Non-Arthroplasty Hip Registry

4th Annual Report 2019

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1 Introduction

The User Group are pleased to present the 4th Annual Report of the Non-Arthroplasty Hip Registry (NAHR). Since formal data entry commenced, the NAHR has collected extensive data on over 10,000 hip preserving operations. There has been a sustained year-on-year increase in the number of surgeons participating and the operations entered since publication of the first report.

This year has seen significant progress in non-arthroplasty hip surgery. In June 2018, The Lancet published the first level one evidence output from the Femoroacetabular Surgery for Hip Impingement syndrome study (**FASHIoN**): a multicentre randomised controlled trial[1]. The results of this study demonstrated a clinically significant benefit of hip arthroscopic surgery over non-operative personalised hip therapy (PHT). Similar results were seen in the **FAIT** trial and published in the BMJ, which showed that patients with symptomatic femoroacetabular impingement (FAI) referred to secondary or tertiary care achieved superior outcomes with arthroscopic hip surgery than with physiotherapy and activity modification [2].

There are several other randomised trials underway and the results of these studies combined with longitudinal 'real world' data from the NAHR will certainly guide future patient selection and treatment and improve outcomes. Data from the NAHR demonstrates similar improvements in iHOT scores following hip arthroscopy for FAI at one year post-operatively although any comment on longer term outcomes is currently limited by the lack of available data.

Arthroscopic surgery still represents the largest proportion of recorded surgical procedures within the NAHR and the majority of procedures with data entered have been performed in a National Health Service (NHS) facility. There is clearly work to be done to improve the collection of data from non-arthroscopic surgeries and even more importantly to improve data collection from private healthcare providers.

Data collection in general, has improved in comparison with the previous years, but still remains a challenge particularly over the longer term, as well-functioning patients get on with their lives, are discharged from follow-up and may choose not to reply to data collection emails. Data collection rates for post-operative patient-reported outcome measures are typically less than 50% and by two years have dropped so far as to render analysis impossible. The rates for consent for data collection improved significantly from 50% to over 90% between 2013 and 2015 and have remained over 90% since.

Without clear patient consent data is anonymised and therefore cannot be linked to further surgery in this registry or others such as the National Joint Registry. The ability to link data and follow a hip joint through its life was one of the founding principles of the registry and improving consent rates has become a key area for the NAHR User Group. It is quite likely that consent for some of these patients has been obtained but not marked electronically in the Registry. Efforts are ongoing to trace the consent of these patients with their relevant Consultants. To prevent this problem continuing we have introduced a system whereby a new record cannot be added on the Registry without activating the consent status.

The introduction of the General Data Protection Regulation (GDPR) in May 2018 created challenges well recognised by anyone involved with the storage or transmission of patient or personal data. A new consent form has been created following multiple consultations within the User Group and the British Orthopaedic Association (BOA). Alongside the new consent form, an updated Minimum Dataset (MDS Version 2.0) has been developed and is available to download from the NAHR website. New areas now recorded include labral grafting and details of the graft length and material, number and type of labral anchors used, further refinement of pelvic osteotomy types recorded and the ability to record extra-articular hip procedures.

In the 2nd Annual Report, the NAHR had laid out plans for a dedicated website and, in January 2018, we launched www.nahr.co.uk, the NAHR website with patient

information, downloadable documents as well as the ability to log in and register for access to the NAHR.

The formation of the Trauma & Orthopaedic Registry Unifying Structure (TORUS) under the stewardship of the BOA, was seen as an essential umbrella organisation under which the growing number of UK orthopaedic registries could work, sharing guidelines, expertise and experience. Additional benefits around legal indemnity, investigation of breaches of data collection, contract negotiations with registry providers and dealing with issues related to information governance are all potential benefits of TORUS membership. The reality of running this organisation is proving a challenge and talks about the future direction of TORUS and its associated registries are continuing. One potential option for the future is to join the National Joint Register (NJR) or NHS Digital, which has the benefit of access to Department of Health funding and other similar data protection and legal benefits to those offered by TORUS. One potential concern of a move to NJR or NHS Digital is the loss of ownership of data within the NAHR. It is clear from discussion with BOA and British Hip Society (BHS) members that maintaining ownership of the data in the NAHR is desirable to avoid potential inappropriate use of the data by third parties.

The NAHR User Group, chaired by Mr Vikas Khanduja, continues to meet five to six times per year to drive the registry forward with the aims of improving data collection and surgeon engagement. One of the challenges faced by the User Group is funding. The NAHR is kindly supported by the BHS and its members but additional funding is needed to fund future developments. The NAHR User Group is very grateful to its primary sponsors; Arthrex, Stryker Orthopaedics and Smith and Nephew, for their generous support of the registry and their understanding of what the registry is trying to achieve. It is fortunate that the NAHR sponsorship money was ring-fenced and therefore protected from the unfortunate financial issues faced by the BHS last year. Notwithstanding this, the User Group has identified additional funding as one of the main targets for the coming year and other industry partners are being approached for support.

The User Group is dedicated to the progress of the Registry and riding on this year's success, its objectives for the next year are:

- Ensuring that the Registry is fully GDPR Compliant
- New MDS Version 2.0 is in place with the GDPR compliant consent form
- Increase funding for growth of Registry
- Articles in peer reviewed journals from the Registry
- Improve surgeon and patient compliance

The 3rd Annual Report was presented at ISHA, SICOT, BOA, BHS and made its presence felt in many regional meetings throughout the country. The report conclusively showed improvement in patient reported outcome measures (PROMS) following hip arthroscopy for Cam and Pincer FAI independently, and also for peri-acetabular osteotomy (PAO).

The User Group are, once again, indebted to Mr Richard Holleyman, an Orthopaedic StR from the North-East, for his help in preparing the statistical analysis and graphical representations in this report. The NAHR remains the world's only national registry of its kind and, together with the BOA, represents an opportunity to lead the world in the field of registry data for hip preservation surgery. The data contained in this report represents the early genesis of the NAHR, but it will allow us to follow the outcome of non-arthroplasty surgery over the lifetime of our patients.

1. Hip arthroscopy versus best conservative care for the treatment of femoroacetabular impingement syndrome (UK FASHIoN): a multicentre randomised controlled trial. The Lancet. 2018:391(10136); 2225-2235.

2. Arthroscopic hip surgery compared with physiotherapy and activity modification for the treatment of symptomatic femoroacetabular impingement: multicentre randomised controlled trial. BMJ. 2019 Feb 7;364:l185.

2 Aim of the NAHR

The NAHR, which is open to data submission by members and non-members of the BHS, aims to benefit both patients and surgeons by collecting longitudinal data on patients with hip pathology, whether or not they undergo surgery. 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.

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

- improving patient awareness of the outcomes of operations on the hip, because 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 forms a part of 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

3 History of the NAHR

The creation of a NAHR was initiated by Mr 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 principal, 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. Whilst the advent of tablet devices is often hailed as the convenient solution to pre-operative data collection, maintenance and theft of these devices remains a major problem. Clearly the NAHR can be used entirely without paper forms for those institutions with durable electronic systems in place. 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 specialities 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 is planned for later in 2019 and will incorporate a new patient consent form in line with GDPR guidelines. Elements of the new dataset include: 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 importance of the NAHR to the BHS was demonstrated further in 2016 by a vote at the annual meeting in Norwich to add another elected post to the Executive of the BHS with direct responsibility for the Registry and to chair the NAHR Steering Committee. Mr Vikas Khanduja from Cambridge was elected unopposed to the role at the BHS meeting in London in March 2017. Paul Gaston and Max Fehily stepped down from their roles in 2015 and 2016 respectively, with their roles taken over by Mr Ajay Malviya, Mr Jon Conroy, and Mr Callum McBryde.

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 1.1, 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.

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 4th Annual Report, provides a summary of the data available and can be used to guide further development of the register.

4 Overview of the data

4.1 Pathways per year

In the NAHR, a pathway is created when an operation is performed. Each patient has a maximum of two pathways, one for each hip, which follows the 'journey' of that hip through every hip preservation operation right to arthroplasty as the endpoint, if this occurs. If a patient changes surgeons during their treatment, then the pathway follows the patient and is taken over by the next operating surgeon. Two pathways cannot be created for patients with the same demographic data, particularly unique identifiers such as the NHS number. 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.

Between January 2012 and December 2018, a total of 10,482 pathways have been entered in the registry. The number entered in the NAHR has steadily increased year on year and 2018 saw a small increase in the number entered compared to 2017, 2,174 compared to 2,146, as show in **Figure 1**. Retrospective data submission is possible within the NAHR and, subsequent to the 2018 annual report, an additional 212 pathways have been recorded with an activity date prior to December 2017.

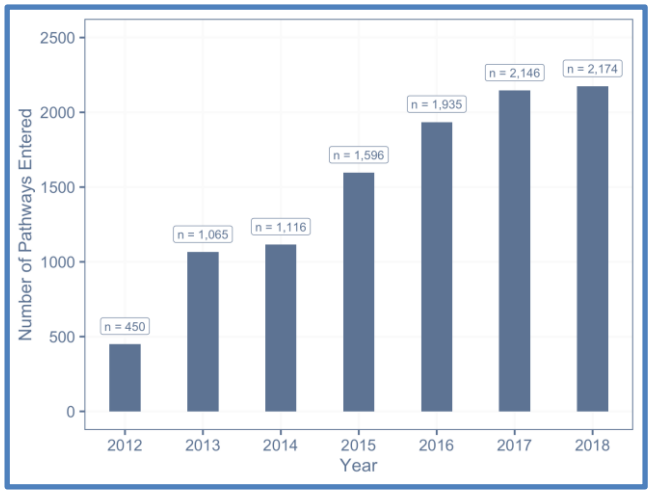

Figure 1 Pathways uploaded per year

Figure 2 shows the number of pathways split into surgical approach. Arthroscopy accounts for at least 60% of recorded pathways, with approximately 10% open including osteotomies and open surgical dislocation for hip impingement. The proportion of patients with approach not recorded remains high at 33% for 2018, the reason for this is not clear.

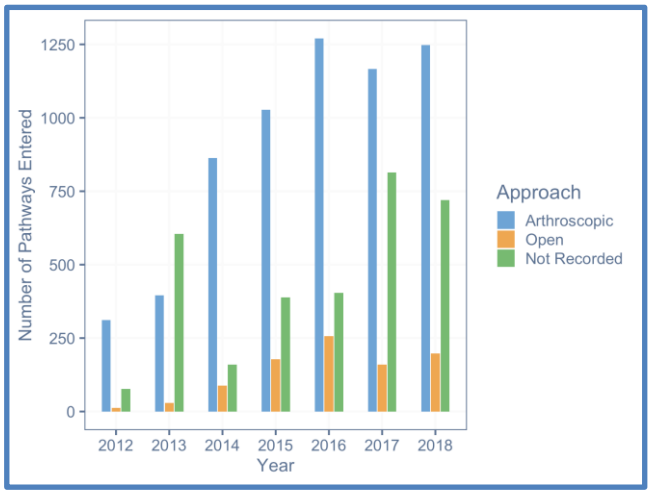

Figure 2 Pathways per year broken down to surgical approach

4.2 Number of surgeons using NAHR

A total of 94 surgeons have entered data on the NAHR at some point which is a substantial increase from 75 in the 2018 report, **Figure 3** shows the number of unique surgeons entering pathways per year since 2012. This had steadily increased such that 61 surgeons have entered data in 2018, an increase from 47 in 2017. The majority of surgeries were performed by a small number of high-volume surgeons. The number of surgeons 'experimenting' with the registry seems to be reducing, and the number of 'regular' users is increasing slowly. 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.

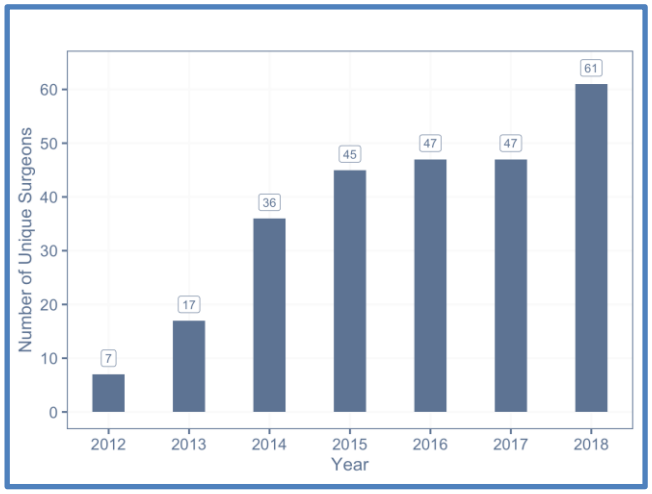

Figure 3 Surgeons adding data to the NAHR

4.3 Surgeon-patient procedures

Thirty-seven surgeons have submitted more than 50 cases, 28 have submitted more than 100 pathways and six more than 500 (**Figure 4**). One particularly high-volume surgeon and dedicated user of the registry has personally uploaded over 14.7% of all pathways on the registry. This contrast demonstrates the difference in attitudes of surgeons with some seeing the potential benefits to their own practices and patients in the follow-up of outcome data.

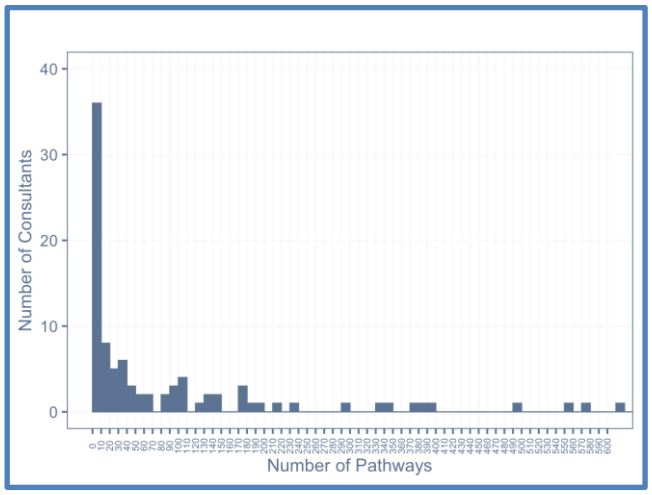

Figure 4 Procedures per surgeon

NB. To better demonstrate the range of surgeons uploading smaller number of procedures, the single highest user has been removed from Figure 4.

4.4 Funding source for surgery

The funding by surgical approach is shown in **Figure 5**. This demonstrates that the proportion of non-arthroplasty procedures funded by the NHS have changed over time from 55% in 2012 to 68% in 2016 with a drop to 52% in 2018; while the numbers recorded in the independent sector have remained similar over this time (115, 25.5% in 2012 vs 278, 12.8% in 2018). It is highly likely that the data from the independent sector is not completely being recorded in the Registry or that data upload is not as accurate. There is a significant proportion that remains 'not recorded' in this category (35% in 2018) and this is one area of the dataset that is likely to become mandatory for completion over the next few years.

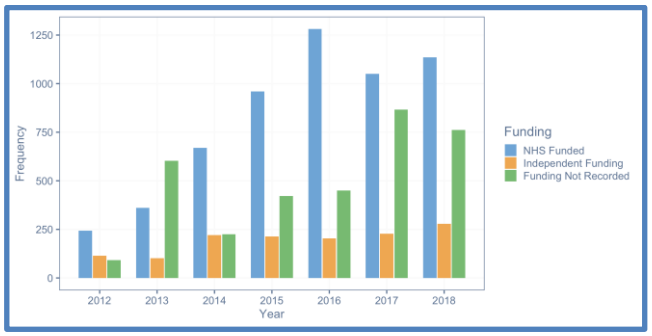

Figure 5 Funding of surgery per year

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5 Demographics

5.1 Patients by age and approach

The analysis of patient age in **Figure 6** shows a skewed distribution towards a younger age for both open and arthroscopic procedures, with patients undergoing open surgery slightly younger than arthroscopic. The distribution of cases with 'no approach recorded' is slightly different which is difficult to explain. In future, as this field is made compulsory, we may see a shift in distribution.

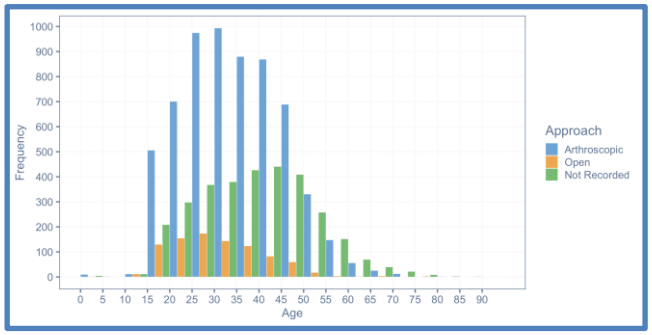

Figure 6 Patients' age distribution by approach

Given the excellent results of hip arthroplasty, several commissioners, perhaps place age restrictions on hip preservation surgery. Of the data recorded in the registry 88.1% (N=9016) of cases entered on the NAHR were between the ages of 15 and 50 years; 54.9% (N=5626) were between the ages of 20 and 40 years and 2.5% (N=254) of cases were performed on those aged 60 years or over. The peak age remains between 25 to 35 years (N=3035, 29.6%).

There are large numbers of paediatric hip preservation procedures performed that are not being recorded with around 0.5% (N=56) of procedures having been performed on patients less than fifteen years old. The management of slipped femoral epiphysis and Perthes is currently a topic of research and the British Orthopaedic Surgery Surveillance (BOSS) programme (www.boss.surgery) has been running since March 2016. At the time of writing, 807 cases had been accrued by BOSS. It is not clear how many of these cases have had surgical management but very few appear to have been submitted to the NAHR. The NAHR can also be used for simply monitoring the progression of outcome scores in patients being treated conservatively and therefore many patients, including those in the BOSS study could be entered regardless of whether they have undergone a procedure. One aim of the NAHR should be to publicise this aspect of the Registry's work.

5.2 Gender distribution by surgical approach

Overall, the majority of patients with data entered on the NAHR are female (63.1%). Of those patients undergoing hip arthroscopy, 60.3% were female compared to 83.5% of patients undergoing open procedures. Again 30.6% of procedures have no approach specified, another area that will be considered mandatory moving forwards. See **Figure 7**.

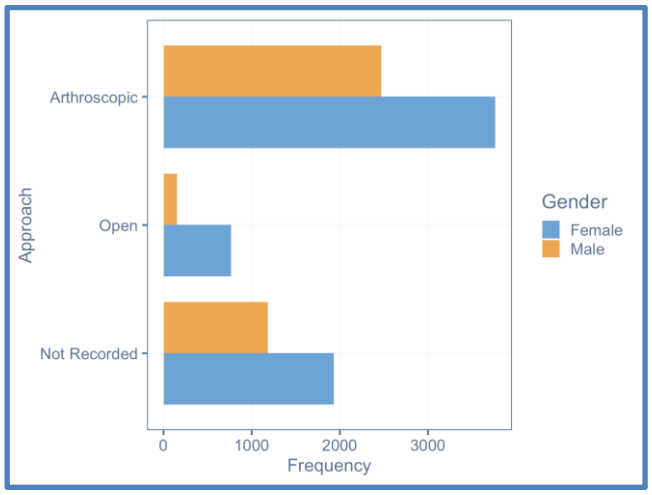

Figure 7 Gender distribution 2012-2018

5.3 Body mass index (BMI) by operation type and gender

Body Mass Index (BMI) was recorded in only 46.9% (N=4924) of cases but the rate of data acquisition, in keeping with many parameters, has improved over the last few years of the register. Of the cases for which BMI is available, 49.5% (N=2436) of patients were recorded as having a BMI of less than 25; with 33.4% recorded as having a BMI greater between 25-30 and 17.1% more than 30. See **Figure 8**.

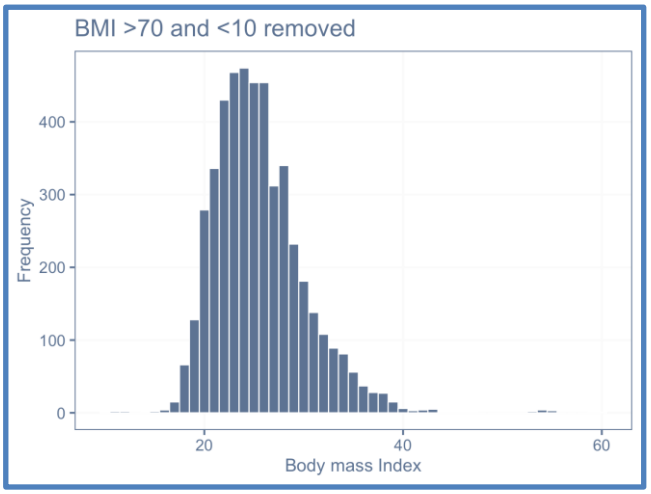

Figure 8 BMI distribution

6 Compliance

6.1 Follow-up and linkage data

In 2018 a high proportion of patients (89.2%) recorded their email address continuing the trend from 2015 onwards. Part of the proposed benefit of the NAHR is the automated email follow-up at six, 12 and 24 months and therefore inclusion of an email is essential. However, as shown in Section 7, there is a poor collection of follow-up scores. The reasons for this are unclear and need exploring. Whether the emails are not being received or are being rejected may explain the poor compliance at later time points. An audit of this aspect is planned for the next year.

In addition to this, a mobile phone number is requested to allow follow-up of a patient via phone should emails remain unanswered. It appears patients are increasingly reluctant to add a mobile phone number to the contact details on the consent form with only 51.1% supplying one in 2018 which was similar at 48.3% in 2014. This is shown in **Figure 9**.

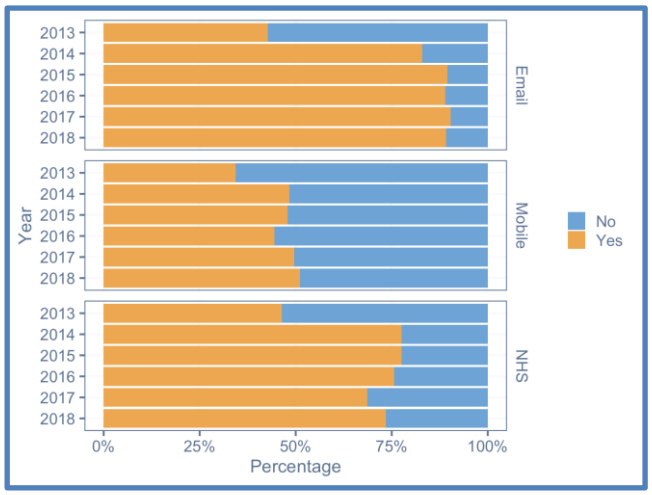

Figure 9 Pathway compliance

The recording of an NHS number has improved to 73.4% in 2018 after having dropped to 68.7% in 2017, perhaps related to data protection and GDPR issues. 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.

6.2 Consent rates

As discussed in the Introduction, the involvement of the NAHR with TORUS has highlighted the importance of good governance and consent to data upload. The percentage of recording of consent for data upload to the NAHR has increased from 46% in 2013 to 96% in 2018 - see **Figure 10**. A part of this increase is due to the Consent tab being made a mandatory field on the website. It is important that surgeons are not recording any data on patients who have not given explicit consent. Reasons for non-consenting and rejection of consent via the patient portal should be explored.

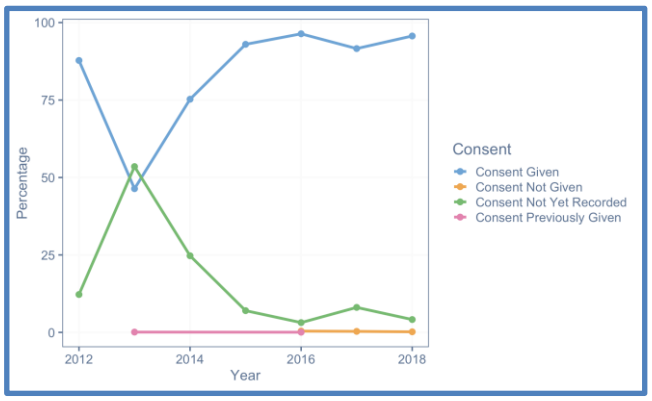

Figure 10 Recording of Consent to data collection

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7 Collection of mandatory scores and statistics

7.1 Overview of scores

The NAHR offers clinicians the opportunity to use various hip scores for patient assessment pre- and post-operatively. The NAHR User Group, following review of evidence defined that only two hip scores would be mandatory for collection in the minimum dataset, with others 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 six months, one and two years post-operatively. Surgeons can select to use other, additional PROM scores if desired.

7.1.1 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).

7.1.2 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 points) and 'Worst imaginable health state' (0 points).

7.1.3 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.[1]

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 11-13**.

7.1.4 Statistical note

Statistical analysis was performed by Richard Holleyman using STATA version 15 (StataCorp. 2017. *Stata Statistical Software: Release 15*. College Station, TX: StataCorp LLC). The statistical approach was agreed previously in consultation with Keith Gray, PhD (Statistician, R&D Department, Northumbria Healthcare NHS Foundation Trust). A p-value of 0.05 was deemed statistically significant. It is acknowledged that p-value adjustment would be appropriate when making multiple comparisons within each analysis/pathology cohort and future reports will aim to incorporate this.

1. Hip arthroscopy versus best conservative care for the treatment of femoroacetabular impingement syndrome (UK FASHIoN): a multicentre randomised controlled trial. The Lancet. 2018:391(10136); 2225-2235

7.2 Rates of score collection

7.2.1 EQ-5D Index

Figure 11 shows the rate of collection of the Index scores at the various time intervals. The rate for pre-operative score collection has increased significantly from 30% in 2013 to 71.2% in 2018, which however is a drop from 82.4% in 2016; perhaps related to retrospective data entry. The rates for collection at post-operative time points remain poor, with 38.1% for 6 months and 17.3% for 12 months for 2018 although a further 6 months of data collection remain for capture of 12-month follow-up for pathways performed towards the end of 2018. The 2017 rates stand at 32.7% for 6 months and 28.2% for 12 months. With longer follow-up the 12 months' data collection should improve. The reasons for the relatively poor patient engagement need to be explored, the patient application, which is planned for 2018-9 will hopefully help in this respect. We did notice a proportion of patients with no operative data and after excluding those patients, the compliance data improved for 2018; reaching more than 52% at 6 months and 25% at 12 months.

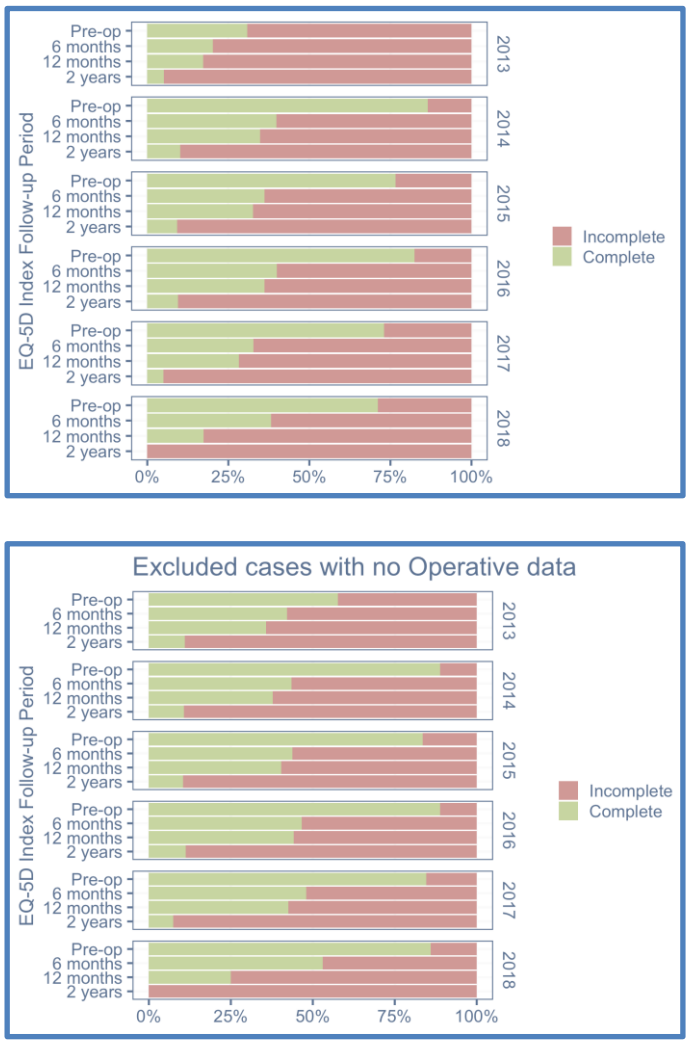

Figure 11 EQ-5D Index score collection compliance – before and after excluding cases with no operative data

7.2.2 iHOT-12

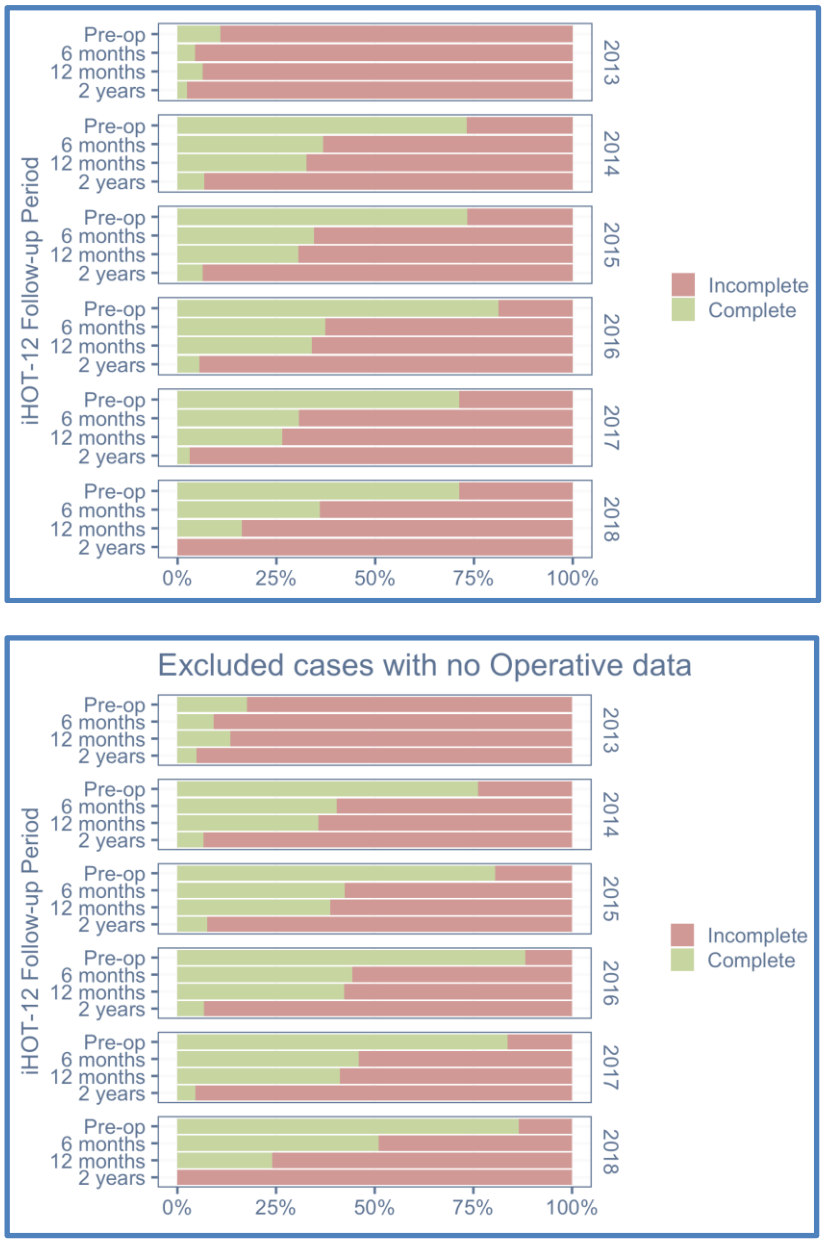

Figure 12 iHOT-12 Score Collection Compliance with and without excluding cases with no operative data

The iHOT-12 score was presented to the International Society for Hip Arthroscopy (ISHA) in 2011. It is, therefore, a new scoring system and hence less well known amongst surgeons. This may be reflected in the slightly reduced uptake of this score in the first two years of the NAHR, despite it being a mandatory score for the minimum dataset. Since 2014, this score has been collected as part of the same scoring sheet as the EQ-5D and the collection rates since are very similar to those for EQ-5D. See **Figure 12**

8 Surgical procedures

8.1 Overview

Figures 13 to 15 show the different types of surgical procedures recorded in the NAHR, including core acetabular and femoral procedures, additional surgical procedures and the different combinations of femoral and acetabular osteotomies. (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 recorded within a single patient pathway. Proportions are therefore proportions relative to all procedures recorded in the NAHR at the given surgical site ('acetabular', 'femoral', 'additional procedures') and *not* proportions of all pathways recorded).

8.2 Acetabular procedures

Labral debridement remains the most commonly performed acetabular procedure in arthroscopic surgery, accounting for 26.7% of acetabular procedures compared to 22.9% labral repairs. Compared to the 2018 report, there has been a reduction in the relative proportion of labral debridement procedures and an increase in labral repair. There are plans for revisions to the dataset to include labral reconstruction/ grafting, a procedure which is being increasingly performed. Regarding all acetabular procedures performed by an open approach, labral debridement comprises 11.3% of procedures as compared with labral repair, which accounts for 56.5% of open acetabular procedures. The difference in these figures between open and arthroscopic surgery and labral surgery are likely to reflect the surgical challenges perceived in labral stabilisation/ repair.

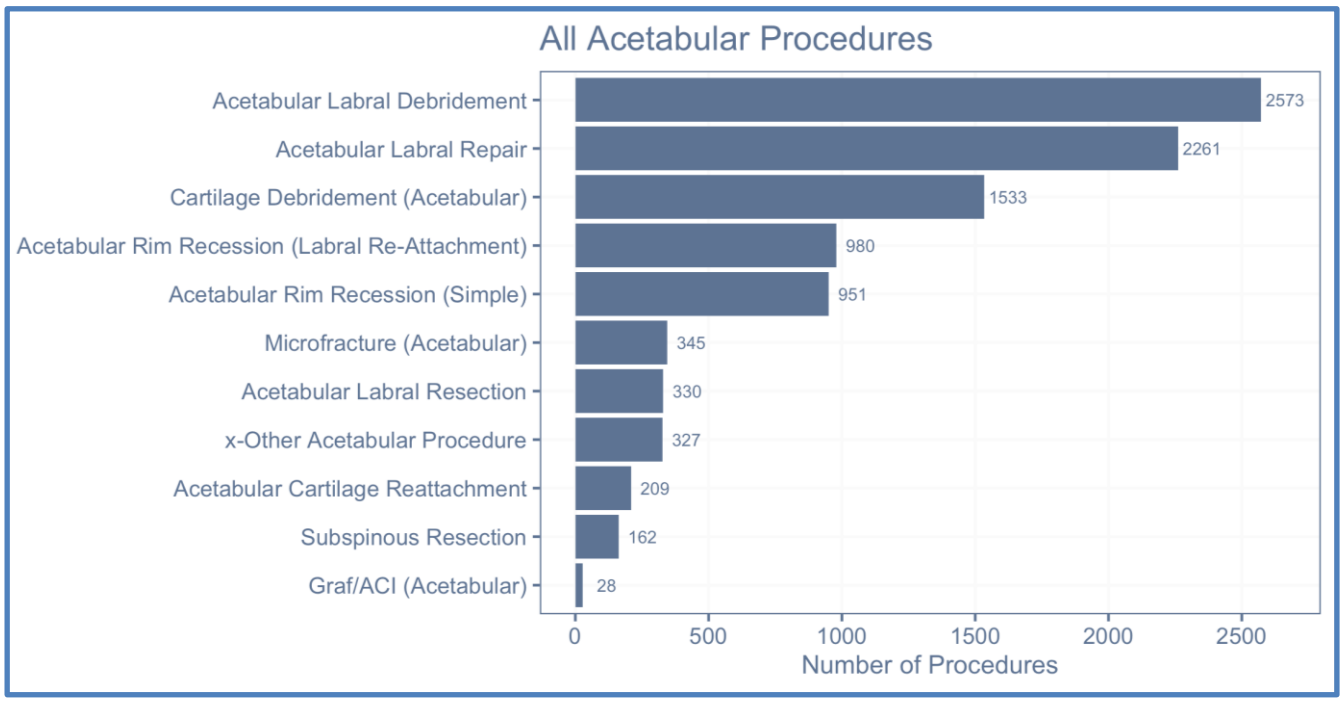

Figure 13 All Acetabular procedures

8.3 Femoral procedures

Figure 14 shows the range of femoral procedures recorded on the NAHR. Cam removal is the commonest femoral procedure accounting for 90% of all femoral procedures performed. Cam removal accounted for greater proportions of total femoral procedures recorded via arthroscopic (n=4,172 of 4,618, 90.3%) and open (n=91 of 123, 74%) approach. It is technically more challenging to perform an adequate cam resection arthroscopically with many proponents of open surgery citing inadequate resection as a reason for failure of hip arthroscopy for FAI. Future reports may be able to study difference in outcome between these two groups. A very small number of cartilage procedures were recorded, including debridement, microfracture, cartilage grafting and core decompression.

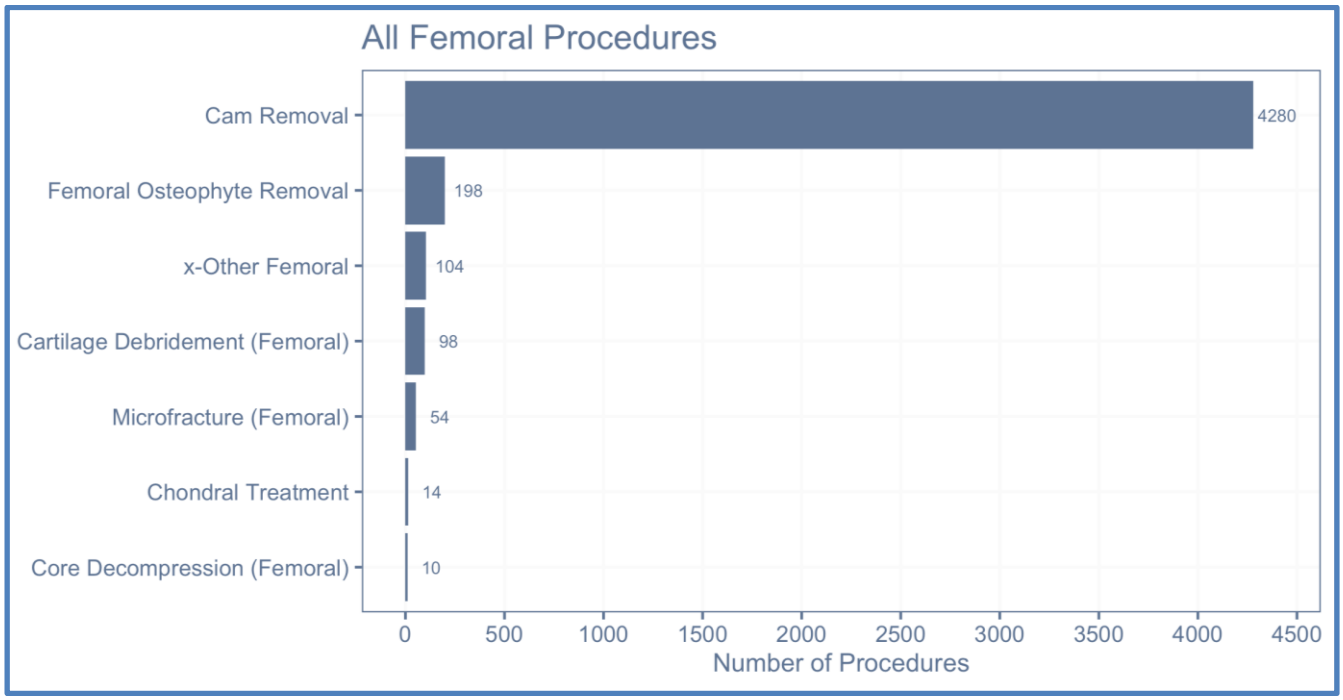

Figure 14 All Femoral procedures

8.4 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. Relatively few of these procedures were recorded and the majority were performed as part of an arthroscopic approach.

Figure 15 shows the frequency of additional procedures recorded in the NAHR. Psoas release is still the most common additional procedure performed. Trochanteric bursal debridement has been recorded 90 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 14 cases entered.

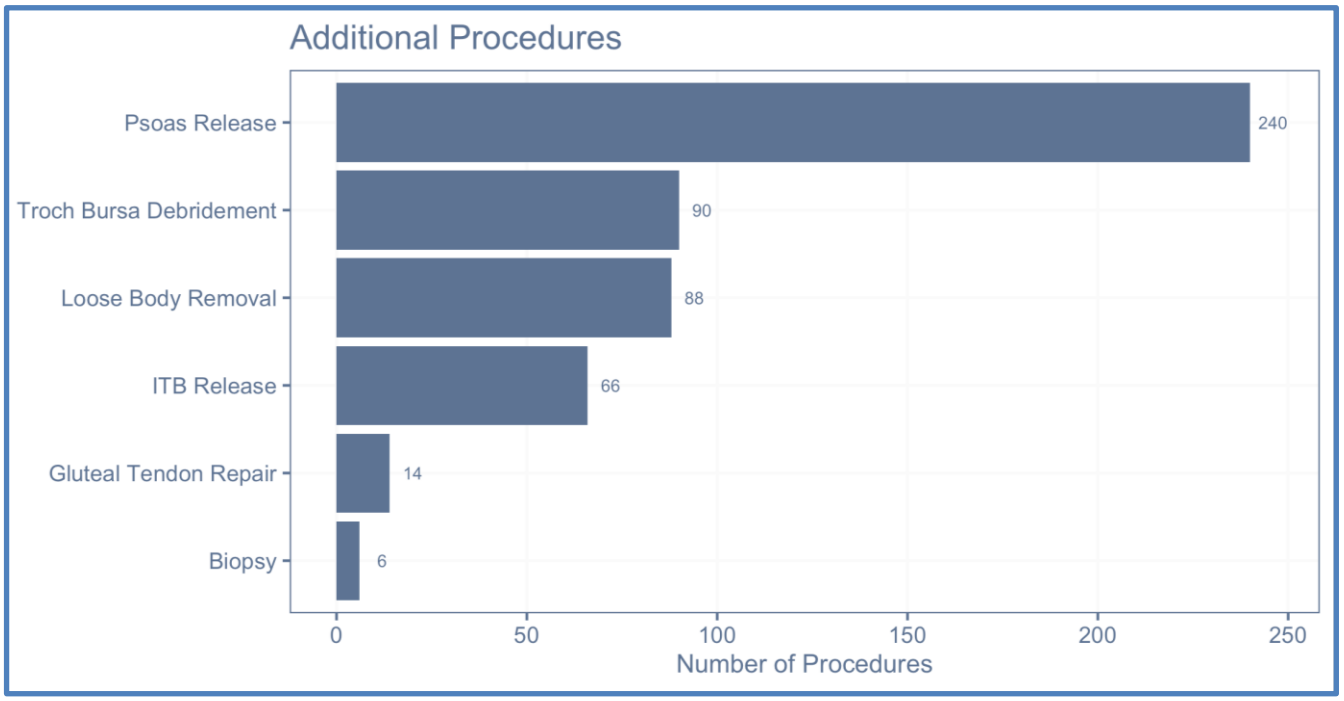

Figure 15 Additional surgical procedures

8.5 Periacetabular osteotomies

A total of 782 periacetabular osteotomies have been reported of which 749 were isolated and 33 combined with femoral osteotomy, the distribution of which is as below in **Figure 16.**

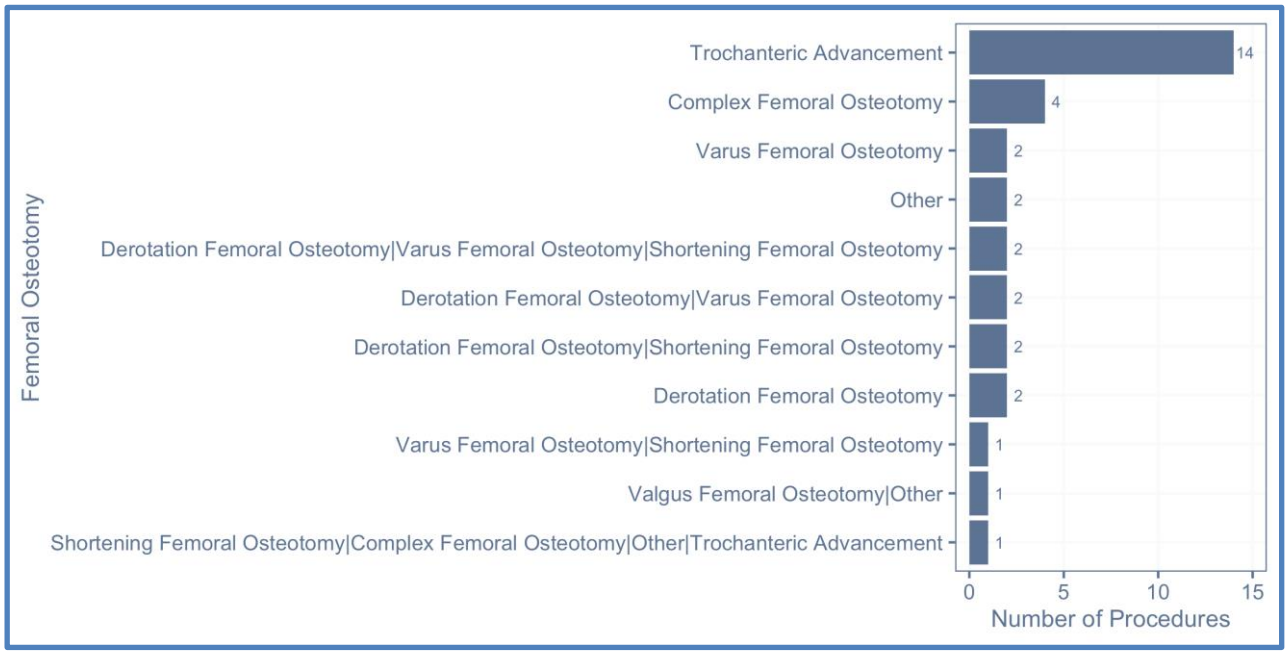

Figure 16 Combination of femoral osteotomies with PAO

8.6 Femoral osteotomies

A total of 92 femoral osteotomies have been recorded in the NAHR, 55 of which were isolated and 37 combined with other procedures (**Figure 17**).

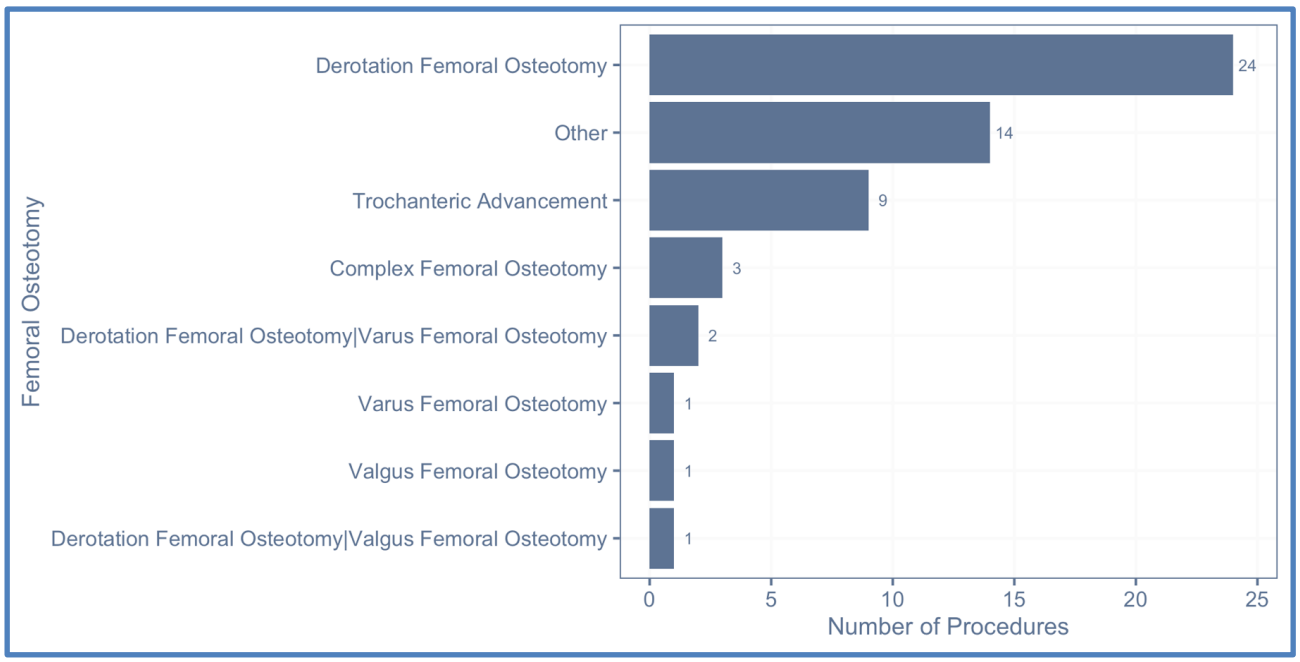

Figure 17 Types of isolated femoral osteotomies

9 Outcome scores

9.1 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. As the primary indication of hip arthroscopy is FAI, we have reported the results for impingement surgery in detail in this section.

9.2 Outcomes of surgery for FAI

9.2.1 Overall

We have reported the outcomes of FAI surgery where cam and/ or acetabular rim recession has been performed. There were 3,331 such procedures recorded in the NAHR. For the purposes of removing confounding factors given the variance in scores, patients who had additional procedures to the cartilage (approximately 1,900 cases), in the form of debridement and/or microfracture either on femoral or acetabular side have been removed in an attempt to remove confounding factors from this highly heterogeneous data. Research looking at the effect of cartilage procedures on outcome is ongoing and results will be presented in next year's report. Scores for these cases are shown in **Figures 18-20**. For the whole group there was significant improvement in the pre-operative iHOT-12 score at six months (mean iHOT-12 change 32.2 to 56.4, n=1,462, p<0.0001) and 12 months (meant iHOT-12 change 32.2 to 57.6, n=1,212, p<0.0001) post-operatively [Paired t-test]. Female gender was significantly associated with a greater improvement in iHOT-12 score (compared to pre-operative scores) at six months (p=0.0001) and one year (p=0.003) post-operatively, influenced by the fact that men start from a higher baseline pre-operative iHOT-12 score [independent t-test]. The two year post-op data needs to be treated with caution due to poor compliance (164, 4.9%).

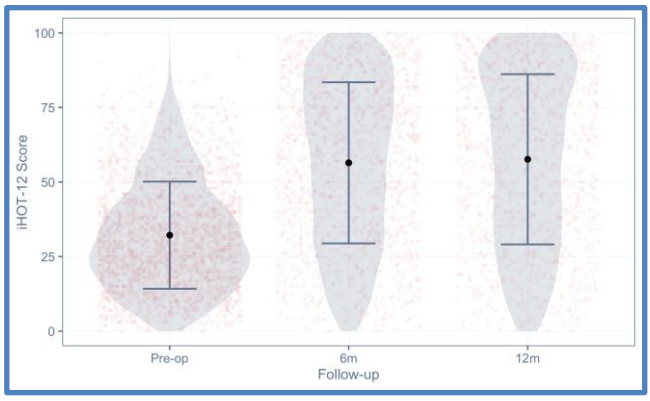

Figure 18 iHOT-12 – whole cohort

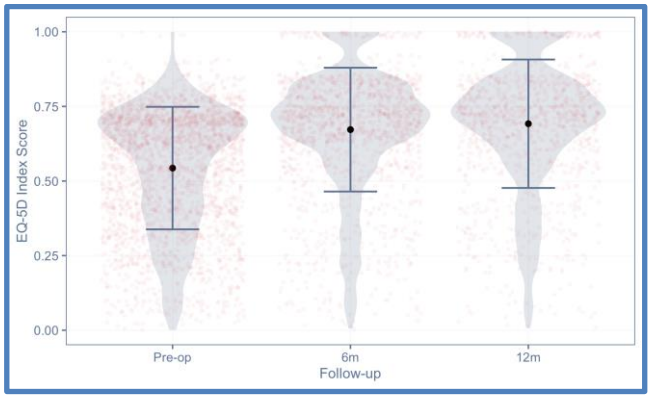

Figure 19 EQ-5D Index score – whole cohort

Figure 20 shows the iHOT-12 score with gender distribution. Females may start with a lower preoperative baseline score but catch up by one year.

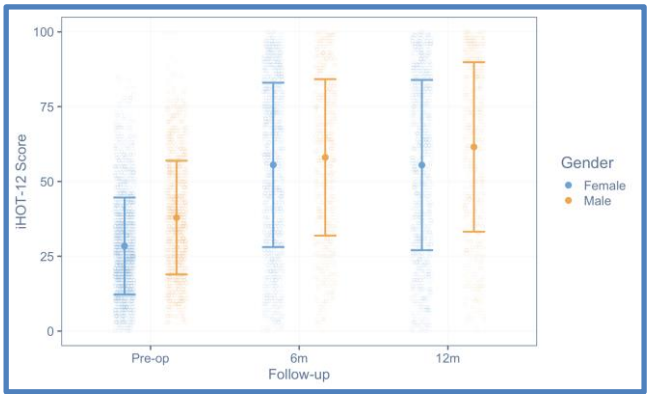

Figure 20 iHOT-12 with gender distribution

9.2.2 Results of FAI surgery for cam lesion

In this group, patients who had surgery for pincer lesions have been excluded. Results of the scores are shown in **Figures 21-22** and reported by gender in **Figure 23**. For isolated cam lesion surgery, there was significant improvement in pre-operative iHOT-12 scores at six months (mean iHOT-12 change 32.6 to 56.7, n=777, p<0.0001) and 12 months (mean iHOT-12 change 32.6 to 59, n=629, p<0.0001) post-operatively [*Paired t-test*]. Female gender was associated with significantly greater improvement in iHOT-12 scores compared to baseline at six months (combined n: female = 427, male = 241, p=0.008) however significance was lost at 12-month follow-up (combined n: female = 348, male = 201, p=0.647) [independent t-test]. Data from two years was not analysed due to small numbers who returned pre and post-operative scores (n=57).

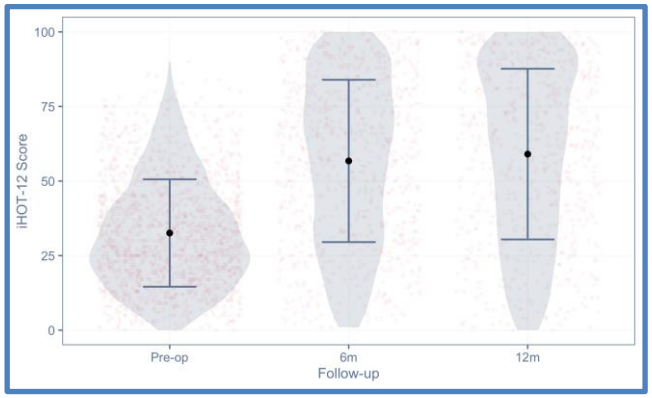

Figure 21 iHOT-12 – cam lesion

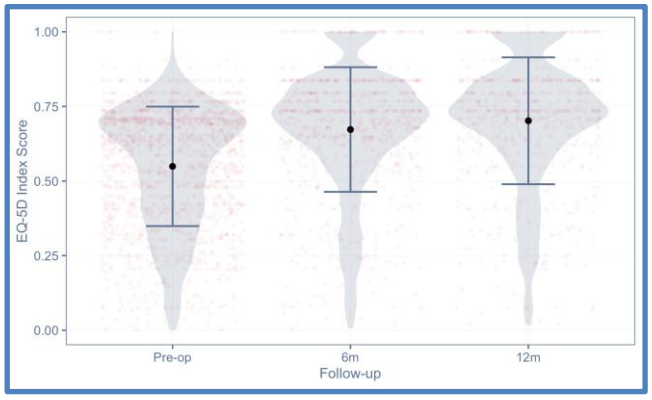

Figure 22 EQ-5D Index score – cam lesion

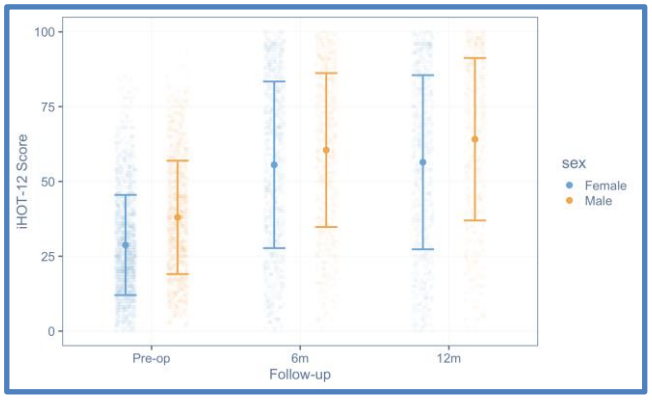

Figure 23 iHOT-12 – gender distribution – cam lesion

9.2.3 Results of FAI surgery for pincer lesions

In this section, patients who had surgery for cam lesion and a cartilage procedure on the acetabular or femoral side have been excluded. For isolated pincer lesion surgery there was significant improvement in pre-operative iHOT-12 scores at six months (mean iHot-12 change 29.3 to 52.7, n=174, p<0.0001) and 12 months (mean iHOT-12 change 29.3 to 51.4, n=161, p<0.0001) post-operatively [*Paired t-test*]. These scores are shown in **Figures 24-26.** Small numbers in the male group precluded any statistical analysis based on gender. Data from two years was not analysed due to small numbers with returned scores (n=35).

Regarding acetabular rim recession, the NAHR records this as either complex (involving labral reattachment) or simple, which would include retro-labral rim recession, leaving the chondro-labral junction intact or rim recession of a calcified labrum with no clear labrum to detach. The outcomes of the iHOT-12 scores are shown in **Figure 26.**

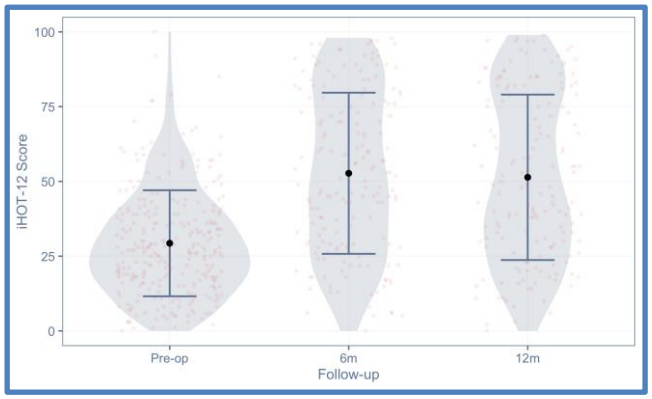

Figure 24 iHOT-12 – pincer lesion

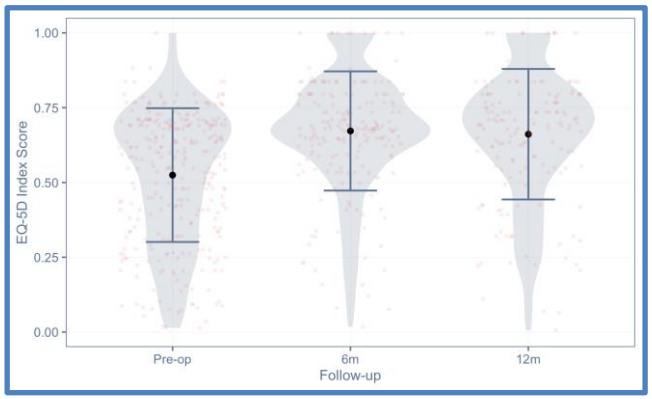

Figure 25 EQ-5D Index – pincer lesion

Between-group analysis comparing labral re-attachment vs simple rim recession showed no statistically significant difference in iHOT-12 score improvement at six months (n=94, p=0.4258) or 12 months (n=90, p=0.833) post-operatively compared to pre-operative baseline [independent t-test].

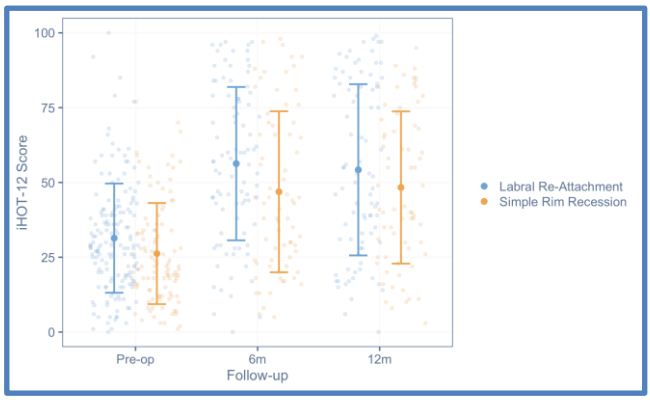

Figure 26 iHOT-12 - rim recession: simple vs complex (with reattachment)

9.2.4 Labral repair vs labral debridement

The optimal management of labral pathology is unclear. Although some studies have shown better outcomes with labral repair and preservation, these studies have not been randomised trials and selection bias makes interpretation difficult. Although similar bias is clearly relevant in this report, the data from the NAHR is grouped into three distinct categories – labral repair, labral debridement and those recorded as having both techniques. The outcomes of the three mandatory scores for labral debridement vs labral repair are shown in **Figures 27 and 28**. For patients undergoing pure 'labral repair' or 'labral debridement' as an acetabular procedure, there was significant improvement in combined pre-operative iHOT-12 scores at six months (mean iHOT-12 change 31.1 to 54.6, n=503, p<0.0001) and 12 months (mean iHOT-12 change 31.3 to 56.3, n=426, p<0.0001) post-operatively [Paired t-test]. There were, however, no significant between-group differences in iHOT-12 scores when comparing 'labral repair' vs. 'labral debridement' at each stage of follow-up (all p>0.05, independent t-test). Pre-operative scores between the two groups are similar and there is a trend towards improvement out to one year with no clear difference between the two treatment groups. The EQ-5D VAS showed less evidence of an improvement post-operatively than other groups. Data from two years was not analysed due to small numbers (n=73).

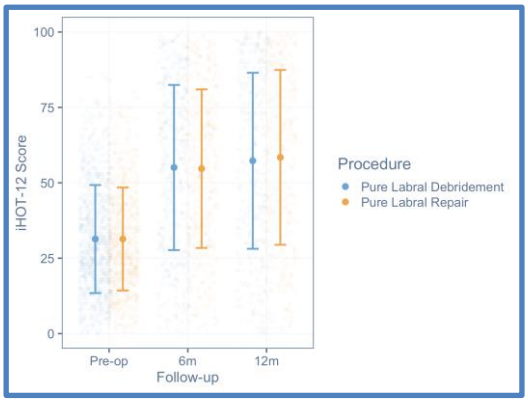

Figure 27 iHOT 12 - Labral debridement vs repair

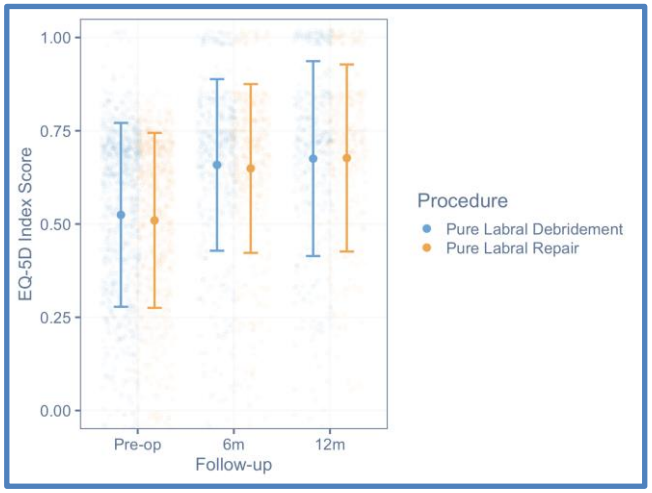

Figure 28 EQ-5D Index - Labral debridement vs Repair

Figure 29 represents the outcome of iHOT-12 scores for the whole cohort with labral pathology against age. There appears to be good improvement with labral debridement or repair regardless of age. The graph shows scatter plots of age vs outcome score with a LOESS method-smoothing curve along with 95% confidence interval.

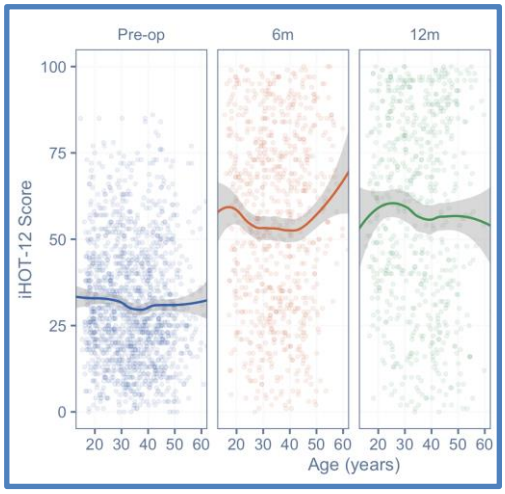

Figure 29 iHOT 12 - Labral pathology vs age

9.3 Outcome following isolated peri-acetabular osteotomy (PAO)

There are 754 PAOs recorded without simultaneous femoral osteotomy. The following graphs (**Figures 30** to **33**) show the three mandatory scores for these cases in isolation. For patients undergoing PAO with no concurrent femoral osteotomy there was significant improvement in pre-operative iHOT-12 score at six months (mean iHOT-12 change 29.1 to 56.5, n=385, p<0.0001) and 12 months (mean iHOT-12 change 29.1 to 63.9, n=351, p<0.0001) post-operatively [*Paired t-test*]. Data from two years was available for only 10.1% cases (n=76).

There was no statistically significant difference in iHOT-12 scores between genders at each stage of follow-up for patients undergoing PAO. Note that there were only small numbers in the male group who returned both pre and post-op scores at 6 (n =26) and 12 months (n=30).

9.3.1 iHOT-12 - PAO

There is a trend towards improvement in the iHOT-12 score at six months and one year post-operatively.

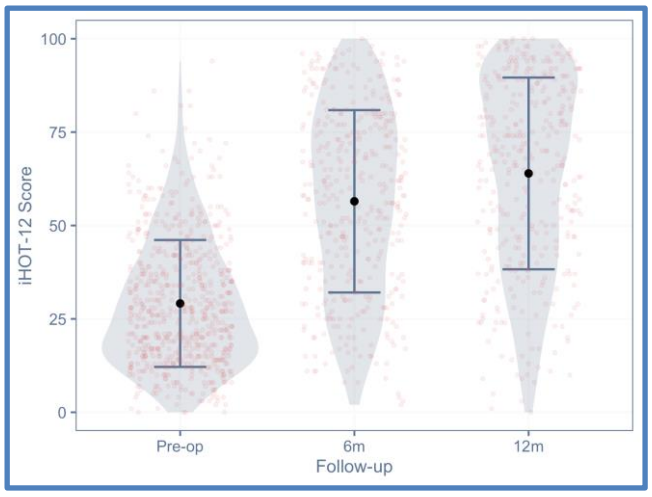

Figure 30 PAO iHOT-12 scores

9.3.2 EQ-5D Index – 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.

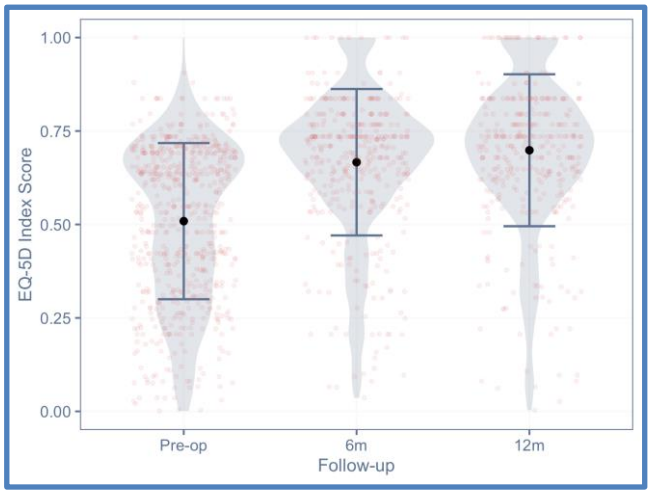

Figure 31 PAO EQ-5D Index scores

9.3.3 Results of PAO vs age at the time of surgery

Figure 32 illustrated the iHOT-12 scores of various age groups. All ages seem to benefit from surgery. 2-year data not presented due to small numbers. Graph shows scatter plot of age vs outcome score with a LOESS method smoothing curve along with 95% confidence interval.

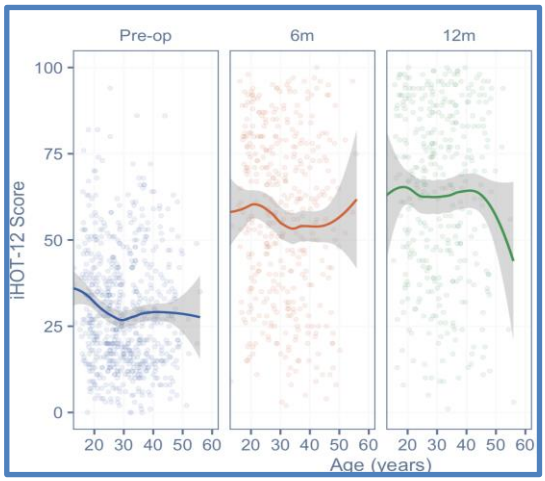

Figure 32 PAO iHOT-12 scores with age distribution

9.3.4 Results of PAO based on gender

Approximately 10% of patients undergoing PAO are males. **Figure 33** shows the iHOT-12 scores of patient's vs gender. Both males and females benefit equally from the procedure.

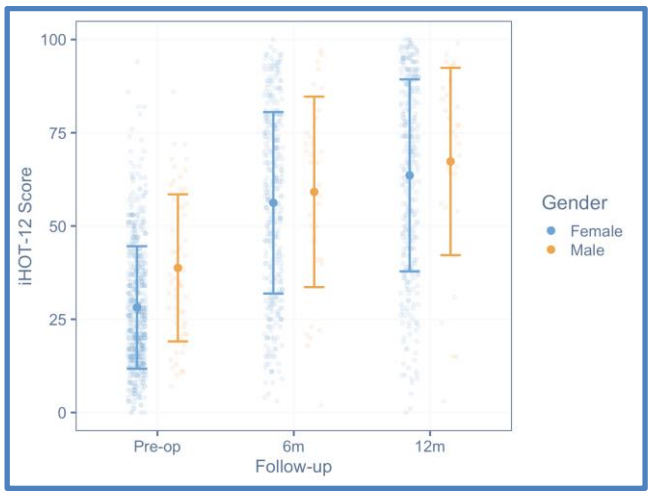

Figure 33 PAO iHOT-12 scores with gender distribution

9.3.5 Results of PAO based on BMI

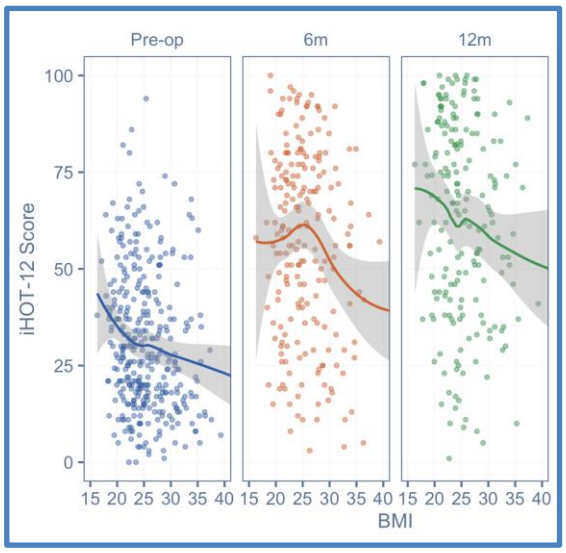

Figure 34 PAO iHOT-12 scores with BMI – LOESS line and 95% CI

10 Summary

The evidence for the role of non-arthroplasty hip surgery continues to develop. There are several randomised controlled studies ongoing around the world at the present time and two, FASHIoN & FAIT have already been published showing benefits of arthroscopic hip surgery over non-operative management. The improvement in clinical scores are, admittedly, modest but the data, as shown in this NAHR report is highly heterogeneous and future work needs to focus on defining which subsets of patients benefit most from which surgical procedures.

The challenge for any registry is to develop a clearly defined minimum dataset which captures critical information, allowing useful analysis, while at the same time being succinct enough to minimise inter-recorder error and encourage complete data collection. In addition, the psychology of young adult hip pain is a confounder in both presentation and outcome and more work is needed to understand the impact of an individual's personal circumstances on the result of surgery.

The new MDS Version 2.0 is an enhancement of the previous version 1.1 and is substantial enough of a change to warrant a change in version numbers. The User Group have worked hard to add useful parameters while removing less used and less useful data points.

There has been a year on year increase in the number of pathways uploaded in 2018 compared with previous years, with 2,174 separate entries recorded. There has been an increase in the number of surgeons entering data this year, 61 compared with 47 the previous year. The User Group is working hard to understand if this represents low volume surgeons stopping surgery or non-submitted data. There remain a few high-volume surgeons contributing the majority of the data with 56.8% of data submitted by only 10 surgeons. It is apparent that a large number of surgeries are being performed by surgeons not entering data and this is an area that the Registry, the BHS as well as health care commissioners are keen to address.

The BHS and the registry are working hard to maintain data ownership in spite of the challenges of managing the increasing costs and governance regulations. The membership of TORUS, the BOA registry umbrella organisation, is seen as essential by all those at the registry and we hope that the BOA will continue to support TORUS in safeguarding the data use and independence of the NAHR and other smaller registries.

For reasons that are not entirely clear, this year has seen an increase in the number of pathways with missing data points such as type of surgery and funding streams (see **Figure 2** and **Figure 5**). Mandatory entry of these data points is clearly the most obvious step to take and this has been discussed with Amplitude, the registry developer.

Compliance with recording patient contact details is seen as essential to improving longer term follow-up and the recoding of an email address has improved this year to over 90%. The recording of mobile phone details has not improved and remains around 50%. The new MDS Version 2.0 has improved methods of recording mobile number and we are hopeful that data capture will improve as this comes online. Making contact details mandatory is not considered an option as this may prejudice data entry if patients decide not to give consent because of a concern about entering email or mobile phone numbers. Recording of patient NHS numbers is also fairly static at around 75%. This represents those patients operated on the private sector not having an NHS number available. Although this is possible to overcome, again this is difficult to mandate without risking losing data entry.

Longer term data collection is the main challenge for the NAHR at present. Pre-op scores are recorded in 75% of cases but this drops to less than 40% at six months, 25% at 12 months and less than 10% at two years. Data collection following surgery is an issue for all registries and the recent changes to data protection laws have done nothing to improve the opportunities to rectify this.

Looking at acetabular procedures, labral work is the most common surgical procedure and debridement remains more common than repair (26.5% vs 23.3%) although this year has seen an increase in the rates of labral repair compared to the previous year, due to a combination of

improving surgical skills, training and instrumentation. Evidence for labral debridement vs repair is not level one but there is a suggestion from the literature that cases undergoing labral repair have an improved outcome. One explanation for this is that hips with a labrum which is felt more appropriate for debridement rather than repair may be in a worse general condition. Therefore, it is intuitive that those hips will have a worse outcome. However, this premise is not supported by the NAHR results. At both six and 12 months post-operatively there is no significant difference in outcome scores between those treated with repair vs those treated with debridement. In addition, there is no significant difference in the baseline hip scopes of these two groups. This is an area that would warrant further study and data from the NAHR suggests a feasibility study for a randomised controlled study of labral repair vs debridement would be reasonable.

On the femoral side, cam removal remains the most commonly performed procedure at 90%. For isolated cam lesion removal, outcome scores are significantly improved at both six and 12 months post-operatively.

The increasing use of arthroscopic techniques for extra-articular problems are demonstrated with 90 cases of trochanteric bursal debridement recorded compared to 28 in 2016. Psoas release remains the most common extra-articular procedure performed.

There are 782 PAOs recorded on the registry and a smaller number of femoral osteotomies with derotation being the most common type recorded. Outcome scores for PAO are again significantly improved at six and 12 months with no difference between genders although, the numbers of men undergoing the procedure and with longer term follow-up is small.

Overall, arthroscopic hip surgery for FAI (with more complex acetabular and femoral procedures removed from analysis) demonstrates significant improvements in hip outcome scores with females having a significantly greater increase than males although men start from a significantly higher baseline score. The results from the NAHR registry support the findings of recent level one publications and are useful for surgeons, commissioners and, most importantly, patients.

For a registry to be able to provide this level of data in only its fourth report is some achievement and the BHS and the NAHR would like to thank all of the members of the User group, all the surgeons, administrative staff and patients that have contributed data to make this possible. We hope that continued engagement with all of these groups will continue to improve data collection and quality, allowing future reports to shed even more light on this complex area of hip surgery.

11 Future plans

The fourth annual report has continued to build on the work of last year. The efforts of the NAHR user group and the BHS in achieving this has to be recognised. In addition, the support of the BOA is essential to the progress that has been made and the future of the NAHR and other smaller orthopaedic registries.

Improvement in surgeon engagement and data collection remain the core themes for the NAHR. The development of a dedicated website in the last year (www.nahr.co.uk) is one step in this direction, improving access and visibility of the registry.

Attempts to improve surgeon engagement have been challenging. The possibility of mandating data entry is being explored and guidance on arthroscopic hip surgery has been developed. It is the view of the NAHR User Group that a large number of these procedures are being performed in the private sector and the majority of these are not being entered onto the registry. Clearly the CCGs have little control over this and therefore the User Group has also approached private medical insurers (PMIs) with initial positive results. It is clearly in the interests of the PMIs to help improve the quality of data with the NAHR. The data produced by this registry and in the literature will help guide best care for their clients and we look forward to developing closer links with other PMIs and private hospitals over the next year.

Improving patient engagement with the NAHR is also key to improving long-term data. As this report clearly demonstrates, the low data returns post-operatively are a significant challenge to producing evidence of longer term results. The User Group is exploring the possibility of an app that patients can download to keep track of their scores. Following discussions with app developers, the biggest challenge is not getting people to download that app but having a good reason to maintain interaction with the app over the longer term. Methods of engagement such as motivational notifications for post-operative rehab, information about post-op rehab and physio regimes as well as collection of activity data are all areas that are being explored. Additionally, there is a possibility of joining forces with an existing healthcare app that monitors general well-being.

In order to develop many of these areas, finance is clearly necessary, and we are very grateful to our industry sponsors, Stryker Orthopaedics, Smith and Nephew and Arthrex who have supported the NAHR. We are approaching other industry partners for support over the next year. Part of this money may be needed to secure the services of a governance officer and a part time research nurse to improve surgeon and patient compliance. The impact of GDPR has been significant and, moving forwards, to protect and improve the data, dedicated support may be required.

Once again the support of Amplitude, in particular Corri Conrad and David Selvey, in developing the user interface and database is invaluable and appreciated.

Part of the mission of the NAHR is to use this data to generate research papers in different areas of non-arthroplasty hip surgery. A research request form has been developed and is available for download from the NAHR website. Data requests so far have resulted in podium and poster presentations at the meetings of the International Society of Hip Arthroscopy and Hip Preservation (ISHA), SICOT, BOA and the BHS.

We look forward to presenting the next report in 2020, and although the data in this report is not mature as yet, it clearly shows a trend of hip preservation procedures improving patient-reported outcomes in the short-term. We hope that you have found this report interesting and thought-provoking.

12 Hospitals submitting data to the NAHR

- Addenbrooke's Hospital, Cambridge
- Alexandra Hospital, Redditch
- BMI Harrogate Hospital, Harrogate
- BMI The Alexandra Hospital, Stockport
- BMI The Droitwich Spa Hospital, Droitwich Spa
- BMI The Ridgeway Hospital, Swindon
- BMI Winterbourne Hospital, Dorchester
- Chapel Allerton Hospital, Leeds
- Colchester General Hospital, Colchester
- Derriford Hospital, Plymouth
- Dorset County Hospital, Dorchester
- Frimley Park Hospital, Frimley
- Great Western Hospital, Swindon
- Guy's Hospital, London
- Harrogate District Hospital, Harrogate
- Hereford County Hospital, Hereford
- Hexham General Hospital, Hexham
- Hospital of St John and St Elizabeth, London
- James Paget Hospital, Great Yarmouth
- Leeds General Infirmary, Leeds
- Leicester General Hospital, Leicester
- Lister Hospital, Stevenage
- London Bridge Hospital, London
- London Clinic, London
- Neath Port Talbot Hospital, Port Talbot
- Nuffield Health Exeter Hospital, Exeter
- Nuffield Health Glasgow Hospital, Glasgow
- Nuffield Health Leicester Hospital, Leicester
- Pembury Hospital, Pembury
- Peterborough City Hospital, Peterborough
- Princess Grace Hospital, London
- Queen Alexandra Hospital, Portsmouth
- Ramsay Ashtead Private Hospital, Ashtead
- Ramsay Duchy Private Hospital, Truro
- Ramsay Fitzwilliam Private Hospital, Peterborough
- Ramsay Oaks Private Hospital, Colchester
- Ramsay Pinehill Private Hospital, Hitchin
- Royal Berkshire Hospital, Reading
- Royal Bolton Hospital, Bolton
- Royal Cornwall Hospital, Truro
- Royal Devon & Exeter Hospital, Exeter
- Royal Infirmary of Edinburgh, Edinburgh
- Royal London Hospital, London
- South West London Elective Orthopaedic Centre, Epsom
- Southern General Hospital, Glasgow
- Spire Clare Park Hospital, Farnham
- Spire Harpenden Hospital, Harpenden
- Spire Manchester Hospital, Manchester
- Spire Murrayfield Hospital Edinburgh, Edinburgh
- Spire Norwich Hospital, Norwich
- St Anthony's Hospital, Sutton
- St Michael's Hospital, Hayle
- Stepping Hill Hospital, Stockport
- University College Hospital, London
- Wansbeck General Hospital, Ashington
- Wrightington Hospital, Wigan

13 Surgeons submitting data to the NAHR

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