reference are currently being drafted. As data submission to **MDOR** will be mandatory, this may well deliver on our aim of making **NAHR** data submission mandatory.

- **The NAHR regional representatives** – will have a very important role in the coming year engaging with surgeons in their region to encourage them to contribute data to the registry. This is a major priority for us this year, and with **MDOR** having been launched and data submission becoming mandatory, I would hope to be able to report on increased submission rates in next year's report.

- **The NAHR board / User Group** – This group of dedicated individuals continues to tirelessly work on supporting and evolving the registry. Two of our board members have left the board this year, and so on behalf of the board I would like to thank Paul Gaston and Jon Conroy for all their hard work over their years of involvement with the **NAHR**. The registry would not have matured into the registry it is today without their hard work. I would add thanks to Ajay Malviya, Vikas Khanduja, Marcus Bankes, Tim Board and Callum McBryde for their ongoing work. If there are any surgeons who are already contributing to the registry who would like to join the board, please do contact us.

- **Sponsors** – I would like to thank **Smith and Nephew** who have supported the registry from inception and continue to do so. I would also like to thank **NTL Biologica** who have become recent supporters of the registry.

Lastly, and most importantly, on behalf of the **NAHR board,** I would like to thank all patients and surgeons who, have in the past, and will in the future contribute to the registry. Your commitment to share your data is what fuels the NAHR's success, and we welcome any feedback you might have on how we can shape it for the future.

Tony Andrade

Chairman, Non-Arthroplasty Hip Registry

NAHR board

Tony Andrade (Chair)

Mr Tony Andrade is a consultant Orthopaedic, Hip and Knee surgeon with a special interest in Young Adult Hip problems. He was appointed to the Royal Berkshire Hospital in 2002, where he established a hip arthroscopy and hip preservation service that that quickly evolved into a tertiary referral centre. Since then, he has been at the forefront of the evolving surgical techniques in arthroscopic and other types of hip preservation surgery, and this led to a visiting surgeon program where surgeons from the UK and across the world are able to join him to learn these surgical techniques. He established a Lower Limb Arthroplasty Fellowship in 2004, and a Hip Arthroscopy Fellowship in 2016. He has been an active member of ISHA – The Hip Preservation Society (formerly known as the International Society of Hip Arthroscopy) since it was founded in 2008 and is a past president of ISHA serving in 2020. He joined the board as the ISHA membership secretary in October 2012 and was the host chairman for the ISHA Annual Scientific Meeting in Cambridge in September 2015. He was one of the original members of the NAHR user group formed at the launch of the registry.

Ajay Malviya (Past Chair)

Mr Ajay Malviya is a Consultant Orthopaedic Surgeon at Northumbria Healthcare NHS Foundation Trust. He trained in the Northern Deanery and has done specialist fellowships in hip preservation and joint replacement surgery in Cambridge, London and Switzerland. He specialises in hip arthroscopy for femoroacetabular impingement, trochanteric pain syndrome and periacetabular osteotomy for hip dysplasia using a minimally invasive approach. He deals with sports injuries of the hip and has published and presented widely on the results of hip arthroscopy in athletes and general population. He has completed a PhD on the role of hip arthroscopy in femoroacetabular impingement.

He was awarded the prestigious ABC (America-Britain-Canada) fellowship in 2016 by the British Orthopaedic Association that involved visits to various high-profile centres in USA and Canada learning about new systems and techniques. He is a very active researcher with more than 100 peer-reviewed publications, the Deputy Editor of Journal of Hip Preservation Surgery and the Vice-Chair of the ISHA (International Hip Preservation Society) Research

Committee. He is the Vice-Chair of the British Orthopaedic Association Education and Careers committee and the national lead of the UK and Ireland orthopaedic in-training examination (UKITE). He is an examiner for the Royal College of Surgeons (FRCS T&O).

Vikas Khanduja

Mr. Vikas Khanduja is a Consultant Orthopaedic Surgeon & Research Lead (Elective) at Addenbrooke's - Cambridge University Hospital, specialising in hip and knee surgery and has a particular interest in arthroscopic surgery of the hip. He has been instrumental in setting up & developing the tertiary referral service for Young Adult Hip Surgery & the Young Adult Hip Research Group in Cambridge .

Complementing his clinical practice, his research interests centre around disease stratification of FAI using novel imaging techniques, better pre-operative planning tools using dynamic analysis and optimisation of arthroscopic management of FAI via precision surgery to improve outcomes. He has authored over 175 peer reviewed articles and three books.

Vikas is the recipient of the American and British Hip Society Travelling Fellowship in 2011, the Arnott Medal presented by the Royal College of Surgeons of England in 2013, the Insall Fellowship presented by the American Knee Society and Insall Foundation in 2014 and the Hunterian Professorship by the RCS England in 2021.

Vikas is a past president of the British Hip Society President, he is part of ESSKA as the Chair of the European Hip Preservation Associates, SICOT as President Elect and the NIHR MSK NSG as the Orthopaedic Lead for the Eastern Region.

Marcus Bankes

Mr Marcus Bankes was a senior surgeon on the Hip Unit at Guy's and St Thomas' Foundation NHS Trust and was appointed Consultant Orthopaedic Surgeon in 2002. He is now in full time private practice. His practice consists almost exclusively of the surgical treatment of young adult hip disorders, including arthroscopic and open hip preservation techniques and arthroplasty, particularly with ceramic-on-ceramic bearings. Recognised as an opinion leader in hip surgery, Marcus is a regular speaker at national meetings and ISHA (The Hip Preservation Society) as well as being a reviewer for a number of orthopaedic journals. He pioneered the use of the British Non-Arthroplasty Hip Registry (NAHR) and was the first Chair of its User Group. He remains on the User Group of the NAHR and has recently led on the Minimum Data Set 2.0 project. His interests outside work include film, TV, pop music, Apple electronic goods, and most sport, particularly cycling.

Tim Board

Professor Tim Board specialises in complex primary and revision hip surgery and hip arthroscopy at Wrightington Hospital, Lancashire. He trained in Manchester, gaining an MD for research into bone grafting and an MSc in Orthopaedic Engineering. Tim then undertook Fellowship training in Sydney, Hannover and Wrightington. Wrightington now performs over 1000 hip and 1000 knee replacements every year and is the tertiary orthopaedic unit in the North West.

Tim is the GM CLRN lead for orthopaedics and chairs the British Hip Society Research Committee. He also sits on the executive committee of the British Hip Society and the North West Surgical Trials Centre. He is a full time NHS consultant but has a strong academic interest in both basic science and clinical research having presented over 200 papers at National and International scientific meetings and published over 100 papers in scientific journals and written numerous book chapters. He is an Honorary Professor and has numerous research collaborations with the Universities of Manchester, Leeds and Salford.

Callum McBryde

Mr. Callum McBryde is a consultant hip surgeon at the Royal Orthopaedic Hospital in Birmingham appointed in 2011. He is proficient in all aspects of hip surgery both hip preservation surgery such as hip arthroscopy and pelvic osteotomy but also complex primary total hip replacement and hip resurfacing. He is considered an expert in the treatment of conditions such as developmental dysplasia, avascular necrosis, femoro-acetabular impingement and slipped upper femoral epiphysis. He completed his undergraduate training at The University of Manchester, completed his surgical and orthopaedic training in Birmingham whilst also completing a Doctor of Medicine higher degree at The University of Birmingham. He then completed a number of international specialist hip fellowships in Australia and Switzerland. He has won a number of prizes and accolades for his research and work including the McKee prize, the European Fellowship and the McMinn scholarship from the British Hip Society.

He has been instrumental in the development of the multidisciplinary young adult hip unit in Birmingham which is a recognised centre of excellence and national referral centre. He is recognised as an opinion leader with a large number or peer reviewed publications and is regularly invited both nationally and internationally to share his knowledge and experience to other surgeons.

Justin Green

Justin is an Orthopaedic Registrar at Northumbria Healthcare Trust who is involved in clinical informatics and AI innovation within the NHS. He was awarded the combined Orthopaedic Research UK and British Hip Society Fellowship in 2022 to explore the use of AI in determining long-term outcomes following hip preservation surgery with the NAHR, forming an integral part of his current Ph.D. in Artificial Intelligence, at Newcastle University School of Computer Science. His approach to using AI in healthcare has been recognised internationally by both industry and the orthopaedic community for his work in developing robust and responsible clinical decision support, leveraging AI and machine learning technology safely. He received an award for his work at ISHA, Cape Town in 2023.

Justin acts as the Clinical Data Scientist and AI Technology Lead within Northumbria NHS trust and a member of the NorthFutures Digital skills and

Training board where he continues to develop and promote digital training for clinical staff across the North East, in addition to being an active participating in the regional NHS Education England Faculty of Digital Health steering group where he has established the North East Trainee Clinical Informatics Forum in order to support postgraduate doctors in developing digital skills.

Inderpaul Samra

Inderpaul completed his higher surgical training in the North-West Deanery, Manchester rotation in 2023 spending 18 months at Wrightington Hospital training in Hip and Knee arthroplasty. He is currently undertaking a post-CCT Fellowship in Arthroplasty and Young Adult Hip Surgery at the Royal Orthopaedic Hospital, Birmingham under Callum McBryde, Angelos Politis and Peter Wall and will be undertaking further fellowship training in Revision Hip and Knee Arthroplasty and Robotic Surgery under Prof. Edward Davis and Yuvraj Agrawal. He has an interest in training and is currently completing further studies in Medical Education at Edge Hill University.

Introduction

We are pleased to introduce the 9th Annual Report of the NAHR. Over a decade since its inception, the NAHR has emerged as an invaluable asset for surgeons worldwide involved in hip preservation surgery. It stands as the world's largest registry of its kind, consistently strengthening year by year. As of January 2024, we are able to report on 13,411 pathways and in the past twelve months alone, over 800 procedures have been recorded by surgeons across a range of institutions. The introduction of the minimum data set (MDS 3.0) in 2021 marked a significant milestone in the report accounting for revision procedures allowing us to report on the results of these. As with last year's report, we have excluded all pathways with missing operative data from the 2024 report allowing for more accurate in-depth analysis.

The report acknowledges the continued impact of the pandemic on hip preservation services, with year-on-year reductions in both overall numbers of pathways and a decline in contributing surgeons compared to pre-pandemic levels. The precise cause remains unclear, however, the possibility of greater numbers of patients moving from the realms of joint preservation towards joint replacement remains a distinct possibility. Shifts in procedure distribution between the private sector and the NHS raise questions about treatment accessibility and potential delays for patients referred in for hip preservation services, potentially still influenced by COVID-19's impact on healthcare provision in the country. This year's report suggests a slight proportional increase in NHS funded operations which may reflect a normalisation to pre-pandemic trends. We anticipate that with continued recovery, pathways will eventually increase to pre-pandemic levels though this may take many more years based on recent data. This report underscores the substantial enhancements in patient-reported outcomes facilitated by NAHR-contributing surgeons, markedly improving both symptoms and quality of life. However, the voluntary nature of surgeon compliance remains an on-going hurdle, awaiting the implementation of recommendations from the Cumberlege report to mandate data submission for surgeons performing hip preservation.

Patient compliance with follow-up data collection poses another ongoing challenge. A previous study funded by Pfizer and spearheaded by Mark Sohatee suggested that with additional administrative support, enhanced follow-up can make registry-based RCTs feasible. This underscores the importance of mandating pre- and post-operative data collection to maximize resource utilization for valuable insights. For the first time, we are able to present separate data on outcomes of PAO and Triple Pelvic Osteotomies providing greater insight into long term outcomes in these patients. Further reports will be able to discern differences between these procedures in greater detail as pathway numbers increase and longer-term data is obtained.

Aim of the NAHR

The NAHR is open to data submission by members and non-members of the BHS. The aim is to benefit both patients and surgeons by collecting longitudinal data on patients undergoing an elective surgical procedure for hip pathology excluding patients who are having an arthroplasty or who have had an arthroplasty operation. Relevant operations include: arthroscopic and open surgery for FAI; PAO; reverse PAO for retroversion, femoral osteotomy; surgery for slipped capital femoral epiphysis (SCFE); surgery for

developmental dysplasia of the hip (DDH); and other treatments for extra-articular hip problems such as trochanteric bursitis, abductor tears and external snapping of the hip. In fact, any operation other than arthroplasty and acute fracture treatment is suitable for being recorded on the NAHR. It is quite likely that private institutions as well as NHS Trusts will soon require proof that outcome data is being collected. Collection of outcome data and reflection on the results is also considered an important component of the appraisal and revalidation cycle.

The NAHR data will be used to bring direct benefits to patients by:

- improving patient awareness of the outcomes of operations on the hip, as results are available in the public domain
- comparing the success rates of different operations and surgical approaches to the hip
- helping to identify whether they would benefit from a specific surgical technique
- identifying which surgical procedure is most likely to bring benefit for a specific diagnosis

The NAHR data will bring additional long-term benefits to surgeons and hospitals by:

- providing feedback to orthopaedic surgeons to define which patients will benefit from surgery and what details of the operative procedure will define a good result; validated outcome data will be available to the surgeon
- identifying which patients are likely to benefit from a particular procedure
- promoting open publication of outcomes following surgery
- comparison of patient reported outcomes for an individual surgeon with the national average and this document forming part the appraisal process
- potentially linking to Hospital Episode Statistics (HES) and NJR data to enable follow-up into arthroplasty, and accurately follow the lifespan of a patient's hip joint.

History of the NAHR

The creation of a NAHR was initiated by Professor John Timperley, Consultant Orthopaedic Surgeon at the Princess Elizabeth Orthopaedic Centre in Exeter and former President of the BHS. He identified the rise in hip preservation surgery but noted, in contrast to joint replacement surgery, a lack of outcomes data outside of small scale published series. Given his interest and expertise in joint replacement registries from around the world, setting up a registry for non-hip replacement hip surgery seemed a logical thing to do. The motion to set up such a registry was unanimously supported by the Membership of the BHS at the Annual General Meeting in Torquay in March 2011 and the membership agreed that the BHS should fund the registry. The Registry went live in March at the 2012 BHS Annual Meeting in Manchester and was formally launched at the BOA Annual Congress in September 2012. NICE (National Institute for Clinical Excellence as it was then known) Interventional Procedure Guidance on Arthroscopic (IPG408) and Open (IPG403) Femoroacetabular Surgery for Hip Impingement Syndrome, published in September and July 2011 respectively, noted that clinicians should submit details to this national registry.

The User Group, initially chaired by Professor John Timperley and then Mr Marcus Bankes, developed during 2012 and 2013 and consisted of Mr Tony Andrade, Professor Tim Board, Professor Max Fehily, Mr Paul Gaston, and Mr Matt Wilson, with assistance from Mr Johan Witt and Professor Damian Griffin. A major streamlining exercise was undertaken in 2013 to improve surgeon compliance following meetings of

interested parties at the BHS in Bristol in March and of the original NAHR User group at the BOA Congress in October. Whilst many arthroscopic and hip preservation surgeons were enthusiastic about the development of the NAHR in principle, many already had their own databases and were unsurprisingly unwilling to duplicate data entry. It was therefore decided that use of the data collection infrastructure which already existed for the NJR in every hospital in England and Wales was essential for success to minimise surgeon involvement in data collection and capture cases.

In addition, a Minimum Data Set (MDS Version 1.0) was defined which included a pre-operative specific and general health measures, namely the iHOT-12 (International hip outcome tool - 12 question version) and the EQ-5D-5L (five-dimensional measure of health-related quality of life, five level questionnaire developed by the EuroQol Group) respectively. Standardised paper data collection forms were redesigned to have a similar appearance to NJR forms to help with this process. Whilst it may seem outdated to develop a paper-based system, availability of convenient hardware, particularly in clinic and theatre environments, varies immensely between hospitals. Post-operative outcome data is electronic however, and patients are currently invited to complete outcome questionnaires at six, twelve and twenty-four months after their operation with an email, linking them directly to the online forms.

Growth of the Registry continued and the MDS Version 1.1 was launched in February 2015 to include data fields for the extent of pre-existing articular cartilage damage on both sides of the joint. Whilst there was little change in the way data was collected, there was increasing interest in non-joint replacement registries from other specialties from the BOA, led at that time by the then President Colin Howie. This led to the formation of an umbrella organisation for these registries called TORUS in 2016 of which the NAHR was an original member. The formation of TORUS provided a shared operating framework that allowed consistency of practice and a central support function (to deal with issues such as data governance, contracting and managing registry suppliers, and resolving day-to-day issues) to reduce the burden on individual registries and introducing efficiencies. The importance of the NAHR being part of TORUS has been particularly highlighted recently in view of the introduction of GDPR. Full release of MDS Version 2.0 along with the updated GDPR complaint consent form was therefore launched and has been in use. Elements of the enhanced dataset included: labral grafting and details of the graft length and material; number and type of labral anchors used, details of extra-articular procedures and there has been a further refinement of pelvic osteotomy types recorded.

The form has undergone further developments and the MDS Version 3.0 is now available for use and will collect more information on capsular management, thromboprophylaxis, heterotopic ossification medication and adhesion prevention. It will also be recording data on articular cartilage repair techniques and intra-articular adjuncts reflecting the ever-developing field of hip preservation. Clinicians can use the NAHR to collect and display comprehensive outcome data on all their patients using various outcome measures. The information sheet, consent form and minimum dataset version 3.0, which can be downloaded here, are designed to reflect the familiar format of the NJR forms. They contain a basic mandatory dataset as well as an enhanced dataset for surgeons to record additional surgical findings.

The board and the leadership have altered over time and currently consists of six surgeons from across the country who dedicate a significant proportion of their time to the Registry. They lead by example, not just by contributing patients but also by ensuring updates,

improving the quality of data analyses, working on the surgeon and patient compliance, maintaining finances, website development and annual reports.

At each Annual General Meeting of the BHS, an update of the NAHR is presented and a workshop arranged to encourage surgeons to join and submit data to the NAHR. This, the 9th Annual Report, provides a summary of the data available and can be used to guide further development of the registry.

Overview of the data

Pathways per year

A pathway on the NAHR is created when a patient's details are entered for a non-arthroplasty procedure. The patient should have already completed their relevant pre-operative scores. The demographic data and in particular unique identifiers such as the NHS number allow for different treatments, potentially in different centres and by different surgeons, that follow the 'journey' of that hip through one or multiple hip preservation operations. The inclusion of an NHS number potentially allows linkage of the NAHR pathway with other registries such as the NJR. Therefore, it is highly desirable that this number is included for all patients.

Up until the 2022 annual report, we included pathways with missing operative data (these pathways have always been included within the denominator when reporting numbers). Pathways with missing operative data were particularly prevalent during 2020 and therefore the NAHR user group decided to exclude all pathways with missing operative data from the analysis, beginning from 2021 and including 2022. This was also applied retrospectively to the registry, hence the apparent change in pathways for previous years compared to earlier annual reports (Figure 1).

Between January 2012 and December 2023, a total of 13,411 pathways have been entered in the registry where operative data was completely recorded as per our inclusion criteria for the report. There remains under half the number of pathways in 2023 (n= 806) in comparison to pre-pandemic levels and the reasons for the continued reduced volume of pathways is not clear.

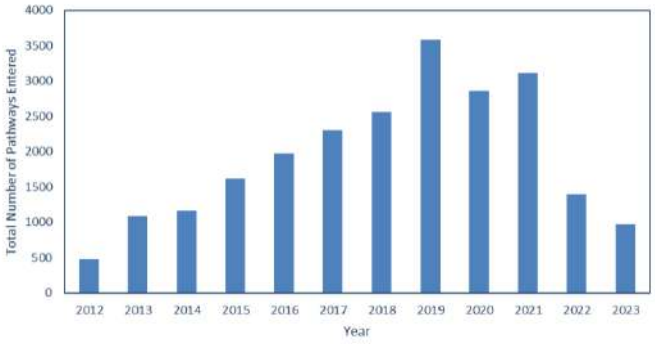

Figure 1 Total Number of Pathways uploaded per year

Pleasingly, there has been a steady increase in the proportion of pathways meeting the inclusion criteria for analysis in this year's report as seen in Figure 2.

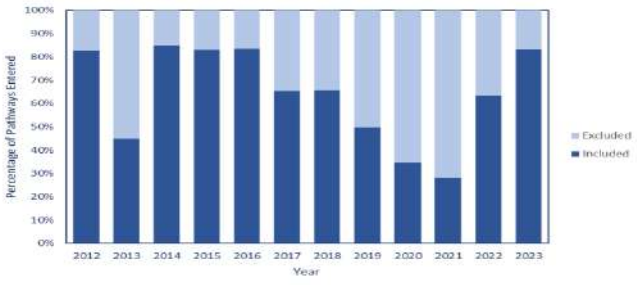

Figure 2 Percentage of pathways uploaded per year

Figure 3 shows the number of pathways by surgical approach. Arthroscopy continues to account for the majority of recorded pathways. Due to patients with missing operative data now being excluded, the number of surgical approach pathways with this information not recorded has significantly reduced (Figure 2).

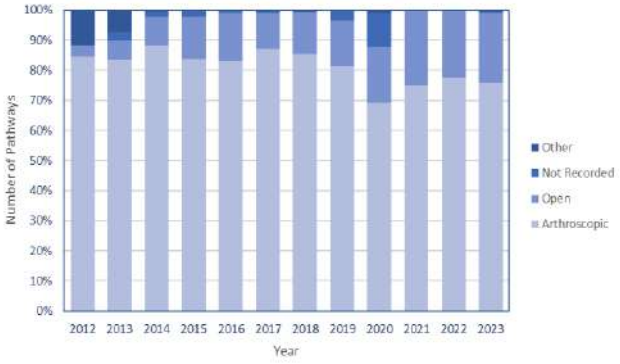

Figure 3 Pathways per year by surgical approach

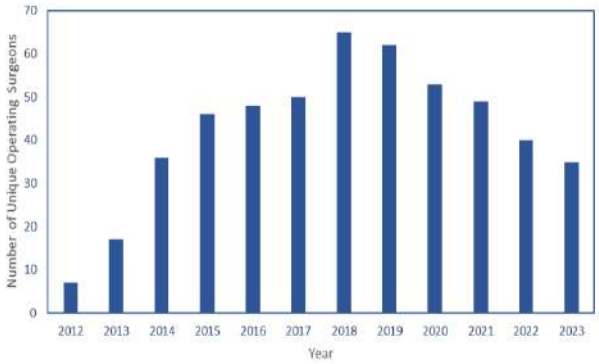

Figure 4 Surgeons contributing data to the NAHR

Number of surgeons using NAHR

After an initial increase in the number of surgeons entering data onto the NAHR up until 2018, there has been a consistent year on year drop up to this year's report. Figure 4 shows the number of unique surgeons entering pathways per year since 2012. This has decreased from a peak of 65 in 2018 to 35 in 2023. The majority of surgeries in the registry have been performed by a small number of high-volume surgeons. Explanations for the reduction in surgeons contributing data include; centralisation of hip preservation services with surgeons with a low number of non-arthroplasty hip procedures either stopping their practice or no longer contributing to the NAHR. It is vital that hip preservation surgeons are encouraged to contribute data to the registry in light of the Cumberlege report. Whereas the NJR has a good mechanism for understanding the denominator of surgeons performing joint arthroplasty, there is no similar surrogate in hip preservation surgery and therefore accurately calculating what percentage of surgeons are uploading data is difficult.

Surgeon procedures

45 surgeons have contributed over 50 pathways with 19 having contributed >200 pathways to the registry in total as seen in Figure 5. The median number of cases per pathway owner is 35.

8 of highest volume surgeons account for over 50% of all included pathways with one particularly high-volume surgeon and dedicated user of the registry having uploaded over 15.8% of all pathways on the registry. The contrast in surgeon engagement with the registry demonstrates the difference in attitudes amongst surgeons with some seeing the potential benefits to their own practices and patients in the follow-up of outcome data.

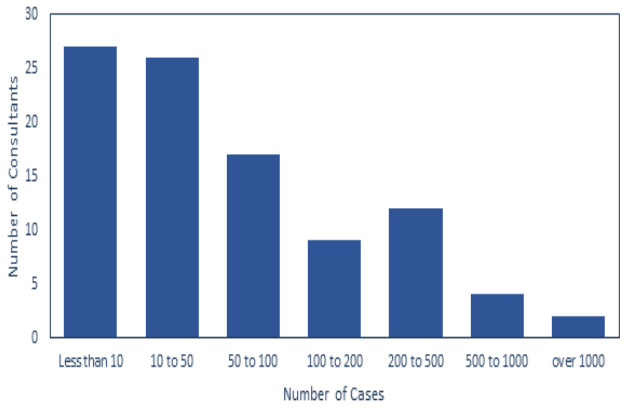

Figure 5 Number of cases per surgeon

Funding source for surgery

Figure 6 demonstrates that approximately one-third of cases in 2023 were performed in the independent sector. It is thought that data from the independent sector was not completely recorded by the Registry or that data upload was not as accurate in the early years of the registry. However, independent sector volume has remained relatively static in previous years and therefore the decrease in the overall pathways post-pandemic is mainly due to reduced NHS surgical volumes due to the effect of the pandemic on the NHS provision of elective orthopaedic care. Since last year's report, there has been a proportional increase in pathways with the NHS recorded as the funding source for over 50% of pathways for the first time since 2018. This may reflect a trend towards recovery in the NHS. More pathways than ever have the funding provider recorded.

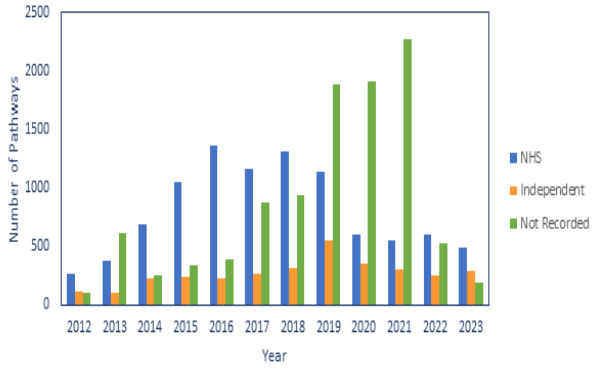

Figure 6 Funding source for procedure

Demographics

Patients by age and approach

As demonstrated in Figure 7, the vast majority of arthroscopic procedures are performed on patients under the age of 55 and for open procedures under 50 years of age. The highest number of procedures (n= 1761) was performed in the 30-35 age group. The proportion of arthroscopic to open surgery increased steadily from age 15 to 65. Very few procedures are recorded on the NAHR in patients under the age of 16, possibly due to increased numbers of surgeons contributing to the NAHR without a paediatric practice as well as paediatric orthopaedic surgeons preforming hip preservation surgery being unaware or unsupported in data submission to the NAHR.

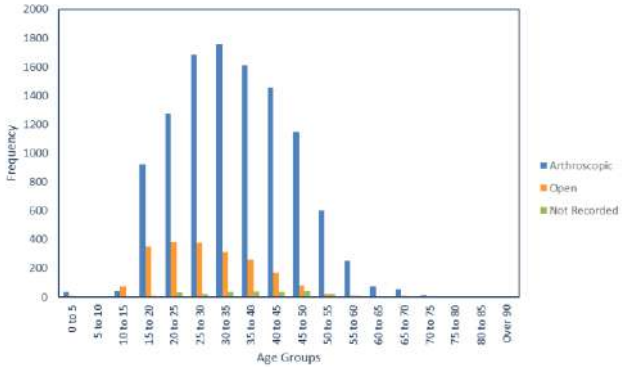

Figure 7 Patients' age distribution by approach

Gender distribution by surgical approach

Overall, females account for the majority of patients with data entered on the NAHR (63.52%). Of those patients undergoing hip arthroscopy, 60% were female compared to 86% of patients undergoing open procedures, suggestive of the increased diagnosis of hip dysplasia in females, more commonly treated with open surgery than arthroscopic management.

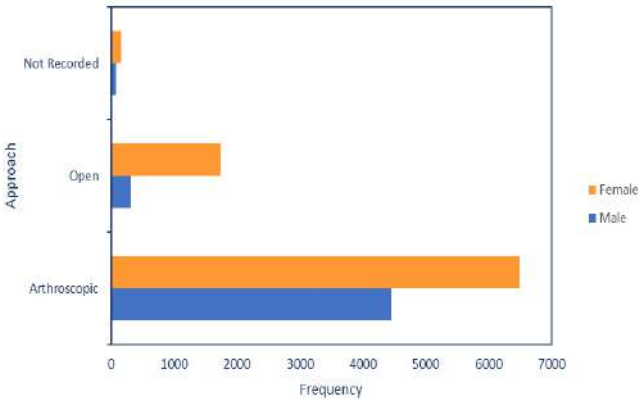

Figure 8 Gender distribution 2012-2023

Body mass index (BMI) by operation and gender

BMI was documented pre-operatively in the majority of pathways. Completion of BMI data continues to improve, with over 75.6% of cases in 2023 included having their BMI recorded (Figure 9).

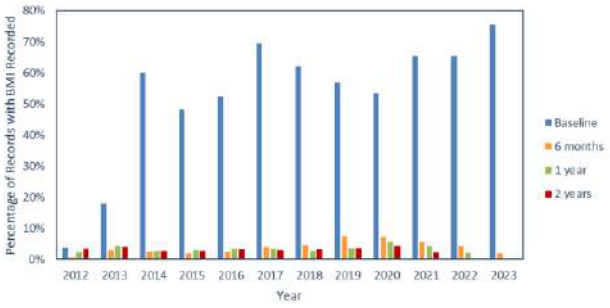

Figure 9 Percentage of BMI records per year

The majority of procedures were performed in patients with baseline BMI <30, with a mode of BMI 26. Obvious outliers (BMI > 70 and <10) were removed as it is anticipated these were errors in data entry, (Figure 10).

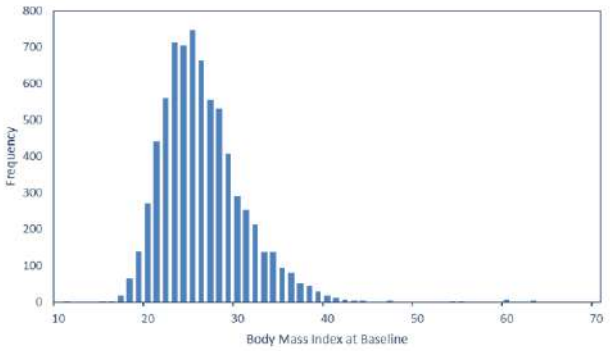

Figure 10 BMI distribution

Compliance

Follow-up and data linkage

As follow-up PROM scores are collated at 6, 12 & 24 months via automated email, accurate records are essential for accurate long-term analysis of interventions. There has been a decreasing trend in the collection of email addresses since 2021 from a peak of 88.9% of records having recorded emails to 75.6% this year. To enable better follow-up, a mobile phone number is also utilised if follow-up emails remain unanswered. Unfortunately, there has also been a noticeable decrease in mobile phone records on the database from previous years as demonstrated in Figure 11.

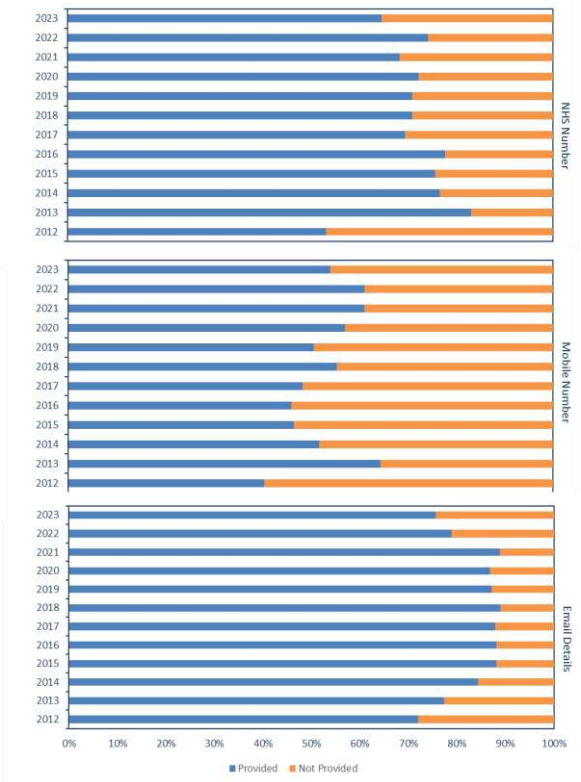

Figure 11 Patient contact details and NHS identifiers

To help aide in better follow-up and accurate analysis in future reports, it is essential to improve uptake of email and mobile phone data in the coming years.

The recording of an NHS number has also decreased slightly on previous years over the duration of registry. Obtaining an NHS number in the private sector is possible but time-consuming and this may be a barrier to increasing this figure. Clear advice on how to obtain the NHS number for private patients is available on the NAHR pages of the BHS website and we encourage clinicians to submit this data where possible.

Consent rates

A record that the patient has given consent to have their data recorded by the NAHR is a mandatory field when creating a patient pathway. In 2023, 98.9% cases gave consent which was the highest since the NAHR was introduced (Figure 12).

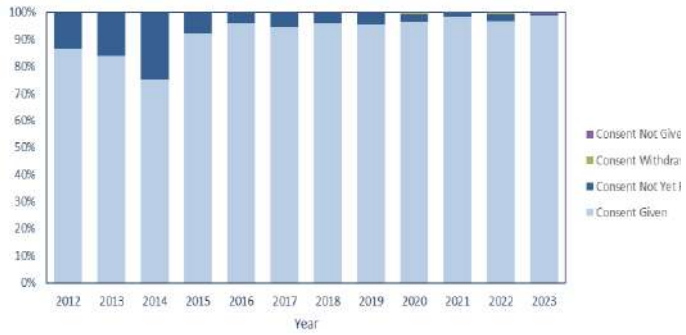

Figure 12 Consent for data collection

Collection of mandatory scores and statistics

Overview of scores

The NAHR offers clinicians the opportunity to use a number of hip scores for assessment pre- and post-operatively. Following a review of available evidence, the NAHR User Group defined that only two hip scores would be mandatory for collection in the minimum dataset, with others being made available depending on surgeon preference. The mandatory scores are the EQ-5D-5L (including the EQ-5D-VAS) and the iHOT-12. Scores are recorded pre-operatively then routinely, via email or in person, at 6 months, 12 months and 2 years post-operatively. Some patients will also receive a text message reminder or telephone phone call to improve follow-up, but this is not universal. Surgeons can select to use other, additional PROM scores if desired.

EQ-5D index

The EQ-5D index score is based on five domains (mobility, self-care, usual activities, pain/discomfort and anxiety/depression) each with five options (no problems, slight problems, moderate problems, severe problems and extreme problems).

EQ-VAS

The EQ Visual Analogue score records the respondent's self-rated health on a 20cm vertical scale where endpoints are labelled 'Best imaginable health state' (100) and 'Worst imaginable health state' (0).

iHOT-12

This is a short form equivalent of the iHOT-33 which was developed by the Multicentre Arthroscopy of the Hip Outcomes Research Network (MAHORN). The iHOT-33 was developed for active patients (18-60 years; > Tegner 4) presenting with a variety of hip conditions. The shorter 12 question patient-derived, patient-reported outcome measure demonstrates excellent agreement with the long version with a minimum clinically important difference of 6.1 points. This report only includes the findings related to these mandatory scores. The scores are recorded as complete or incomplete and results are shown in Figures 11-12.

Statistical note

The analysis and visualisation of the NAHR data was primarily achieved using Pandas for data manipulation, Matplotlib and Seaborn for creating visualisations, and SciPy, version 1.7.1, for statistical analysis.

Rates of score collection

Overall, the proportions of PROMs returned have increased when compared to previous reports, taking into consideration the excluded pathways and those missing operative data.

EQ-5D index

Figure 13 shows the number of completed EQ-5D index scores at the set time intervals. Baseline collation of EQ-5D continues to improve with the highest levels (91.4%) recorded in 2023. Compliance with follow-up scoring remains challenging. In 2021, 86.5% of patients recorded EQ-5D at baseline , this dropped to 55.1% for 6 month scores, 50.5% at 1 year and only 10.8% at 2 years. Similarly in 2018, only 3.3% recorded 5-year outcomes. Increasing patient compliance with follow-up PROMs remains a challenge for the registry. The use of e-mail and the updating of the NAHR are measures that are being employed to improve this. Further work by the user group, in collaboration with Amplitude, is ongoing and includes looking at a variety of other measures to increase completion and this a major focus for the NAHR in the future.

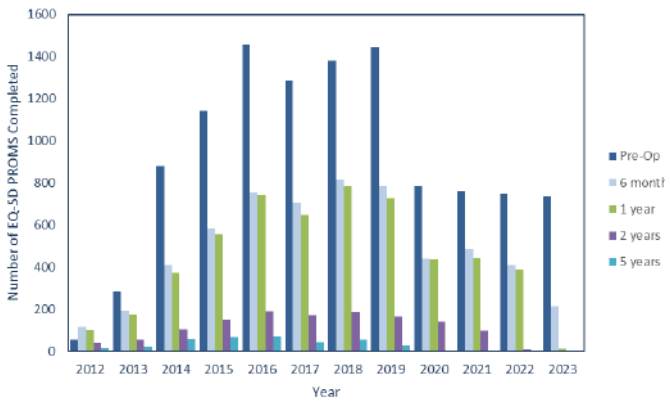

Figure 13 EQ-5D index score completion

iHOT-12

The iHOT-12 score was presented to the International Society for Hip Arthroscopy (ISHA) in 2011. Since 2014, this score has been collected as part of the same scoring sheet as the EQ-5D. In 2023, 24.7% of patients submitted 6 month iHOT-12 follow-up scores. Overall follow-up has remained fairly consistent in previous years with significant drops between preop and 6 month scores and 1 year and 2 year scores (Figure 14).

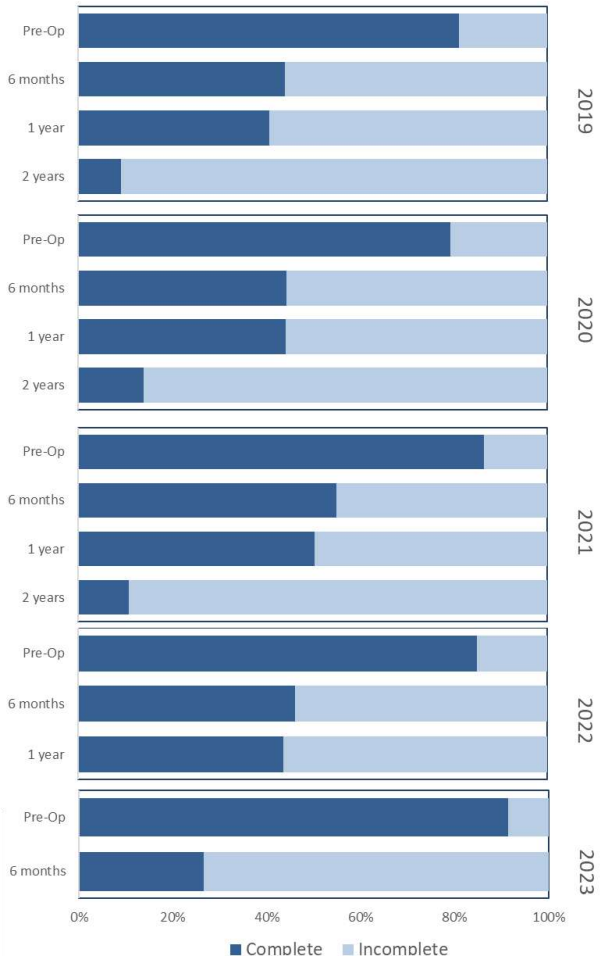

Figure 14 iHOT-12 Score completion

Surgical procedures

Overview

Figures 15 and 17, show the different types of acetabular and femoral surgical procedures recorded in the NAHR. (Note that the data presented in this section reports the frequency of procedures recorded and that more than one or any combination of surgical procedures may be performed in a single case).

Acetabular procedures

Labral repair is the most commonly performed acetabular procedure in the registry accounting for 48.2% of pathways with acetabular procedures recorded (Note that multiple acetabular procedures may be performed in a single patient). There has been a move from acetabular labral debridement towards acetabular labral repair since the creation of the NAHR. Labral repair accounted for 71.7% of acetabular labral procedures in 2023 (Figure 16). The increasing use of labral repair rather than labral debridement is likely to be multifactorial but includes the increasing evidence within the literature that labral repair appears to offer better outcomes than labral debridement. Labral reconstruction remains a relatively rare procedure in the UK, with only 18 cases entered in the registry, although there has been a slight upturn from 14 cases registered in the 2022 report. Early reports suggest improvements in short-term outcomes with irreparable labral injury, though further evidence is required to ascertain sustained long-term benefits and ideal factors for patient selection.

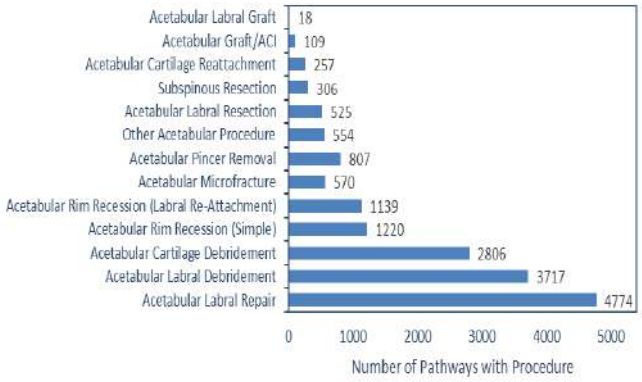

Figure 15 Acetabular procedures performed.

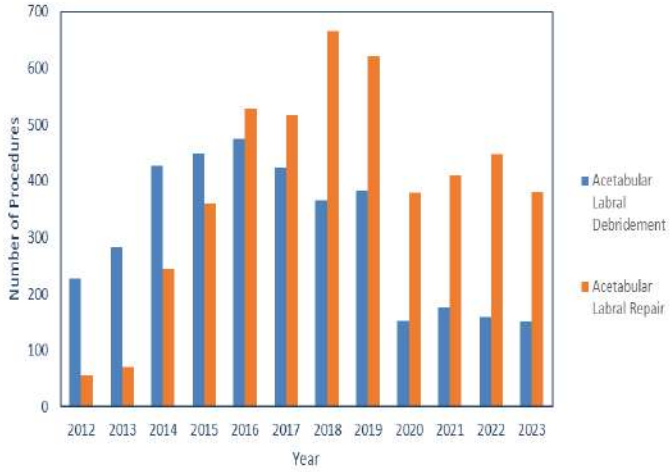

Figure 16 Arthroscopic labral debridement and labral repair per year

Femoral procedures

Figure 17 shows the range of femoral procedures recorded on the NAHR. Cam removal is the commonest femoral procedure, accounting for 95.6% of femoral procedures performed. In contrast to the acetabular side, a much smaller number of femoral cartilage procedures were recorded, including debridement, microfracture, cartilage grafting and core decompression.

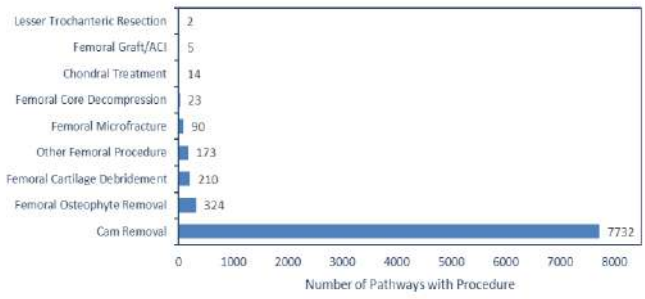

Figure 17 Femoral head/neck procedures performed

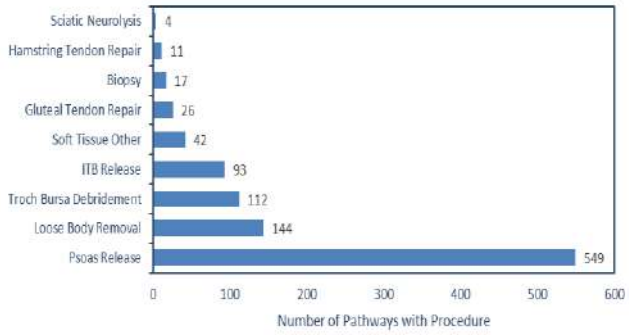

Figure 18 Additional surgical procedures

Additional surgical procedures

The NAHR dataset records a wide range of additional surgical procedures performed during hip preservation surgery, the majority of which relate to extra-articular structures and soft tissue releases. Multiple procedures can be recorded in a single pathway and many of these additional procedures are performed in combination with other acetabular/ femoral procedures. The majority were performed as part of an arthroscopic approach. Figure 18 shows the frequency of additional procedures recorded in the NAHR. The order of frequency with which these procedures are performed has remained consistent. Psoas release is still the most common additional procedure performed forming 60.7% (n=549) of pathways with additional procedures. The board acknowledge that there are increasing numbers of arthroscopic psoas release in patients who have had prior joint replacement within this group. Trochanteric bursal debridement has been recorded 112 times, compared to just 28 in the 2016 report. Together these two procedures account for two-thirds of all additional procedures performed. Gluteal tendon repair was performed infrequently, with only 26 cases entered.

Revision Hip Arthroscopy

Revision hip arthroscopy data is presented in Figure 19. 318 pathways were included for primary analysis with 2nd and 3rd revision data excluded (n=8) due to insufficient numbers. In revision cases, mean baseline iHOT-12 score was 32.25 (n=119). Mean scores rose to 46.20 (n=60) with an improvement of 15.58 points (p=<0.0001) at 6 month follow-up. At 1 year mean iHOT-12 scores were 52.66 (n=44) with an improvement of 17.74 points above baseline (p=<0.0001) . EQ-5D scores showed similar effects with mean improvements of 0.13 points (p=<0.0001) at 6 months from a mean baseline score of 0.44 and an improvement of 0.16 points at 1 year from baseline (p=0.004). This report demonstrated positive effects of revision surgery in whom revision surgery was deemed appropriate.

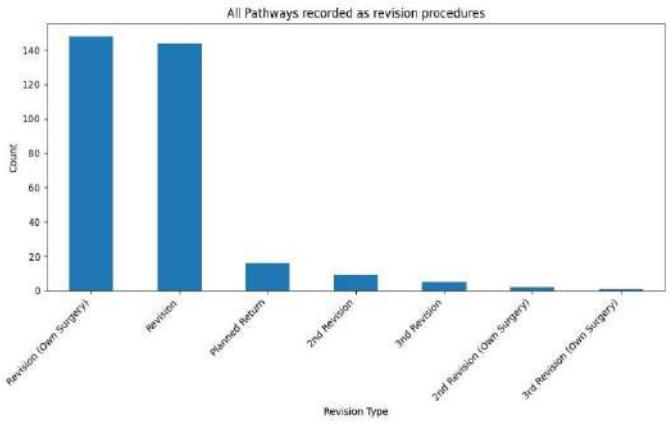

Figure 19 Revision Arthroscopy Pathway Count

Outcome scores

Overview

All scores are presented as a mean score with +/- one standard deviation error bars. In most cases, raw data has also been plotted and, where appropriate, a violin plot is also provided to demonstrate the data

distribution. It is acknowledged that showing two standard deviations would show 95% confidence intervals.

Outcomes of surgery for FAI

Overall

We have reported the outcomes of FAI surgery where cam and/ or acetabular rim recession or acetabular pincer removal has been performed. Cases for which concurrent microfracture or other cartilage procedure were excluded as in previous reports. All recorded PROMs demonstrated improvement in scores compared with preoperative levels. There was improvement in the pre-operative iHOT-12 score at 6 months with mean iHOT-12 increasing from 33.3 (n=4,430) to 58.5 (n=2,382) which was sustained up until 1 year postoperatively with mean score of 58.5 (n=2,135). At 2 years there was a modest reduction in iHOT-12 to 49.6 (n=271) which remained above baseline preoperative scores. EQ-5D scores similarly demonstrated improvements in baseline scores following intervention (Figure 20). Mean EQ5D improved from 0.519 (n=4,568) preoperatively to 0.675 (n=2,519) at 6 months. At 1 year there was a slight downturn in score to a mean of 0.571 (n=2,241) and at 2 years there was a slight improvement to 0.584 (n=482).

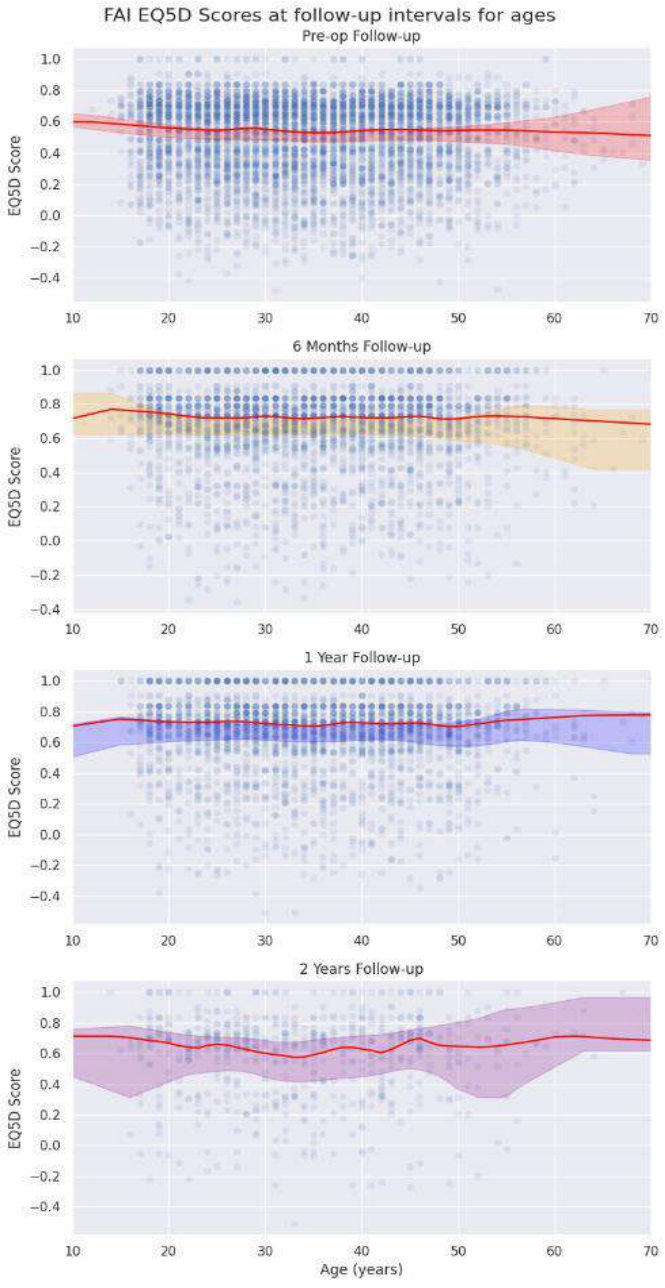

Figure 20 EQ-5D index score - whole cohort for FAI

Results of surgery for cam lesions by gender

Figure 21 shows the EQ-5D score against gender whilst Figure 22 demonstrates iHOT-12 scores. As identified in previous reports, females start with a lower preoperative baseline scores but catch up by one year post-operatively. Scores decrease in both men and women from 1 to 2 years postoperatively but consistently remain above baseline levels at 2 years. Female scores remain slightly below male scores at all follow-up time intervals. Mean EQ-5D at baseline was 0.5 for females (n=2,679) and 0.55 (n=1,888) for males. This rose to 0.67 (n=1,596) at 6 months for females and 0.69 (n=923) for males. The scores remained similar at 12 months prior to a modest decrease to 0.57 (n=320) for females and 0.62 (n=162) for males.

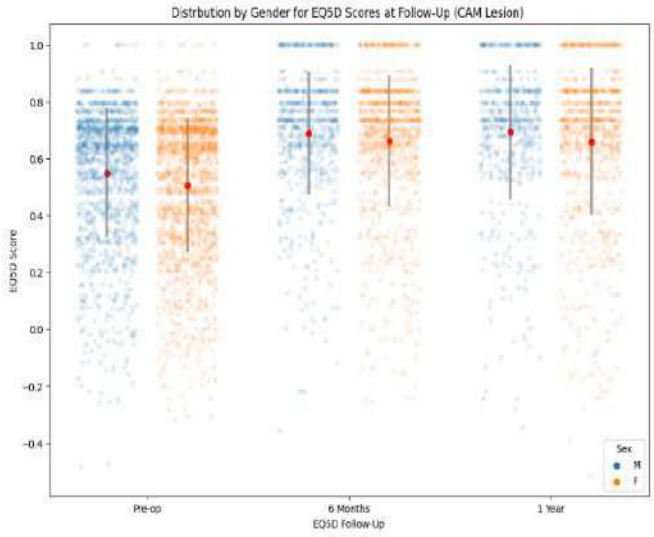

Figure 21 EQ-5D by gender for FAI

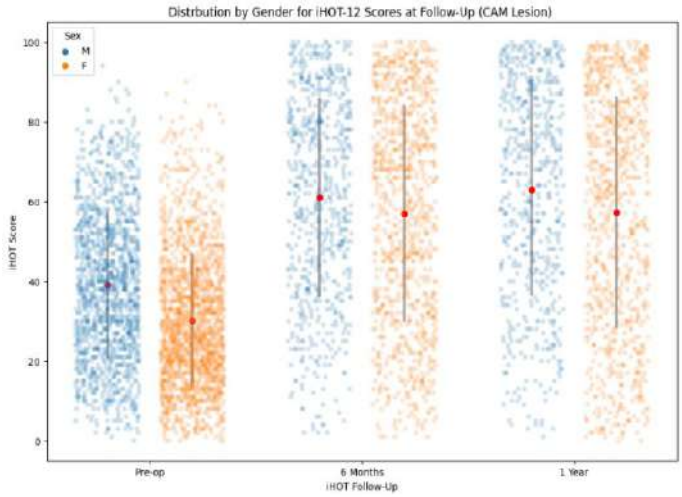

Figure 22 iHOT-12 by gender for FAI

Results of surgery for cam lesions by age

All age groups under the age of 60 benefitted from cam osteoplasty and experienced increased EQ-5D (Figure 23) mean change 0.15 (n=523) and iHOT-12 mean change 24.6 (n=477) from baseline levels up to 6 months follow-up ($p<0.0001$). In age groups under 40, peak scores were obtained at the 6 month follow-up before marginal decreases at 1 and 2 year follow-up but remaining well above baseline levels ($p<0.0001$). In age groups above 40, scores continued to improve up

until 2-year follow-up which may highlight the benefit of surgery in selected patients in this cohort.

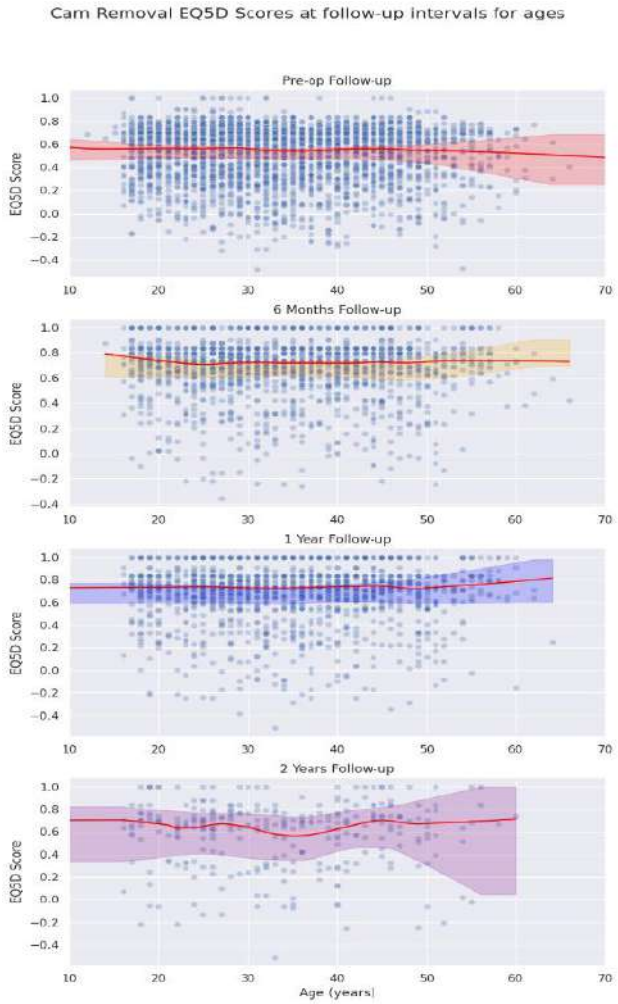

Figure 23 EQ-5D by age for cam lesion

Results of surgery for pincer lesions

In this section, patients who had surgery for a cam lesion and/or a cartilage procedure on the acetabular or femoral side have been excluded. A total of 580 patients had isolated pincer surgery. There was improvement in pre-operative iHOT-12 scores at 6 months and 12 months post-operatively. These scores are shown in Figure 24 and Figure 25. For pincers there was improvement in pre-operative iHOT-12 scores at 6 months from mean iHOT-12 of 31 (n=400) to 56 (n=241), p<0.0001 (Paired t-test) n=178) and 12 months (mean iHOT-12 change 31 (n=400) to 53 (n=227), p<0.0001 (Paired t-test). EQ-5D scores followed a similar pattern of improvement with mean scores of 0.48 (n=445) at baseline improving to 0.67 (n=272) at 6 months (p<0.0001) and 0.65 (n=239) at 12 months (p<0.0001). Females generally had lower mean scores at all time intervals (Figure 24 and Figure 25)

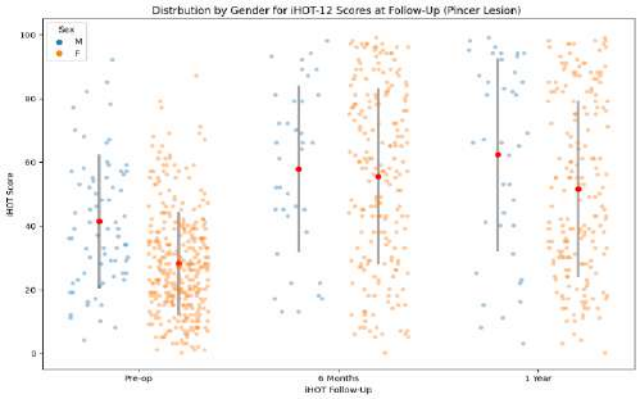

Figure 24 iHOT-12 - surgery for pincer lesion

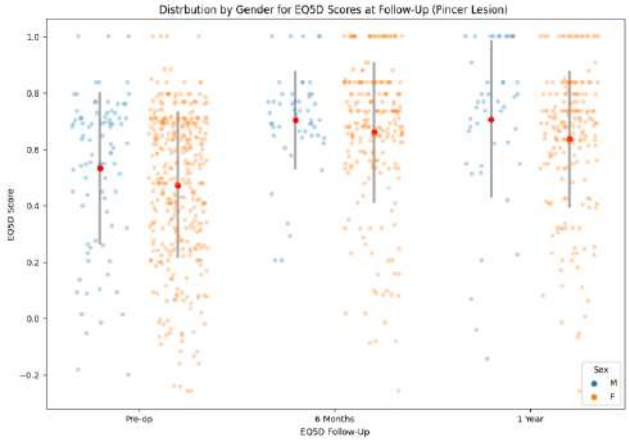

Figure 25 EQ-5D Index - surgery for pincer lesion

Chondral Damage in FAI Surgery

In this section we report the grade of single worst zone of acetabular chondral damage for the same FAI cohort as described above. Total number of procedures: n=5,698, of which were done by arthroscopic approach) including all cases where a cam/pincer/or both procedures were recorded, excluding concurrent cartilage or microfracture procedure. A large number of pathways had information missing as shown in Figure 26. A high proportion of cases had damage noted in acetabular zones compared with no chondral damage present in recorded pathways. At 6 month follow up, unsurprisingly mean iHOT-12 improvements decreased with increasing severity of chondral damage (Figure 27). At 12 month follow-up greater benefit vs preoperative baseline scores was seen in groups of patients with grade 1 and 2 damage compared with those patients with no damage. Those patients with grade 3 and 4 changes did poorly compared to lesser grades as expected.

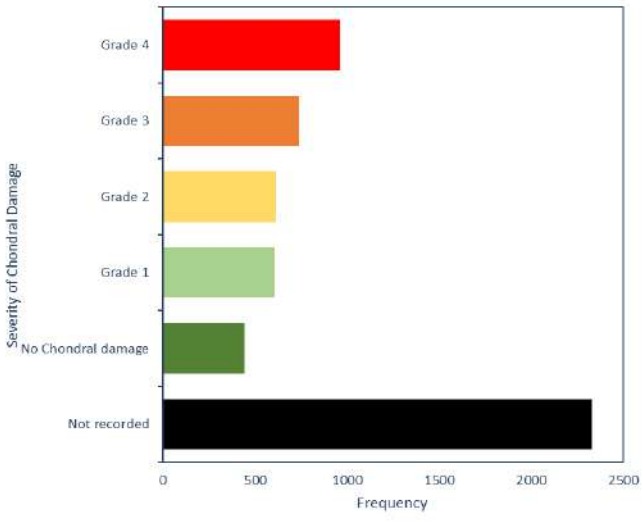

Figure 26 Number of pathways with Acetabular Chondral Damage (Grades 1-4)

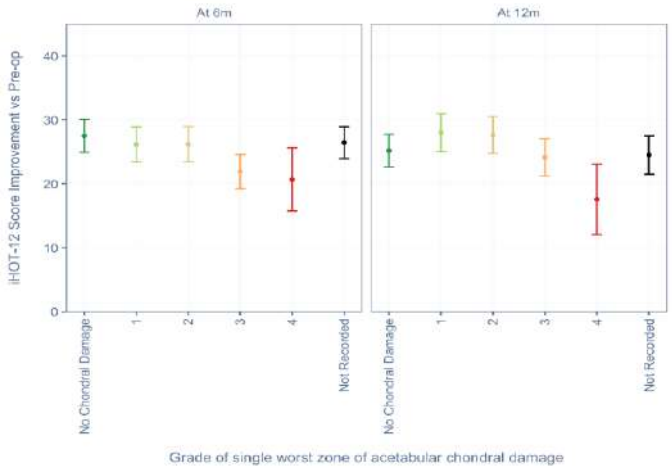

Figure 27 Outcome scores by single worst grade of acetabular chondral damage

Outcome following isolated periacetabular osteotomy (PAO)

Figures 28 and 29 show outcome scores for periacetabular osteotomy cases performed in isolation. A total of 1,599 PAOs have been recorded without simultaneous femoral osteotomy.

iHOT-12 in PAO osteotomy

For patients undergoing PAO with no concurrent femoral osteotomy there was improvement in pre-operative iHOT-12 score at 6 months with mean iHOT-12 change 30.16 (n=1,387) to 55.31 (n=795), and 1 year (mean iHOT-12 change 30.16 (n=1,387) to 62.03 (n=753) post-operatively. At 2 years follow-up there were slight reductions in scores from 1 year to 2 year follow-up from 62.03 (n=753) to 56.55 (n=230) but these remained elevated over baseline iHOT-12 scores. This is shown in Figure 28.

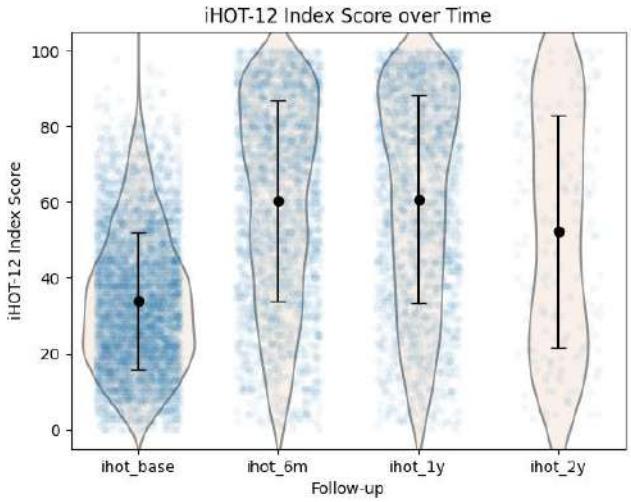

Figure 28 iHOT-12 in Pelvic Osteotomy surgery

EQ-5D index in PAO

Similar trends are shown with the index score with an improvement on the pre-operative scores, which appears to continue to improve at 12 months with lesser reductions to 2-year scores (Figure 29).

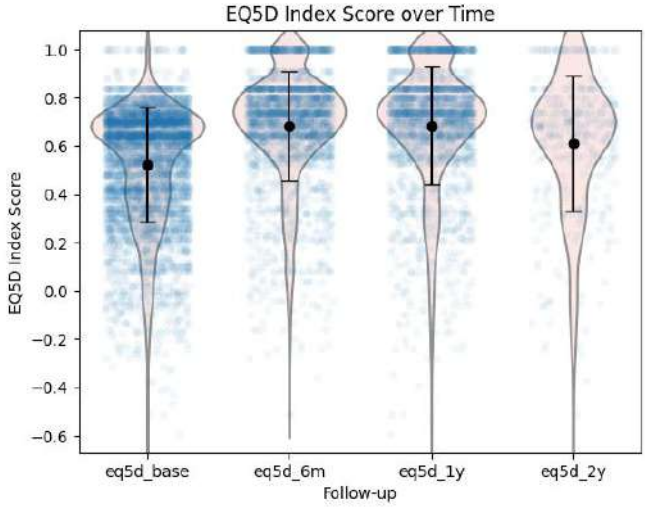

Figure 29 EQ-5D Index scores for PAO surgery

Results of PAO vs age

Figure 30 illustrates the iHOT-12 scores of various age groups. All ages seem to benefit from surgery from PAO. 2-year data is presented but large confidence intervals are noted due to small numbers. Figures 30 and 31 show scatter plots of age against outcome scores with a LOWESS method smoothing curve along with 95% confidence interval.

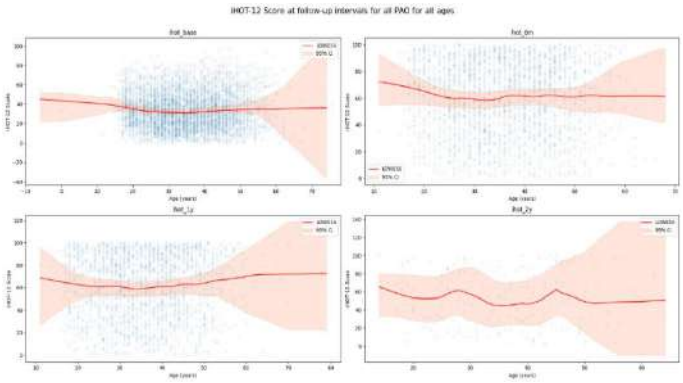

Figure 30 iHOT-12 scores with age distribution for pelvic osteotomy surgery

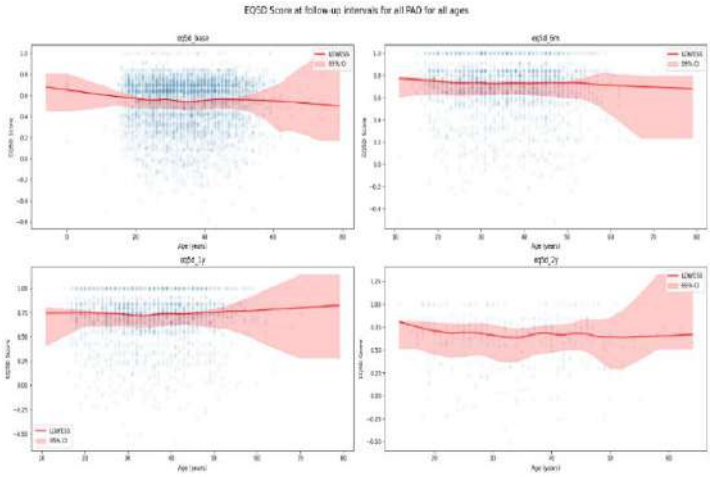

Figure 31 EQ-5D scores with age distribution for pelvic osteotomy surgery

Results of Peri-acetabular Osteotomy vs gender

Female gender is associated with a lower pre-operative iHOT-12 and EQ-5D scores but overall show a greater improvement than male patients with a PAO to 1 year (Figure 32 and Figure 33). Both genders have most improvement in the first 6 months with some further improvement to the 12-month point with slight reduction in scores at 2-year follow-up for females and a slight increase in scores for men. Mean 1 year follow-up scores demonstrated substantial clinical improvement with scores increasing from 29.6 (n=1276) in females to 61.1 (n=710) a difference of 31.5 points and from 38.9 (n=140) in males to 67.6 (n=68) a difference of 28.7 points. Interestingly at 2-year follow-up male patients demonstrate a continued improvement to a mean of 69.4 (n=13) with a 30.5 point difference from baseline scores although the sample size is small.

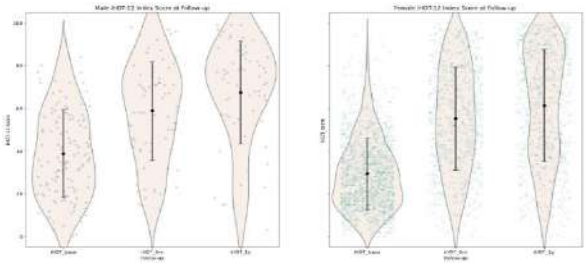

Figure 32 iHOT-12 Scores by gender for pelvic osteotomy

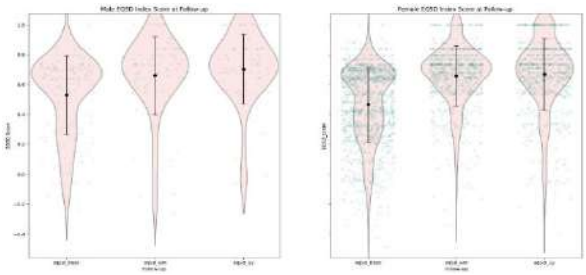

Figure 33 EQ-5D Scores by gender for pelvic osteotomy

Results of Surgery with BMI

There was a clear trend towards poorer iHOT-12 and EQ-5D scores preoperatively and at 6, 12 month and 2-year follow-up in association with being over-weight, echoing findings in previous reports. Figures 34 and 35 demonstrate stepwise decreases in mean PROM scores beyond the 20-25 range with peak scores obtained in this range.

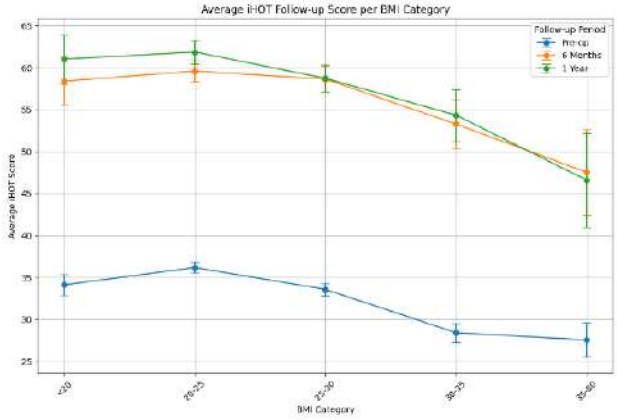

Figure 34 iHOT-12 score against BMI category

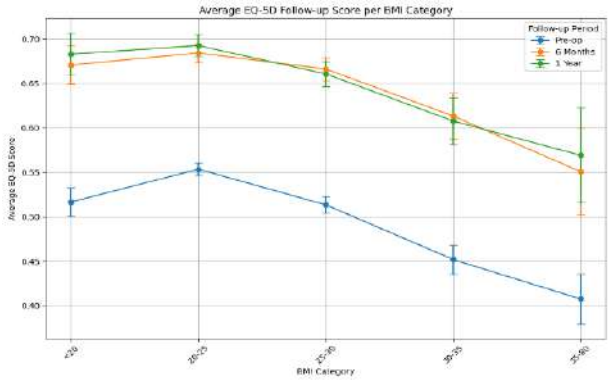

Figure 35 EQ-5D score against BMI category

The overall pathway numbers of Triple Pelvic Osteotomy (TPO) were far lower than PAO (n=144). However, available data suggests improvements in PROM scores at all recorded time intervals. Figure 36 represents PROM score changes in both PAO and TPO with the bars representing the volume differences in available pathways. Meana iHOT-12 scores at baseline were 30.88. This iHOT-12 scores rose by mean 13.35 at 6 months (p=0.031) (n=20) and by 25.5 points to 1 year (p=0.0027) (n=16). EQ-5D scores followed similar patterns with a mean improvement from baseline to 6 months of 0.15 (p=0.0227) (n=27) and by 0.14 points (n=27) from baseline to 1 year (p=0.0374). Given the low volume of pathways available for analysis, direct comparisons between PAO and TPO cannot yet be made.

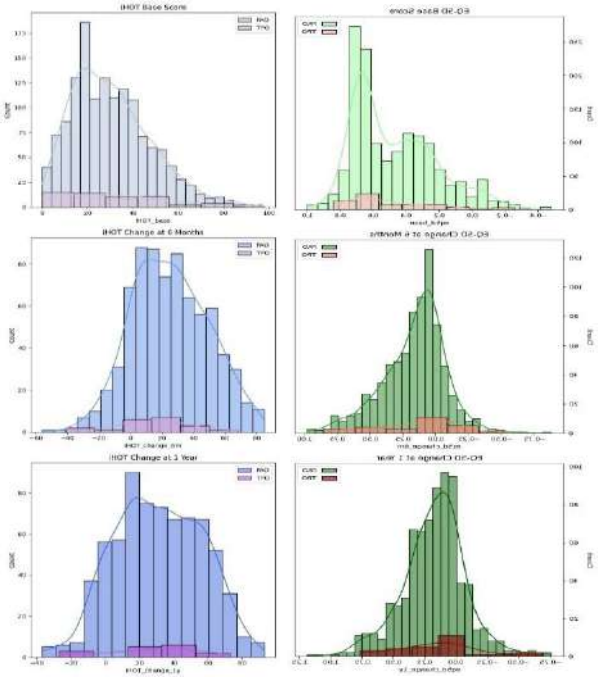

Figure 36 PROM score changes in TPO and PAO

Summary

This report underscores the significance of a registry dedicated to non-arthroplasty surgical treatments, offering invaluable insights to clinicians, patients, and policymakers. Despite a decrease in the overall volume of pathways and a halving of procedures recorded on the NAHR compared to pre-Covid-19 levels, attributed to pandemic-induced disruptions in healthcare provision and referral pathways, there has been a notable decline in the number of surgeons entering data over the years, dropping from 65 in 2016 to 35 in 2023. This trend may signify the concentration of these procedures among high-volume surgeons or centres, although an anticipated post-pandemic recovery is expected to boost pathway numbers. It recognised that not all non-arthroplasty procedures are captured by the NAHR however, surgeon compliance with submitting data has improved, and it is hoped that the regional representatives that act as advocates for the registry will further improve surgeon engagement and compliance. We hope that greater compliance with obtaining contact details from patients undergoing hip preservation surgery will help improve both the quality and quantity of data we receive long term.

The PROMS data highlighted in this report as in previous years demonstrate that surgical treatment of femoroacetabular impingement and acetabular dysplasia offers continued benefit to patients with significant improvements at all follow-up intervals. This report is the first to highlight individual PROM score outcomes for Triple pelvic osteotomy and PAO. This report showed significant clinical improvements in collected PROM scores at follow-up for both treatments. Whilst pathway numbers are too low at this stage to make direct comparisons between treatment strategies, it is hoped that later reports may be able to demonstrate differences, if any, between

these treatments. BMI data continues to suggest that overweight patients do less well from interventions as found in previous reports. Data from these reports may be used to counsel patients regarding the beneficial effects of weight loss prior to surgical intervention. Continued data collection over coming years will enable a greater understanding of the longer-term outcomes of hip preservation surgery and improve the strength of conclusions made.

Following the introduction of the MDS 3.0 the registry is now also collecting data on several other aspects of non-arthroplasty hip procedures such as the number and type of anchors used, capsular management, acetabular cartilage repair techniques, novel soft tissue procedures and interventions to prevent thrombosis, heterotopic ossification, adhesions and other adjuncts such as platelet rich plasma. The collection of this data is increasingly important following the publication of the Cumberlege report which highlighted the essential role of registries in monitoring implanted medical devices. Anchors used for labral repair are considered an implanted medical device and thus it should be mandatory that when used data should be entered onto the NAHR. We hope that as further data is collected, we are able to analyse outcomes in greater details to be able to determine optimal treatment strategies in terms of patient outcomes.

Finally, the BHS and NAHR would like to again thank members of the user group along with all the surgeons, administrative staff and patients that have contributed data to the registry, allowing the NAHR to continue to lead the way as a voluntary register of non-arthroplasty hip procedure

Future plans

- Surgeon engagement and patient compliance are common problems to all Orthopaedic registries. With the advent of the Medical Device Outcome Registry programme by NHS England, this may well provide an opportunity for the NAHR to overcome these difficulties in the future. In this coming year we will see how the MDOR initiative will affect the number of NAHR pathways generated. The NAHR board will continue to collaborate with Scott Pryde and his team at NHS England to determine how the NAHR data will interface with MDOR.

- There are plans to develop further nested trials within the registry. Ongoing collaboration with industry partners will clarify how these plans may then require changes in the MDS. As the registry continues to mature this may require changes in the dataset.

- It is anticipated that the regional representatives will be particularly busy in the coming year, driving surgeon engagement and facilitating adoption of registry data input in their regional centres.

- As the number of registries capturing data on hip preservation procedures grows around the world this then opens up opportunities for collaboration with other registries and learn from the merged data sets.

- The educational and research opportunities from the NAHR data continue to grow. More papers will be published and more presentations delivered at national and international meetings. An Instructional Course Lecture on the NAHR has been proposed for the ISHA-The Hip Preservation Society annual scientific meeting in Washington in October 2024.

The future is bright for the NAHR!

NAHR Regional Representatives

Paul Gaston - Edinburgh Royal Infirmary
REGIONAL REPRESENTATIVE LEAD

Sanjeev Madan - Sheffield Sheffield Children's NHS Foundation Trust

Jonathan Hutt - London University College Hospital NHS Foundation Trust

Colin Holton - Leeds Leeds Teaching Hospital NHS Trust

Simon Newman - Nuffield Orthopaedic Centre, Oxford

Peter Wall - Royal Orthopaedic Hospital, Birmingham

Ashwin Kulkarni - University Hospitals of Leicester NHS Foundation Trust

Owen Diamond - Musgrave Park Hospital, Belfast

Geraint Thomas - Robert Jones and Agnes Hunt Hospital, Oswestry

Hospitals that have submitted data to the NAHR during 2023

University College Hospital, London
Wrightington Hospital, Wigan
Fortius Clinic, London
Contributing Hospital For 2023
Schoen Clinic, London
Royal Orthopaedic Hospital, Birmingham
Sheffield Childrens Hospital, Sheffield
Wansbeck General Hospital, Ashington
Royal Infirmary of Edinburgh, Edinburgh
Spire Manchester Hospital, Manchester
Royal Hallamshire Hospital, Sheffield
London Clinic, London
Nuffield Health Cambridge Hospital, Cambridge
Nuffield Orthopaedic Centre, Oxford
Gartnavel General Hospital, Glasgow
Spire Leeds Hospital, Leeds
Hexham General Hospital, Hexham
Lister Hospital, Stevenage
Ramsay Pinehill Private Hospital, Hitchin
Nuffield Health Leeds Hospital, Leeds
Royal Devon & Exeter Hospital, Exeter
Addenbrooke's Hospital, Cambridge
NHS Nightingale Hospital Exeter
Chapel Allerton Hospital, Leeds
Princess Grace Hospital, London
Spire Montefiore, Hove
Royal Victoria Infirmary, Newcastle Upon Tyne
Spire Cambridge Lea Hospital, Cambridge
The Vale Hospital, Hensol
Robert Jones & Agnes Hunt Orthopaedic Hospital, Oswestry
One Hatfield Hospital
Leeds General Infirmary, Leeds
Royal Berkshire Hospital, Reading
Woodend Hospital, Aberdeen
BMI The Ridgeway Hospital, Swindon
Spire Hull And East Riding Hospital, Hull
James Paget Hospital, Great Yarmouth
Great Western Hospital, Swindon
Alder Hey Childrens NHS Foundation Trust, Liverpool
Weston General Hospital, Weston-super-Mare
Doncaster Royal Infirmary, Doncaster
Nuffield Health Glasgow Hospital, Glasgow

Surgeons that have submitted data to the NAHR during 2023

We are grateful to the following individuals who have submitted their data to the Non-Arthroplasty Hip Registry during 2023. Their support, appreciation and understanding of what the NAHR is trying to achieve are appreciated.

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