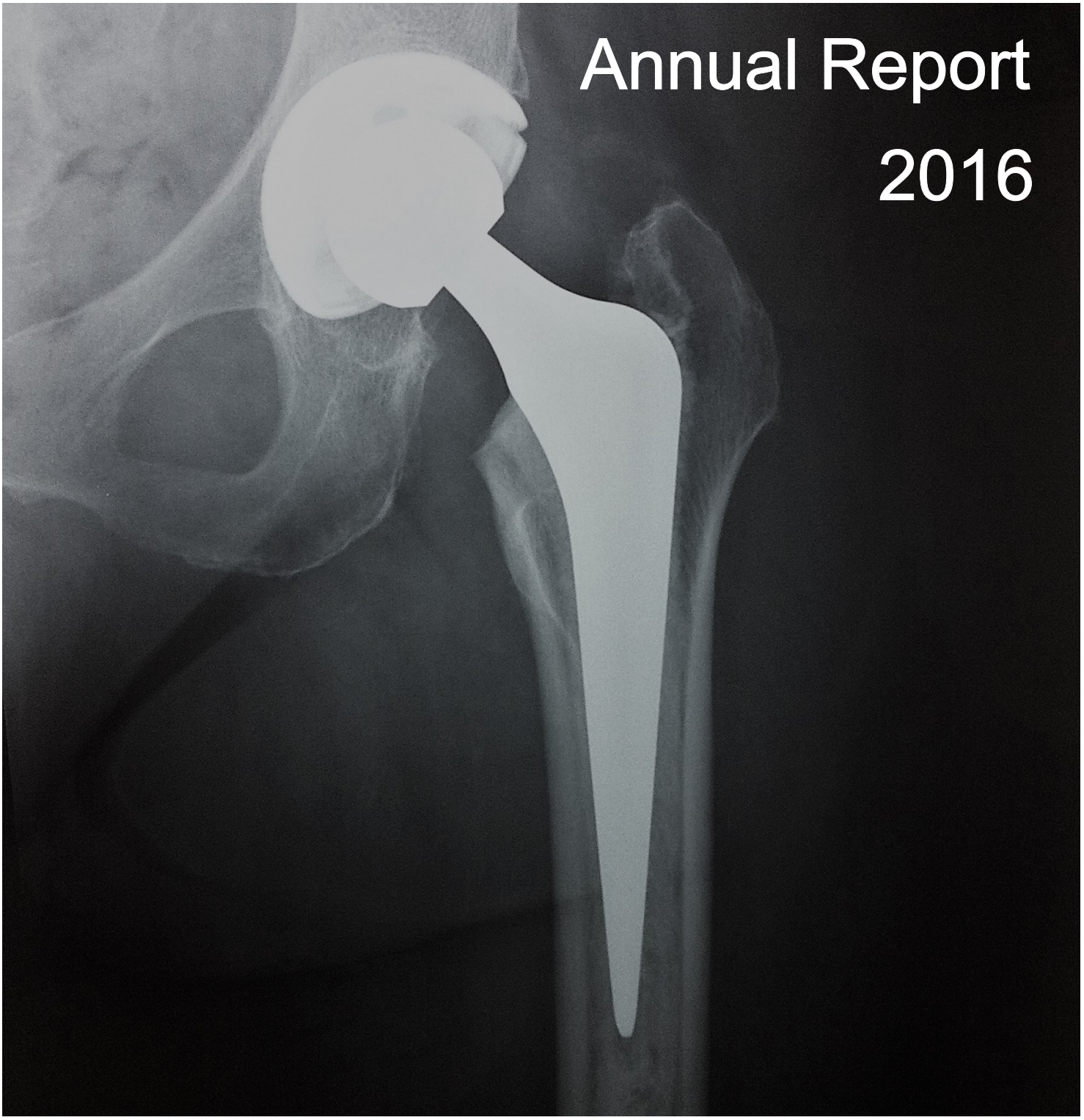
ACORN

Arthroplasty Clinical Outcomes Registry



# Annual Report 2016

Ingham Institute
Applied Medical Research

UNSW
AUSTRALIA

WHITLAM
Orthopaedic Research Centre

# ACORN

## Arthroplasty Clinical Outcomes Registry National

### 2016 Annual Report

### 1st January 2013 to 31st December 2016

THIS REPORT has been prepared by Tim Churches, Justine Naylor and Ian Harris on behalf of the ACORN Steering Committee.

| | |
|---|---|
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THIS REPORT was generated automatically on 22nd July, 2017 by **R** programme code written by Tim Churches, and typeset automatically using the *knitr* package for R via LaTeX. Transition charts generated using the *Gmisc* package for **R** by Max Gordon.

SUGGESTED CITATION

Churches T, Naylor J, Harris IA. Arthroplasty Clinical Outcomes Registry National (ACORN) Annual Report 2016. Sydney: Whitlam Orthopaedic Research Centre; 2017.

# ACKNOWLEDGEMENTS

The Arthroplasty Clinical Outcomes Registry would like to acknowledge the funding and in-kind support provided by:

- UNSW South Western Sydney Clinical School
- UNSW Faculty of Medicine, Medicine Computing Support Unit
- Ingham Institute for Applied Medical Research
- Nepean Blue Mountains Local Health District
- South Eastern Sydney Local Health District
- Whitlam Orthopaedic Research Centre
- Liverpool Hospital Orthopaedic Department
- Fairfield Hospital
- Tasmanian Health Service - Northern Region

# PARTICIPATING HOSPITALS

ACORN wishes to acknowledge the members of the Steering Committee and the support of the orthopaedic departments at all participating hospitals. Special thanks are extended to the Site Coordinators, who have taken responsibility for the collection and submission of data and who are vital to the success of ACORN. Thanks are also given to Shirley Cross, Michelle Jones, Gursharan Singh and Cheryl Ryce for participant follow-up and administrative support.

| Hospital | Co-ordinator | Role |
|---|---|---|
| Canterbury Hospital | Sue Maree | Patient Registration Manager, Admissions Office |
| Coffs Harbour Health Campus | Andrew Wong | Physiotherapy Orthopaedic Care Coordinator |
| Fairfield Hospital | Susan Dietsch | Orthopaedic Clinical Nurse Consultant, Orthopaedics |
| Liverpool Hospital | Christopher Saliba | Senior Outpatients Physiotherapist |
| Nepean Hospital | Jennifer Smith | Orthopaedic Clinical Nurse Consultant, Surgery and Anaesthetics |
| Sutherland Hospital | Charu Sood | Acting Nurse Unit Manager, Orthopaedics and Surgery |
| Bowral Hospital | Loretta Andersen | Head, Physiotherapy |
| Southern Highlands Private Hospital | Melissa Hennessy | Practice Manager, Orthopaedics and Surgery |
| Launceston General Hospital | Tiana Lockhart | Clinical Co-ordinator, Orthopaedic Clinic |
| Calvary Health Care Tasmania St Luke's Campus | Natalie Byram | Orthopaedics Practice Manager |

# *Contents*

# 1
# *Executive Summary*

The Arthroplasty Clinical Outcomes Registry, National (ACORN) was established in 2012 to improve the quality and effectiveness of arthroplasty surgery by monitoring, evaluating and reporting clinical outcomes. By producing an Annual Report on the effectiveness of this common and resource-intensive procedure that is available to patients, surgeons, and hospital departments, the registry aims to inform future decision-making in order to improve the outcomes after hip and knee arthroplasty surgery.

ACORN covers all hip and knee replacement (arthroplasty) surgery performed as an elective procedure in participating institutions. The outcomes measured include general health and measures of pain and function in the hip or knee. The registry also reports on complications (such as readmission, reoperation, infection and blood clot), patient satisfaction and patient-rated recovery.

Many clinical units in Australia see significant value from the measurement of clinical outcomes for the interventions they provide and have instituted their own follow-up of people who undergo surgery at their units. The value of ACORN is the provision of a standardised and centralised collection of patient-reported outcomes and complications after arthroplasty. The benefit of this method of data collection is that the analysis and reporting from multiple units provides the ability to undertake risk-adjusted comparisons of institutions and surgeons.

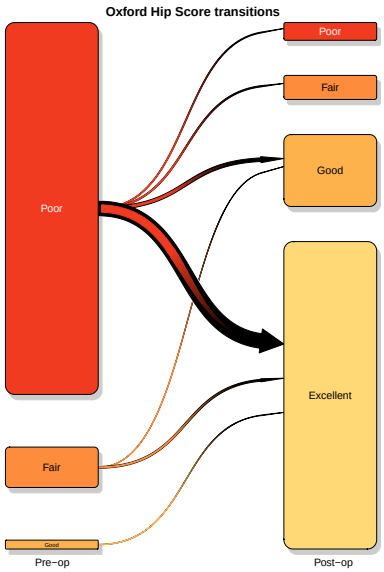
This report uses data from nine institutions. The report is restricted to reporting on sites with outcome data for the 2013 to 2016 calendar years. The report includes data on 5932 elective hip and knee arthroplasty procedures. As reflected in other reports, knee arthroplasty outnumbered hip arthroplasty by over two to one. Revision surgeries made up only 4% of all procedures recorded in the registry.

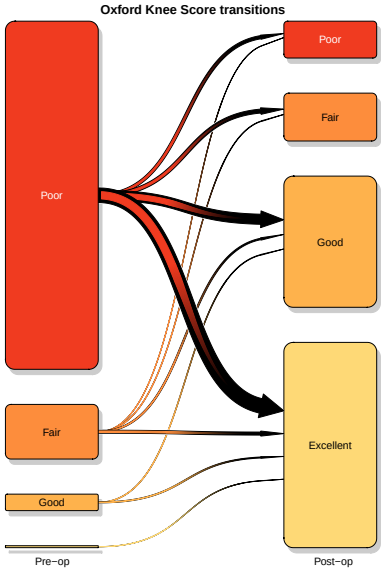
Overall, satisfaction and success after hip and knee arthroplasty were high, although patient-reported satisfaction was higher after primary hip arthroplasty than after knee arthroplasty. There was also substantial improvement in pain and function, as measured by the Oxford Hip or Knee Score, and in health-related quality of life. As for satisfaction, these

improvements were greater in people who had a primary hip arthroplasty compared to primary knee arthroplasty.

However, the proportion of people reporting no problems with mobility, self-care, their usual activities, pain or discomfort, and anxiety or depression, increased after surgery at similar levels for primary hip and knee arthroplasty. Health improvements and satisfaction after revision surgery were less than for primary surgery.

The Annual Report contains only summary data. Reports providing hospital comparisons are made available to individual departments every six months, and surgeon level reports are available to participating surgeons on an *ad hoc* basis. Furthermore, statistical analyses of predictors of outcome are currently withheld from the Annual Report.

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The charts on the right of this page show the changes in Oxford hip and knee scores from pre-operatively to six months post-operatively, for primary hip and knee arthroplasty patients, respectively. The height of each box indicates the proportion of patients in that Oxford joint score category, pre- and post-operatively, and the thickness of the arrows is proportional to the number of patients in each pre-operative Oxford score category undergoing the transition indicated by the arrow.

# 2
# *Introduction*

Arthroplasty (joint replacement) surgery has been shown to be an effective intervention to improve pain, function, and quality of life in people with severe joint disease of the hip or knee. Currently, more than 100,000 primary and revision hip and knee arthroplasties were undertaken in Australia, and these two procedures each account for more health system spending than any other procedure, totalling over 2 billion dollars per year[1].

[1] Australian Commission for Safety and Quality in Healthcare. Prioritisation of clinical quality registries - discussion paper. Table 8, p21. Sydney, March 2016.

Two of the primary reasons for a person to choose hip or knee arthroplasty are increasing pain and decreasing functional ability. In the Australian context, measurement of the effectiveness of surgery in addressing these indicators is not undertaken in a standardised, systematic way. While patient-reported measures are considered subjective, they constitute the most direct measurement of the achievement of the goals of surgery. Internationally, there has been an increasing emphasis on the inclusion of patient reported outcomes or experiences after hip and knee arthroplasty. Most notably, Sweden, England, New Zealand, and USA, have developed and implemented methods to measure the impact of arthroplasty from the perspective of the person who has undergone the procedure.

Domestically, the Australian Orthopaedic Association National Joint Replacement Registry (AOANJRR) is a recognised leader in the surveillance of procedures and implants used in arthroplasty. The AOANJRR uses revision surgery (re-operation) as the primary indicator of surgical failure and this has led to improvements by the identification of poorly performing prostheses. It is acknowledged that avoidance of surgical revision is important, however re-operation does not provide a complete picture of the effectiveness of arthroplasty with respect to relief of pain, functional improvement, and improvements in quality of life for the recipient.

ACORN (Arthroplasty Clinical Outcomes Registry National) was formed to address the gap in clinical outcome measurement after hip and knee arthroplasty, and to use that information to drive improvements in the clinical outcomes being measured. The outcomes measured by

ACORN can be broadly grouped into general health, joint pain and function, patient-rated satisfaction, and complications.

This Annual Report maintains the template established in the previous reports. The aim is to make the report accessible for all stakeholders, including members of the public. We have done this by avoiding medical jargon where possible and by restricting reporting of statistical methods to the minimum required for an understanding of the data presented.

## *2.1 Background*

In 2012, a multidisciplinary team of health care professionals initiated the ACORN project to pilot the feasibility of monitoring, evaluating, and reporting outcomes after hip and knee arthroplasty surgery. The project was titled "Arthroplasty Clinical Outcomes Registry National"[2] to provide a reminder of the project vision: an Australian clinical outcomes registry that will be able to provide the patient's perspective of their recovery after hip or knee arthroplasty and by doing so, contribute to improved outcomes in the future.

[2] Note that most ACORN sites are in NSW.

In 2012, existing post-arthroplasty outcomes registries, such as England's PROMs program and the New Zealand Joint Registry, were reviewed as well as other Australian outcome registries and this provided a foundation for the development of ACORN. In addition, the work of the Australian Commission of Safety and Quality in Health Care in developing standards[3] provided guidance towards the development of systematic collection of outcome data after hip and knee arthroplasty. A Steering Committee with defined terms of reference[4] was established to oversee the development, implementation, and growth of ACORN. The committee members include arthroplasty surgeons, senior nursing managers, allied health clinicians, and researchers, with processes developed for consultation with consumer organisations and health service executives where required.

[3] National Operating Principles and Technical Standards for Australian Clinical Quality Registries

[4] Appendix 1 of the ACORN annual report.

The Hunter-New England Human Research Ethics Committee provided ethics approval for ACORN and site-specific approvals from the relevant Research Governance Offices were received prior to the project commencing at any site. To protect the privacy of participants, all records are securely stored and only accessed by approved staff. In addition, policies and procedures have been developed to ensure compliance with the new Australian Privacy Principles relating to the collection, storage, access to, and use of personal information.

ACORN has been supported by the collaborative efforts of several government, non-government, and research organisations. These organisations include UNSW South Western Sydney Clinical School, the Ingham Institute for Applied Medical Research, Nepean Blue Mountains Local Health District, South Eastern Sydney Local Health District, Fairfield

Hospital, Liverpool Hospital Orthopaedic Department, Tasmanian Health Service (Northern Region) and the Whitlam Orthopaedic Research Centre.

## 2.2 How does ACORN function?

### 2.2.1 Participation

**ACORN Inclusion Criteria**

- Person aged 18 years of age or over
- Planned (elective) primary or revision hip or knee arthroplasty
- Surgery is undertaken at a hospital participating in ACORN

**ACORN Exclusion Criteria**

- Surgery is unplanned, such as hip arthroplasty for acute fracture
- Person is cognitively impaired or is unable to understand the process for participation

Participation in ACORN is open to all hospitals that perform hip and/or knee arthroplasty. Participation is voluntary and agreement of all surgeons within the orthopaedic department of each participating hospital is required in addition to in-principle support for participation in the registry from the hospital executive. ACORN utilises an opt-out consent process and hospitals nominate a specific person to act as the Site Coordinator, who is responsible for: provision of patient information sheets to all eligible people; explanation of the purpose of ACORN; and data collection in the preoperative and perioperative stages of surgery. Eligible participants are identified during the pre-operative admission process, which occurs up to eight weeks prior to a patient's admission for surgery. Inclusion is based first on the principal arthroplasty procedure for a specific hospital admission (see Appendix 2 of the ACORN annual report) and then on the criteria set out below.

During the pre-admission process, preoperative data are prospectively collected and the Site Coordinator securely stores the data until matched with the perioperative data on completion of a patient's admission. The Head of Orthopaedics and the Site Coordinator determine the data collection process suited to their individual context. This usually requires contributions by two or three clinicians across the continuum of care, with the Coordinator taking overall responsibility for data completeness and accuracy. Site Coordinators forward records to the registry at the end of each calendar month and the records are entered into the registry to enable six-month follow-up to be undertaken.

### 2.2.2 Overview of the Data Set

For each person included in ACORN, the data collected include:

- Identifiable demographic information used for follow-up, data quality processes, and any linkage with other data sets;
- Baseline clinical status including expectations and co-morbid conditions;
- A condition-specific measure of joint pain and function completed preoperatively and at six-months post-surgery;
- A generic measure of self-reported health status completed preoperatively and at six-months post- surgery;
- Global perceptions of recovery and the impact of surgery;

- Acute surgical complications and post-discharge complications and re-admissions in the six months post-surgery.

ACORN does not collect data on the specific types of prosthesis used.

### *2.2.3 Data Collection and Verification*

Site Coordinator training is provided to ensure consistent, complete, and accurate data collection between sites, and one-to-one on-site training is included as part of the hospital participation process.

ACORN has developed processes for checking data completeness and accuracy when sites submit their data centrally, and since November 2015, has provided data completeness reports for each new batch of data submitted by participating sites. This ensures that the data captured and held by the registry are as complete and accurate as possible. Accuracy of the data collected by the registry has been previously reported[5].

[5] Seagrave K, Naylor JM, Armstrong E, Leong KM, Descallar J, Harris IA. Data quality audit of the arthroplasty clinical outcomes registry NSW. BMC Health Services Research 2014, 14:512

### *2.2.4 Follow-up Data Collection*

The follow-up of participants is undertaken by telephone at six months ($\pm$ one month) by ACORN. The option of using postal follow-up is available, however this is only used after up to six telephone attempts have been exhausted. Six months was determined as the best balance between stabilised clinical recovery and minimisation of loss to follow-up.

The following survey instruments are used to measure Patient-Reported Outcomes (PROMs):

*Pain and Function Measure*

Oxford Hip or Knee Score (OHS, OKS)

*Health-Related Quality of Life*

EuroQol Health-Related Quality of Life: 5-Dimensions and Visual Analogue Scale (VAS)

*Satisfaction and Success*

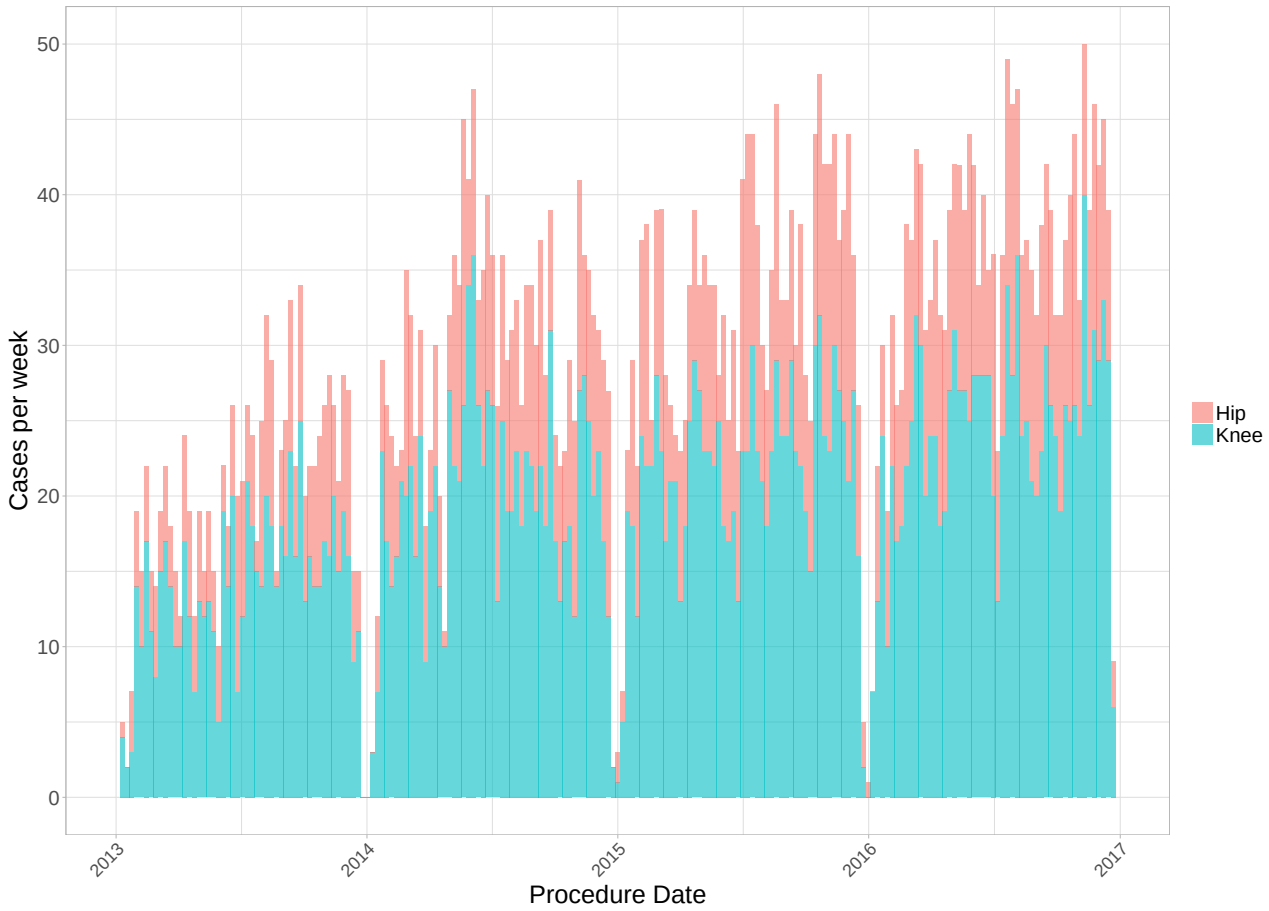
UK PROMs satisfaction and success questions

*Person Perceived Problems*

Re-admission, Re-operation, Complications

# 3

# *Data Submission and Patient Follow-up*



## 3.1 Six Months PROMs Follow-up

The table below shows the numbers and percentage of cases lost to follow-up, and the number of cases followed up within or outside the follow-up window of five to seven months (nominally six months) post-surgery. The graph at right shows the considerable improvement in the loss to follow-up rate since the inception of the registry.


Figure 3.1: Percentage lost to follow-up, January 2013 to December 2016

- *n* lost, % lost = number and percentage lost to follow-up
- Attempts, Lost attempts = Mean number of follow-up attempts in those not lost to follow-up and in those lost to follow-up
- <5m = percentage with follow-up completed < 5 mths post-op
- 5-7m = percentage with follow-up completed between 5 and 7 mths post-op
- 8m = percentage with follow-up completed 8 mths post-op
- >8m = percentage with follow-up completed > 8 mths post-op

| Year | Qtr | *n* | *n* lost | % lost | Attempts | Lost attempts | % <5m | % 5-7m | % 8m | % >8m |
|---|---|---|---|---|---|---|---|---|---|---|
| 2013 | 1 | 173 | 27 | 15.7 | 1.9 | 4.0 | 0.0 | 76.5 | 3.6 | 3.6 |
| 2013 | 2 | 231 | 38 | 16.5 | 2.0 | 4.4 | 0.0 | 65.4 | 13.9 | 1.3 |
| 2013 | 3 | 331 | 56 | 16.9 | 1.8 | 3.0 | 0.0 | 44.8 | 29.1 | 7.3 |
| 2013 | 4 | 269 | 14 | 5.2 | 2.6 | 4.4 | 0.0 | 90.7 | 3.0 | 0.0 |
| 2014 | 1 | 286 | 25 | 8.8 | 2.2 | 1.7 | 2.5 | 84.9 | 1.8 | 0.7 |
| 2014 | 2 | 427 | 42 | 9.9 | 2.0 | 3.2 | 0.2 | 54.0 | 29.0 | 5.0 |
| 2014 | 3 | 422 | 22 | 5.2 | 1.9 | 3.2 | 0.5 | 38.8 | 43.6 | 4.0 |
| 2014 | 4 | 348 | 16 | 4.6 | 2.1 | 6.4 | 0.6 | 87.6 | 4.3 | 2.3 |
| 2015 | 1 | 350 | 18 | 5.2 | 2.1 | 3.4 | 20.1 | 65.6 | 1.1 | 0.6 |
| 2015 | 2 | 408 | 6 | 1.5 | 2.2 | 8.0 | 2.9 | 91.4 | 0.0 | 0.2 |
| 2015 | 3 | 480 | 10 | 2.1 | 2.7 | 5.2 | 0.4 | 61.6 | 26.5 | 2.1 |
| 2015 | 4 | 438 | 9 | 2.1 | 2.7 | 5.4 | 0.0 | 92.6 | 3.9 | 0.5 |
| 2016 | 1 | 383 | 16 | 4.2 | 2.7 | 8.1 | 7.9 | 82.2 | 0.3 | 0.0 |
| 2016 | 2 | 488 | 22 | 4.5 | 2.6 | 8.0 | 0.2 | 88.2 | 5.2 | 1.6 |
| 2016 | 3 | 501 | 30 | 6.1 | 2.4 | 8.8 | 0.2 | 86.2 | 5.7 | 0.6 |
| 2016 | 4 | 456 | 24 | 5.4 | 2.7 | 5.4 | 0.2 | 89.7 | 3.8 | 0.4 |

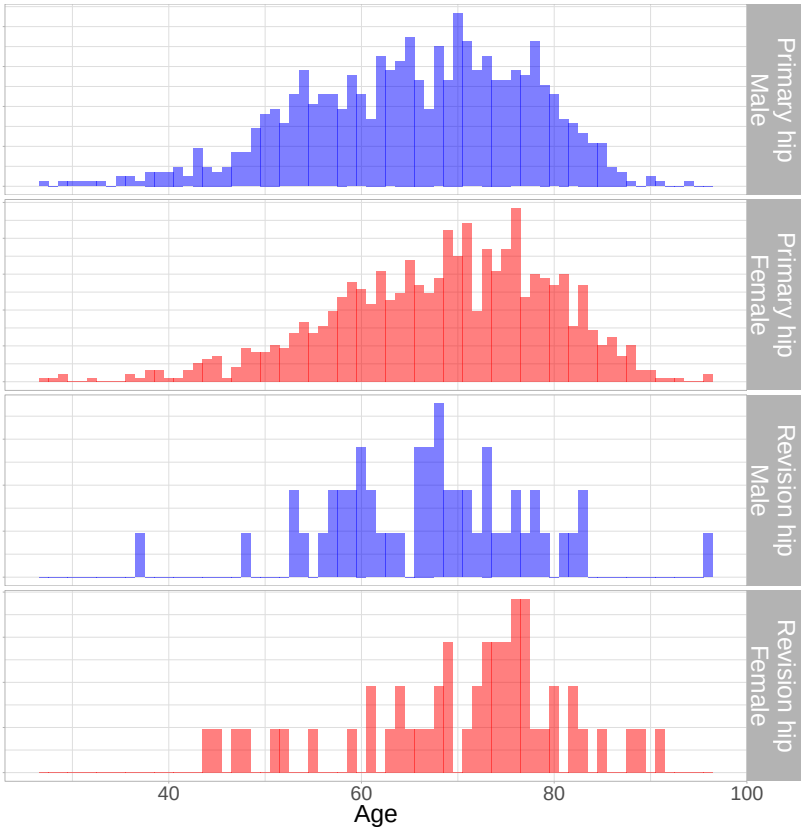
# 4
# *Hip Arthroplasty*

Hip arthroplasties are either an initial (primary) procedure on a joint, or they are a subsequent (revision) surgery on a previously replaced joint. ACORN collects information on primary total hip arthroplasty and revision hip arthroplasty. A primary total hip arthroplasty involves replacing both surfaces of the hip joint and revision hip arthroplasty surgery is where one or more of the previously implanted components are removed and/or replaced. ACORN only collects information on *elective* primary and revision total hip arthroplasty procedures — therefore procedures performed as treatment for hip fractures are not included.

Between January 2013 and December 2016, primary total hip arthroplasty surgery accounted for 94% of hip arthroplasty procedures reported by participating hospitals. The average age of all people having a hip procedure was 67.1 years. The most common reason for primary surgery was osteoarthritis. Hip arthroplasty surgery was more common in women (53.8%).

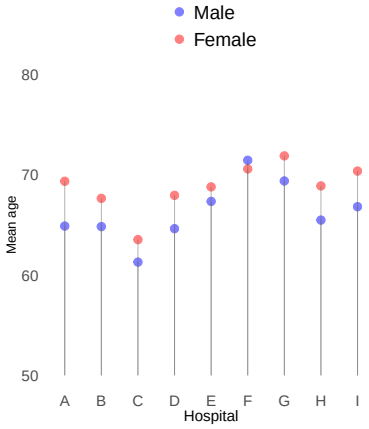
## 4.1 Demographic Profile

### 4.1.1 Age Distribution




The average age of hip arthroplasty patients is around the mid 60s, with the average age for males about three years less than the average age for females. About one-fifth of the males in the ACORN registry undergoing hip replacement are aged less than 55 years, compared to about one-eighth of the women.

The chart below shows the variation in the mean age of primary hip arthroplasty patients between ACORN hospitals. The order of hospitals and their labels is random.



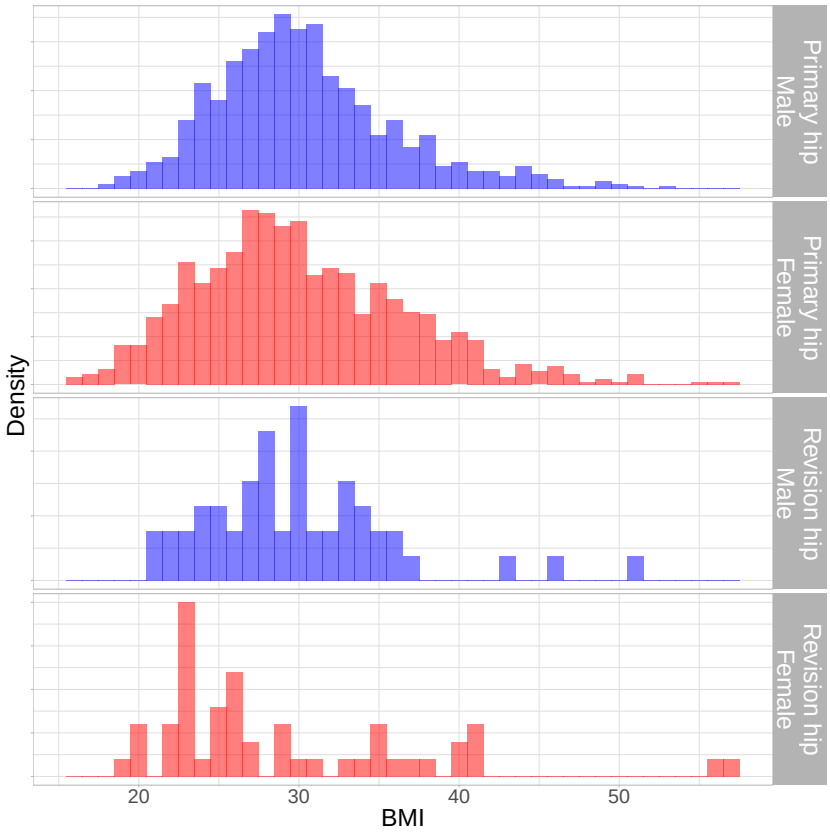

AGE OF PATIENTS — PRIMARY HIPS

| | *n* | % | **Mean** | StdDev | Min | Max | <55 | 55-64 | 65-74 | 75-84 | ≥ 85 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Male | 831 | 46.0 | **65.5** | 11.60 | 27.0 | 93.8 | 20% | 25% | 31% | 22% | 2% |
| Female | 976 | 54.0 | **68.3** | 11.33 | 27.4 | 96.2 | 12% | 24% | 33% | 26% | 4.5% |
| **Persons** | **1807** | **100.0** | **67.0** | **11.53** | **27.0** | **96.2** | **16%** | **24%** | **32%** | **24%** | **3.4%** |

AGE OF PATIENTS — REVISION HIPS

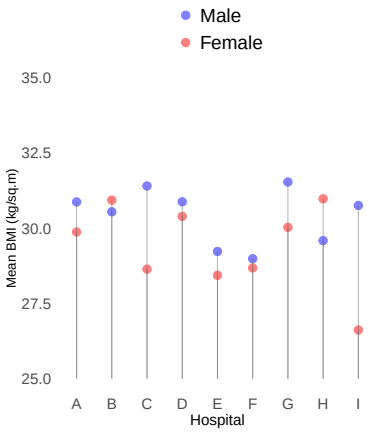
| | *n* | % | **Mean** | StdDev | Min | Max | <55 | 55-64 | 65-74 | 75-84 | ≥ 85 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Male | 53 | 50.5 | **67.1** | 10.24 | 36.5 | 95.9 | 9.4% | 28% | 42% | 19% | 1.9% |
| Female | 52 | 49.5 | **70.4** | 11.11 | 44.3 | 90.5 | 12% | 13% | 37% | 31% | 7.7% |
| **Persons** | **105** | **100.0** | **68.7** | **10.76** | **36.5** | **95.9** | **10%** | **21%** | **39%** | **25%** | **4.8%** |

### 4.1.2 *Body Mass Index (BMI)*




The average Body Mass Index (BMI) of patients undergoing primary hip arthroplasty is about 30 in both sexes, with a wide range and spread of BMI values in both sexes.

The chart below shows the variation in the mean BMI of primary hip arthroplasty patients between ACORN hospitals. The order of hospitals and their labels is random.




BODY MASS INDEX (BMI) — PRIMARY HIPS

| | *n* | Missing | | **Mean** | StdDev | Min | Max |
|---|---|---|---|---|---|---|---|
| Male | 831 | 33 | 4.1% | **30.4** | 5.69 | 18 | 53 |
| Female | 976 | 55 | 6.0% | **30.1** | 6.6 | 16 | 56.9 |
| **Persons** | **1807** | **88** | **5.1%** | **30.3** | **6.2** | **16** | **56.9** |

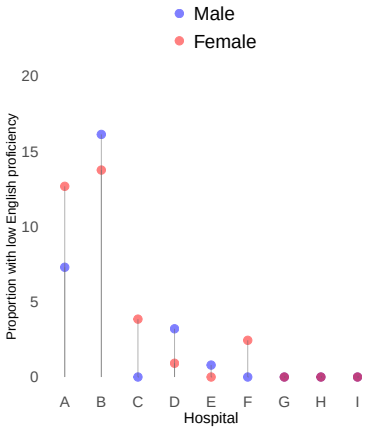
BODY MASS INDEX (BMI) — REVISION HIPS

| | *n* | Missing | | **Mean** | StdDev | Min | Max |
|---|---|---|---|---|---|---|---|
| Male | 53 | 1 | 1.9% | **29.9** | 5.9 | 21.3 | 51.3 |
| Female | 52 | 2 | 4.0% | **29.3** | 8.49 | 19.5 | 56.7 |
| **Persons** | **105** | **3** | **2.9%** | **29.6** | **7.26** | **19.5** | **56.7** |

### 4.1.3 *English Proficiency*

ENGLISH PROFICIENCY — PRIMARY & REVISION HIPS

| | *n* | Missing | | High | | Low | |
|---|---|---|---|---|---|---|---|
| Male | 884 | 39 | 4.4% | 781 | 88.3% | 64 | 7.2% |
| Female | 1028 | 65 | 6.3% | 887 | 86.3% | 76 | 7.4% |
| **Persons** | **1912** | **104** | **5.4%** | **1668** | **87.2%** | **140** | **7.3%** |




### 4.1.4 *Level of Education*

SCHOOL EDUCATION — PRIMARY & REVISION HIPS

| | *n* | Missing | | No schooling | | Yr 9 or below | | Yrs 10 or 11 | | Yr 12 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Male | 884 | 69 | 7.8% | 9 | 1% | 228 | 26% | 413 | 47% | 165 | 19% |
| Female | 1028 | 89 | 8.7% | 17 | 1.7% | 269 | 26% | 442 | 43% | 211 | 21% |
| **Persons** | **1912** | **158** | **8.3%** | **26** | **1.4%** | **497** | **26%** | **855** | **45%** | **376** | **20%** |

POST-SCHOOL EDUCATION — PRIMARY & REVISION HIPS

| | *n* | Missing | | None | | Cert/Diploma | | Bachelor | | Postgrad | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Male | 884 | 84 | 9.5% | 439 | 50% | 281 | 32% | 41 | 4.64% | 39 | 4.4% |
| Female | 1028 | 122 | 12% | 630 | 61% | 141 | 14% | 46 | 4.5% | 89 | 8.7% |
| **Persons** | **1912** | **206** | **11%** | **1069** | **56%** | **422** | **22%** | **87** | **4.6%** | **128** | **6.7%** |

## *4.2 Patient Medical & Surgical Characteristics*

### *4.2.1 Comorbidities*

PRE-OPERATIVE COMORBIDITIES — PRIMARY HIPS

| | *n* | Low back pain | | Other lower limb arthritis | | Heart disease | | Hypertension | |
|---|---|---|---|---|---|---|---|---|---|
| Male | 831 | 287 | 35% | 215 | 26% | 268 | 32% | 400 | 48% |
| Female | 976 | 382 | 39% | 282 | 29% | 288 | 30% | 502 | 51% |
| **Persons** | **1807** | **669** | **37%** | **497** | **28%** | **556** | **31%** | **902** | **50%** |

| | *n* | Diabetes | | Gastrointestinal disease | | Respiratory disease | | Renal disease | |
|---|---|---|---|---|---|---|---|---|---|
| Male | 831 | 136 | 16% | 128 | 15% | 106 | 13% | 59 | 7% |
| Female | 976 | 148 | 15% | 211 | 22% | 174 | 18% | 47 | 5% |
| **Persons** | **1807** | **284** | **16%** | **339** | **19%** | **280** | **15%** | **106** | **6%** |

| | *n* | Hepatic disease | | Neurological disease | | Anxiety/ depression | |
|---|---|---|---|---|---|---|---|
| Male | 831 | 20 | 2% | 46 | 6% | 106 | 13% |
| Female | 976 | 23 | 2% | 55 | 6% | 201 | 21% |
| **Persons** | **1807** | **43** | **2%** | **101** | **6%** | **307** | **17%** |

| | *n* | No comorbs | | 1 comorb | | 2 comorbs | | $\geq$ 3 comorbs | |
|---|---|---|---|---|---|---|---|---|---|
| Male | 831 | 139 | 17% | 174 | 21% | 205 | 25% | 313 | 38% |
| Female | 976 | 142 | 15% | 177 | 18% | 230 | 24% | 427 | 44% |
| **Persons** | **1807** | **281** | **16%** | **351** | **19%** | **435** | **24%** | **740** | **41%** |

PRE-OPERATIVE COMORBIDITIES — REVISION HIPS

| | *n* | Low back pain | | Other lower limb arthritis | | Heart disease | | Hypertension | |
|---|---|---|---|---|---|---|---|---|---|
| Male | 53 | 15 | 28% | 14 | 26% | 17 | 32% | 20 | 38% |
| Female | 52 | 21 | 40% | 10 | 19% | 23 | 44% | 24 | 46% |
| **Persons** | **105** | **36** | **34%** | **24** | **23%** | **40** | **38%** | **44** | **42%** |

| | *n* | Diabetes | | Gastrointestinal disease | | Respiratory disease | | Renal disease | |
|---|---|---|---|---|---|---|---|---|---|
| Male | 53 | 5 | 9% | 9 | 17% | 12 | 23% | 4 | 8% |
| Female | 52 | 5 | 10% | 14 | 27% | 6 | 12% | 5 | 10% |
| **Persons** | **105** | **10** | **10%** | **23** | **22%** | **18** | **17%** | **9** | **9%** |

| | *n* | Hepatic disease | | Neurological disease | | Anxiety/ depression | |
|---|---|---|---|---|---|---|---|
| Male | 53 | 2 | 4% | 4 | 8% | 8 | 15% |
| Female | 52 | 0 | 0% | 5 | 10% | 11 | 21% |
| **Persons** | **105** | **2** | **2%** | **9** | **9%** | **19** | **18%** |

| | *n* | No comorbs | | 1 comorb | | 2 comorbs | | $\geq$ 3 comorbs | |
|---|---|---|---|---|---|---|---|---|---|
| Male | 53 | 10 | 19% | 12 | 23% | 11 | 21% | 20 | 38% |
| Female | 52 | 10 | 19% | 7 | 13% | 8 | 15% | 27 | 52% |
| **Persons** | **105** | **20** | **19%** | **19** | **18%** | **19** | **18%** | **47** | **45%** |

### 4.2.2 *ASA Physical Status Classification*

ASA — Primary hips

| | *n* | Missing | | ASA 1 | | ASA 2 | |
|---|---|---|---|---|---|---|---|
| Males | 831 | 138 | 17% | 50 | 6% | 399 | 48% |
| Females | 976 | 171 | 18% | 46 | 5% | 441 | 45% |
| Persons | 1807 | 309 | 17% | 96 | 5% | 840 | 46% |

| | *n* | ASA 3 | | ASA 4 | | ASA 5 | |
|---|---|---|---|---|---|---|---|
| Males | 831 | 238 | 29% | 6 | 0.7% | 0 | 0% |
| Females | 976 | 309 | 32% | 9 | 0.9% | 0 | 0% |
| Persons | 1807 | 547 | 30% | 15 | 0.8% | 0 | 0% |

The ASA scoring system categorises patients into the following categories of pre-operative physical status, as an approximate estimate of anaesthetic risk:

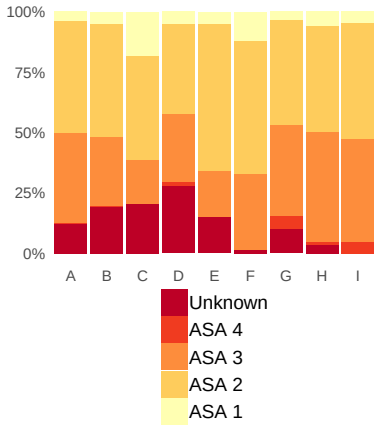
1. a normal healthy person
2. a person with mild systemic disease
3. a person with severe systemic disease
4. a person with severe systemic disease that is a constant threat to life
5. a moribund person who is not expected to survive

ASA — Revision hips

| | *n* | Missing | | ASA 1 | | ASA 2 | |
|---|---|---|---|---|---|---|---|
| Males | 53 | 12 | 23% | 3 | 6% | 14 | 26% |
| Females | 52 | 17 | 33% | 0 | 0% | 17 | 33% |
| Persons | 105 | 29 | 28% | 3 | 3% | 31 | 30% |

| | *n* | ASA 3 | | ASA 4 | | ASA 5 | |
|---|---|---|---|---|---|---|---|
| Males | 53 | 23 | 43% | 1 | 2% | 0 | 0% |
| Females | 52 | 18 | 35% | 0 | 0% | 0 | 0% |
| Persons | 105 | 41 | 39% | 1 | 1% | 0 | 0% |

The chart below shows the variation in the proportion of hip arthroplasty patients in each ASA category between ACORN hospitals. The order of hospitals and their labels is random.




### 4.2.3 *Type & Laterality of Surgery*

Type & Laterality — Primary & revision hips

| Type | *n* | Missing | | Left | | Right | | Bilateral | |
|---|---|---|---|---|---|---|---|---|---|
| Primary | 1807 | 1 | 0.06% | 765 | 42% | 1016 | 56% | 25 | 1% |
| Revision | 105 | 1 | 1% | 45 | 43% | 59 | 56% | 0 | 0% |

### 4.2.4 *Principal Reason for Surgery*

#### Reason for Surgery — Primary hips

| | *n* | OA | | RA | | DDH | |
|---|---|---|---|---|---|---|---|
| Male | 831 | 759 | 91% | 2 | 0.2% | 4 | 0.5% |
| Female | 976 | 888 | 91% | 10 | 1% | 12 | 1% |
| Persons | 1807 | 1647 | 91% | 12 | 0.7% | 16 | 0.9% |

| | *n* | Oth arth | | ON/AVN | | Tumour | |
|---|---|---|---|---|---|---|---|
| Male | 831 | 1 | 0.1% | 48 | 6% | 0 | 0% |
| Female | 976 | 6 | 0.6% | 28 | 3% | 0 | 0% |
| Persons | 1807 | 7 | 0.4% | 76 | 4% | 0 | 0% |

| | *n* | Other | | Missing | |
|---|---|---|---|---|---|
| Male | 831 | 8 | 1% | 9 | 1% |
| Female | 976 | 17 | 2% | 15 | 2% |
| Persons | 1807 | 25 | 1% | 24 | 1% |

*OA*
: osteoarthritis

*RA*
: rheumatoid arthritis

*DDH*
: developmental dysplasia of the hips

*Oth arth*
: other inflammatory arthritis

*ON/AVN*
: osteonecrosis/avascular necrosis

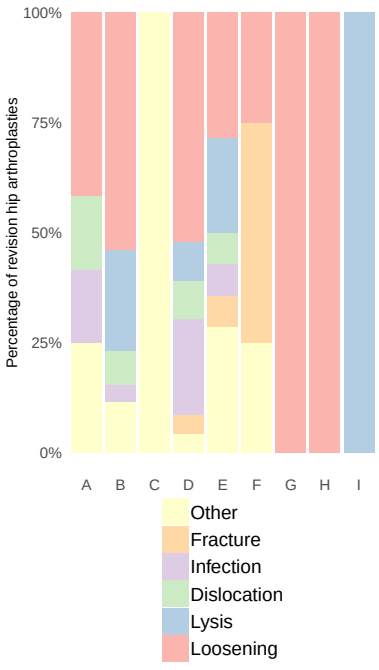
#### Reason for Surgery — Revision hips

| | *n* | Loosening | | Lysis | | Dislocation | |
|---|---|---|---|---|---|---|---|
| Male | 53 | 24 | 45% | 4 | 8% | 4 | 8% |
| Female | 52 | 22 | 42% | 8 | 15% | 5 | 10% |
| Persons | 105 | 46 | 44% | 12 | 11% | 9 | 9% |

| | *n* | Implant break | | Infection | | Fracture | |
|---|---|---|---|---|---|---|---|
| Male | 53 | 0 | 0% | 9 | 17% | 2 | 4% |
| Female | 52 | 1 | 2% | 2 | 4% | 2 | 4% |
| Persons | 105 | 1 | 1% | 11 | 10% | 4 | 4% |

| | *n* | Other | | Missing | |
|---|---|---|---|---|---|
| Male | 53 | 9 | 17% | 1 | 2% |
| Female | 52 | 7 | 13% | 5 | 10% |
| Persons | 105 | 16 | 15% | 6 | 6% |

The chart below shows the variation in reasons for **revision** in hip arthroplasty patients between ACORN hospitals. Revisions are relatively uncommon, and thus many of the differences may be random variation, but some systematic variation between hospitals may be present. More data would be needed to investigate this. The order of hospitals and their labels is random.



## 4.3 Acute Care Measures

During the admitted period of care, the specific acute care measures collected by ACORN are: any requirement for a high care bed and whether this was a planned or unplanned admission to that bed; any complication experienced during the admitted acute care stay; the need for a blood transfusion; and discharge destination from the acute care ward.

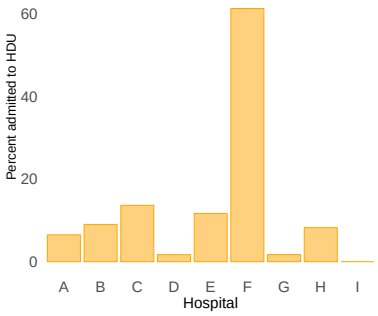
Complications are required to have been documented in the medical record. They include delirium, surgical site infection (SSI), deep venous thrombosis (DVT), pulmonary embolus (PE), respiratory infection, cardiovascular events, dislocation, fracture, nerve injury, bladder infection or retention, wound dehiscence, and death.

### 4.3.1 High Care Bed Utilisation

HIGH CARE BED UTILISATION — PRIMARY HIPS

| | *n* | Missing | | High Care Bed | | Unplanned* | |
|---|---|---|---|---|---|---|---|
| Male | 831 | 0 | 0% | 85 | 10% | 62 | 73% |
| Female | 976 | 0 | 0% | 80 | 8% | 50 | 62% |
| Persons | 1807 | 0 | 0% | 165 | 9% | 112 | 68% |

The chart below shows the variation in high care bed utilisation following **primary** hip arthroplasty between ACORN hospitals. The labelling and order of hospitals is randomised.




HIGH CARE BED UTILISATION — REVISION HIPS

| | *n* | Missing | | High Care Bed | | Unplanned* | |
|---|---|---|---|---|---|---|---|
| Male | 53 | 0 | 0% | 13 | 25% | 8 | 62% |
| Female | 52 | 0 | 0% | 10 | 19% | 7 | 70% |
| Persons | 105 | 0 | 0% | 23 | 22% | 15 | 65% |

* Percentage of admissions to high care beds which were unplanned.

### 4.3.2 *Peri-operative Blood Transfusion*

#### Blood Transfusion — Primary hips

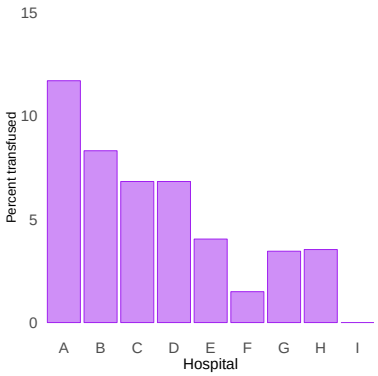
| | *n* | Missing | | Transfused | | Mean units |
|---|---|---|---|---|---|---|
| Male | 831 | 4 | 0.5% | 35 | 4% | 2.2 |
| Female | 976 | 5 | 0.5% | 101 | 10% | 2 |
| Persons | 1807 | 9 | 0.5% | 136 | 8% | 2.1 |

#### Blood Transfusion — Revision hips

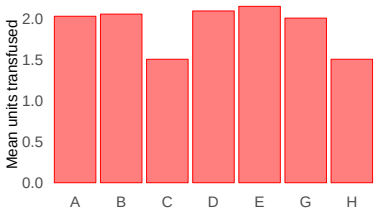
| | *n* | Missing | | Transfused | | Mean units |
|---|---|---|---|---|---|---|
| Male | 53 | 3 | 6% | 13 | 25% | 3.4 |
| Female | 52 | 1 | 2% | 12 | 23% | 2.3 |
| Persons | 105 | 4 | 4% | 25 | 24% | 2.9 |

* percentages are of patients who received transfusions.

The chart below shows the variation in blood transfusion utilisation following **primary** hip arthroplasty between ACORN hospitals. The labelling and order of hospitals is randomised.




The variation between hospitals in the mean number of units transfused (in those patients receiving a transfusion) for primary hip arthroplasty patients is shown below.



### *4.3.3 Complications during Index Admission*

COMPLICATIONS (ANY) DURING ADMISSION — PRIMARY HIPS

| | *n* | 1 or more | | None | | Unk/NS | |
|---|---|---|---|---|---|---|---|
| Males | 831 | 107 | (13%) | 715 | (86%) | 9 | (1%) |
| Females | 976 | 125 | (13%) | 841 | (86%) | 8 | (0.8%) |
| Persons | 1807 | 232 | (13%) | 1556 | (86%) | 17 | (0.9%) |

COMPLICATIONS (DETAILS) DURING ADMISSION — PRIMARY HIPS

| Complications | Males | | Females | | Persons | |
|---|---|---|---|---|---|---|
| Drug reaction | 0 | 0% | 0 | 0% | 0 | 0% |
| Delirium | 15 | 1.8% | 6 | 0.61% | 21 | 1.2% |
| SSI requiring oral antibiotics | 0 | 0% | 0 | 0% | 0 | 0% |
| SSI requiring IV antibiotics | 1 | 0.12% | 0 | 0% | 1 | 0.055% |
| SSI requ surg c̄ prosth removal | 0 | 0% | 0 | 0% | 0 | 0% |
| SSI requ surg s̄ prosth removal | 0 | 0% | 0 | 0% | 0 | 0% |
| Deep vein thrombosis | 2 | 0.24% | 2 | 0.2% | 4 | 0.22% |
| Pulmonary embolus | 1 | 0.12% | 3 | 0.31% | 4 | 0.22% |
| Fat emboli | 0 | 0% | 0 | 0% | 0 | 0% |
| Respiratory infection | 9 | 1.1% | 7 | 0.72% | 16 | 0.89% |
| CVS | 14 | 1.7% | 20 | 2% | 34 | 1.9% |
| Dislocation | 0 | 0% | 4 | 0.41% | 4 | 0.22% |
| Fracture | 6 | 0.72% | 11 | 1.1% | 17 | 0.94% |
| Nerve injury | 0 | 0% | 5 | 0.51% | 5 | 0.28% |
| Urinary tract infection | 7 | 0.84% | 13 | 1.3% | 20 | 1.1% |
| Urinary retention | 15 | 1.8% | 3 | 0.31% | 18 | 1% |
| Wound dehiscence | 4 | 0.48% | 4 | 0.41% | 8 | 0.44% |
| Reoperation during index adm | 1 | 0.12% | 3 | 0.31% | 4 | 0.22% |
| Pressure area | 0 | 0% | 1 | 0.1% | 1 | 0.055% |
| Fall | 0 | 0% | 2 | 0.2% | 2 | 0.11% |
| Hypotension | 10 | 1.2% | 23 | 2.4% | 33 | 1.8% |
| Cellulitis | 0 | 0% | 1 | 0.1% | 1 | 0.055% |
| Death | 1 | 0.12% | 0 | 0% | 1 | 0.055% |
| Other | 27 | 3.2% | 24 | 2.5% | 51 | 2.8% |

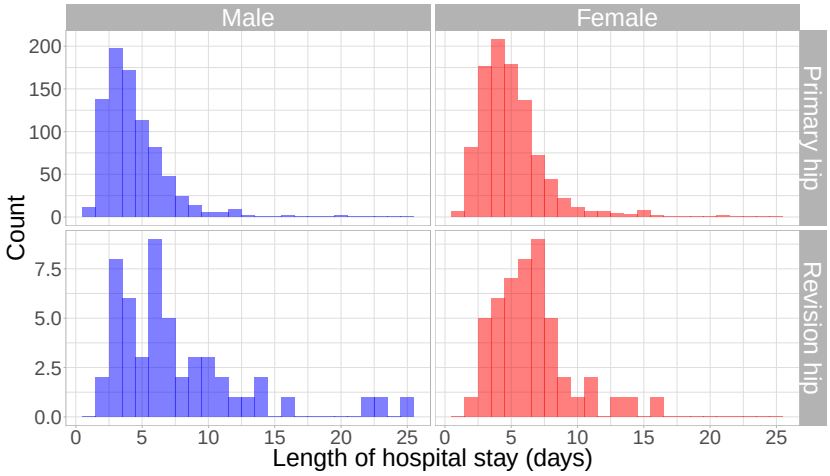
## Complications (any) during Admission — Revision hips

| | *n* | 1 or more | | None | | Unk/NS | |
|---|---|---|---|---|---|---|---|
| Males | 53 | 9 | (17%) | 44 | (83%) | 0 | (0%) |
| Females | 52 | 13 | (25%) | 38 | (73%) | 1 | (2%) |
| Persons | 105 | 22 | (21%) | 82 | (78%) | 1 | (1%) |

## Complications (details) during Admission — Revision hips

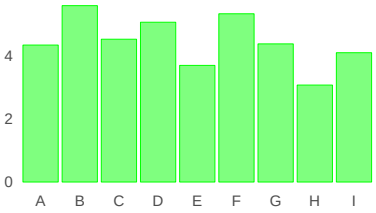
| Complications | Males | | Females | | Persons | |
|---|---|---|---|---|---|---|
| Drug reaction | 0 | 0% | 0 | 0% | 0 | 0% |
| Delirium | 0 | 0% | 0 | 0% | 0 | 0% |
| SSI requiring oral antibiotics | 0 | 0% | 0 | 0% | 0 | 0% |
| SSI requiring IV antibiotics | 0 | 0% | 0 | 0% | 0 | 0% |
| SSI requ surg c̄ prosth removal | 0 | 0% | 0 | 0% | 0 | 0% |
| SSI requ surg s̄ prosth removal | 0 | 0% | 0 | 0% | 0 | 0% |
| Deep vein thrombosis | 0 | 0% | 1 | 1.9% | 1 | 0.95% |
| Pulmonary embolus | 0 | 0% | 0 | 0% | 0 | 0% |
| Fat emboli | 0 | 0% | 0 | 0% | 0 | 0% |
| Respiratory infection | 0 | 0% | 0 | 0% | 0 | 0% |
| CVS | 1 | 1.9% | 0 | 0% | 1 | 0.95% |
| Dislocation | 2 | 3.8% | 0 | 0% | 2 | 1.9% |
| Fracture | 0 | 0% | 2 | 3.8% | 2 | 1.9% |
| Nerve injury | 0 | 0% | 1 | 1.9% | 1 | 0.95% |
| Urinary tract infection | 0 | 0% | 1 | 1.9% | 1 | 0.95% |
| Urinary retention | 0 | 0% | 1 | 1.9% | 1 | 0.95% |
| Wound dehiscence | 2 | 3.8% | 0 | 0% | 2 | 1.9% |
| Reoperation during index adm | 0 | 0% | 1 | 1.9% | 1 | 0.95% |
| Pressure area | 0 | 0% | 0 | 0% | 0 | 0% |
| Fall | 0 | 0% | 1 | 1.9% | 1 | 0.95% |
| Hypotension | 1 | 1.9% | 1 | 1.9% | 2 | 1.9% |
| Cellulitis | 0 | 0% | 0 | 0% | 0 | 0% |
| Death | 0 | 0% | 0 | 0% | 0 | 0% |
| Other | 1 | 1.9% | 5 | 9.6% | 6 | 5.7% |

### 4.3.4 *Length of Stay in Hospital*




The plot at left excludes 9 cases in which the length of stay in hospital was greater than 25 days.

The variation between hospitals in the mean length of stay (in days) for primary hip arthroplasty patients is shown below.




LENGTH OF STAY IN HOSPITAL — PRIMARY HIPS

| | *n* | | Missing | | Mean | Median | 75th %ile | 95th %ile |
|---|---|---|---|---|---|---|---|---|
| Male | 831 | 46% | 5 | 0.6% | 4.4 | 4 | 5 | 8.8 |
| Female | 976 | 54% | 5 | 0.5% | 5.2 | 5 | 6 | 9 |
| Persons | 1807 | 100% | 10 | 0.6% | 4.8 | 4 | 6 | 9 |

LENGTH OF STAY IN HOSPITAL — REVISION HIPS

| | *n* | | Missing | | Mean | Median | 75th %ile | 95th %ile |
|---|---|---|---|---|---|---|---|---|
| Male | 53 | 50% | 0 | 0% | 9.5 | 6 | 10 | 24 |
| Female | 52 | 50% | 0 | 0% | 8.6 | 6 | 8 | 27 |
| Persons | 105 | 100% | 0 | 0% | 9.1 | 6 | 9 | 25 |

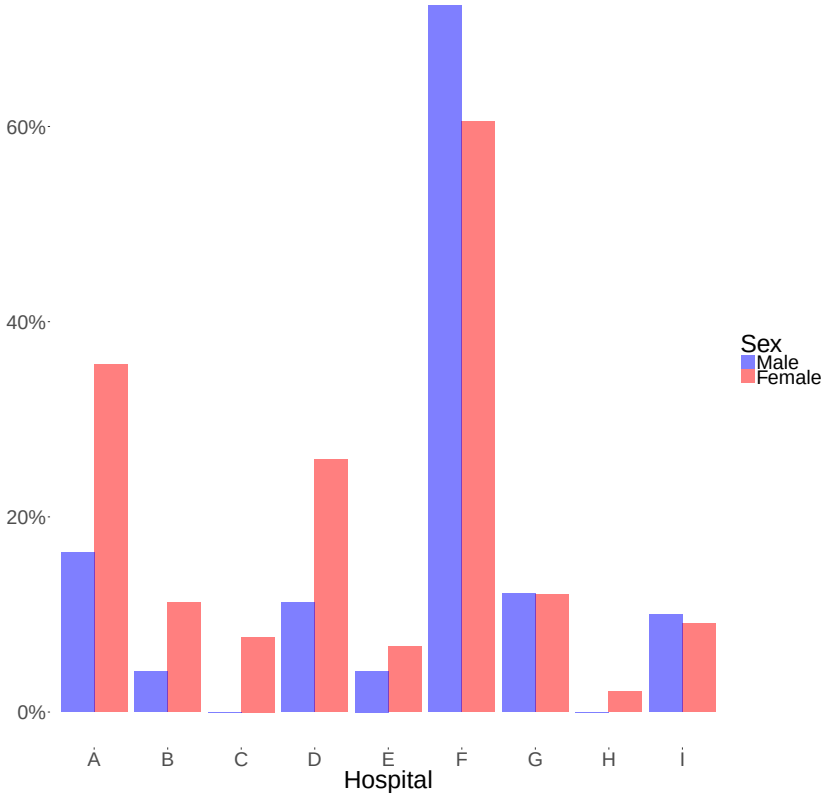
### 4.3.5 *Discharge Destination*

DISCHARGE DESTINATION — PRIMARY HIPS

| | *n* | Unk/NS | | Usual residence | | Inpatient rehab | | Other | |
|---|---|---|---|---|---|---|---|---|---|
| Male | 831 | 7 | 0.8% | 728 | 88% | 87 | 10% | 9 | 1% |
| Female | 976 | 8 | 0.8% | 763 | 78% | 201 | 21% | 4 | 0.4% |
| Persons | 1807 | 15 | 0.8% | 1491 | 83% | 288 | 16% | 13 | 0.7% |

DISCHARGE DESTINATION — REVISION HIPS

| | *n* | Unk/NS | | Usual residence | | Inpatient rehab | | Other | |
|---|---|---|---|---|---|---|---|---|---|
| Male | 53 | 2 | 4% | 37 | 70% | 11 | 21% | 3 | 6% |
| Female | 52 | 3 | 6% | 28 | 54% | 20 | 38% | 1 | 2% |
| Persons | 105 | 5 | 5% | 65 | 62% | 31 | 30% | 4 | 4% |




Women are considerably more likely to be discharged to inpatient rehabilitation than men. However, there is considerable variation between hospitals in the proportion of hip arthroplasty patients who are discharged to inpatient rehabilitation. The graph at left demonstrates this variation for primary hip arthroplasty patients. Hospital identities have been randomised.

## *4.4 Patient-Reported Outcome Measures (PROMs)*

Patient-reported outcome measures (PROMs) are measures of health status collected directly from the person. In ACORN, they provide a personal perspective of the impact of surgery by comparing health status at two different points in time, therefore allowing comparison of not only clinical measures but also the perceptions of the individual.

Since March 2013, ACORN has included measures of the individual's expectations of surgical outcome. Prior to admission, each person is asked "what are your expectations of your hip/knee pain six months after your surgery?" and "what are your expectations of your functional ability six months after your surgery?" At follow-up, questions to measure perceived satisfaction and success are asked. These replicate the questions used by the PROMs programme in England and Wales. They have been incorporated into ACORN's post-operative follow-up with permission from the National Joint Registry (NJR) England & Wales.

For satisfaction, the question asked is "how would you describe the results of your operation?" with five options provided: excellent; very good; good; fair; or poor.

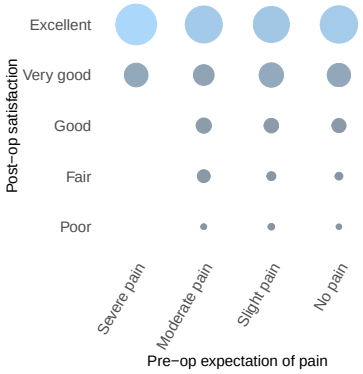
For success, the question asked is "overall, how are the problems now with your hip/knee on which you had surgery, compared to before your operation?" This question also allows the person to choose one of five options: much better; a little better; about the same; a little worse; and much worse.

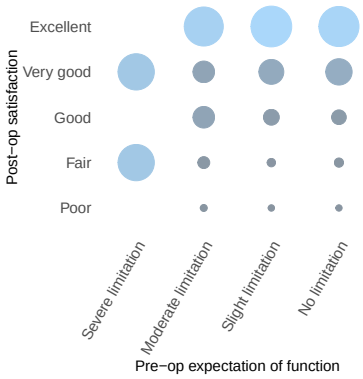
In addition, ACORN asks participants whether they have been re-admitted to hospital since discharge, had another operation on the joint that was replaced six months earlier, and whether they have experienced any other problem not requiring re-admission or re-operation. By asking this additional question about problems not requiring re-admission or re-operation, ACORN is able to capture those outcomes that continue to impact the individual or have resulted in additional services being utilised in the primary or community care setting, although they have not resulted in additional utilisation of admitted hospital services.

The Oxford Hip Score (OHS) and the Oxford Knee Score (OKS) are 12-item, person-reported instruments developed to assess pain and function in people undergoing hip or knee arthroplasty. The questionnaires explore a person's perception of their pain and functional impairment in tasks of daily living over the previous four weeks. The least difficulty undertaking tasks or the least severity of symptoms scores four points, and the most severe symptoms and dysfunction scores zero. The individual scores are summed to achieve a single score, with the highest attainable score of 48 indicating a person who experiences no functional impairment and no pain. The lowest score of 0 means the person has severe pain and functional impairment as a result of their joint problems. In reporting the

A person's pre-operative expectations of their post-operative pain and function are considered to be important predictors of the outcome of joint replacement surgery.

The charts below illustrate this relationship between pre-operative expectation of pain following surgery and 6-month satisfaction rating (top chart), and pre-operative expectation of joint function following surgery and 6-month satisfaction rating (lower chart) for **primary hip arthroplasty** patients. The area of each circle indicates the proportion of patients in each pre-operative expectation category who end up in each the 6-month post-operative satisfaction categories.



Oxford Hip and Knee Scores, outcomes are additionally grouped into four score categories, as reported by the New Zealand Joint Registry. Prior to surgery, the surveys are patient-completed. After surgery, an interviewer completes the surveys by the telephone.

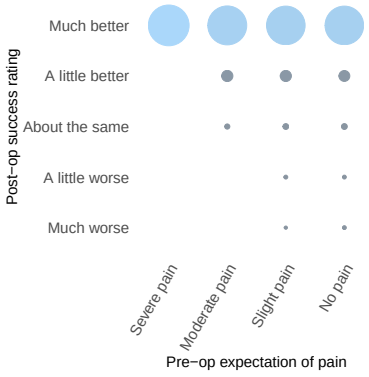
The EQ-VAS records a person's self-rated health on a 20 cm vertical scale with 0 at the bottom representing "worst health imaginable" and 100 at the top representing "best health imaginable". Prior to surgery, the surveys are patient-completed. After surgery, the surveys are completed over the telephone by an interviewer.

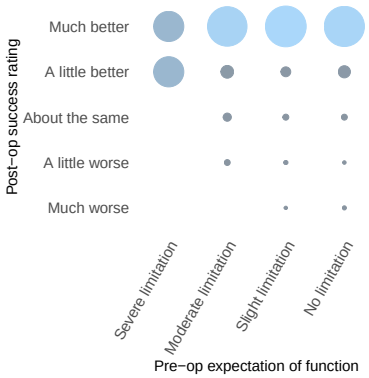
The EQ-5D-5L is a descriptive system of five dimensions of a person's general health. The dimensions are Mobility, Self-care, Usual Activities, Pain or Discomfort, and Anxiety or Depression. Each dimension has five levels: no problems, slight problems, moderate problems, severe problems, or extreme problems. A person is asked to indicate his/her health state by marking the box beside the most appropriate statement in each of the five dimensions on the day the survey is administered. Prior to surgery, the surveys are completed by patients on paper. After surgery, the surveys are completed over the telephone by an interviewer.

**Please note**: Only those patients for whom 6 month follow-up is complete or who have been declared lost to follow-up appear in the tables and graphs below that show 6 month follow-up data.

The EQ-5D quality of life scores provide a measure of the overall effect of the procedure on a person's health and well-being. They also allow different types of procedures to be compared.

The charts below illustrate this relationship between pre-operative expectation of pain following surgery and 6-month patient rating of success (top chart), and pre-operative expectation of joint function following surgery and 6-month patient rating of success (lower chart) for **primary hip arthroplasty** patients. The area of each circle indicates the proportion of patients in each pre-operative expectation category who end up in each the 6-month post-operative success rating categories.



### 4.4.1 *Pre-op Expectation of Pain at 6 months post-op*

EXPECTATION OF PAIN — PRIMARY HIPS

| | *n* | Unknown/ Not stated | | No pain | | Slight pain | | Moderate pain | | Severe pain | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Male | 831 | 114 | 14% | 518 | 62% | 157 | 19% | 40 | 5% | 2 | 0.2% |
| Female | 976 | 161 | 16% | 547 | 56% | 234 | 24% | 31 | 3% | 3 | 0.3% |
| Persons | 1807 | 275 | 15% | 1065 | 59% | 391 | 22% | 71 | 4% | 5 | 0.3% |

EXPECTATION OF PAIN — REVISION HIPS

| | *n* | Unknown/ Not stated | | No pain | | Slight pain | | Moderate pain | | Severe pain | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Male | 53 | 13 | 25% | 24 | 45% | 12 | 23% | 3 | 6% | 1 | 2% |
| Female | 52 | 17 | 33% | 25 | 48% | 7 | 13% | 3 | 6% | 0 | 0% |
| Persons | 105 | 30 | 29% | 49 | 47% | 19 | 18% | 6 | 6% | 1 | 1% |

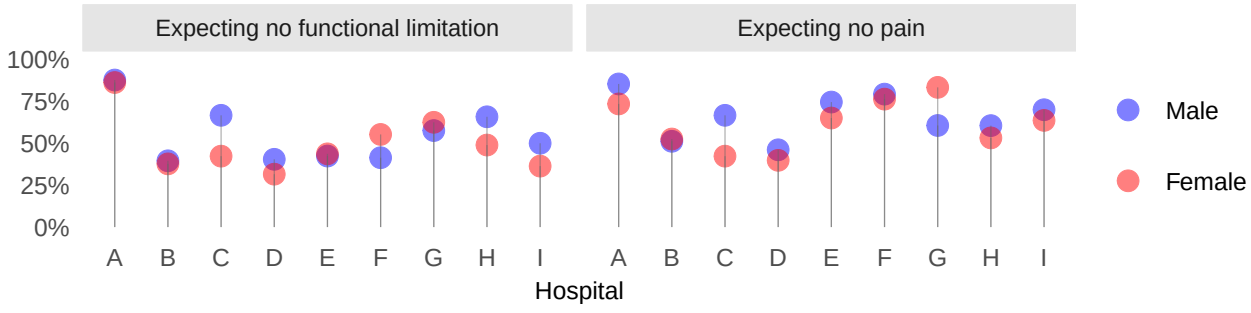
### 4.4.2 *Pre-op Expectation of Function at 6 months post-op*

EXPECTATION OF FUNCTION — PRIMARY HIPS

| | *n* | Unknown/ Not stated | | No limitation | | Slight limitation | | Moderate limitation | | Severe limitation | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Male | 831 | 116 | 14% | 433 | 52% | 253 | 30% | 29 | 3% | 0 | 0% |
| Female | 976 | 163 | 17% | 467 | 48% | 311 | 32% | 33 | 3% | 2 | 0.2% |
| Persons | 1807 | 279 | 15% | 900 | 50% | 564 | 31% | 62 | 3% | 2 | 0.1% |

EXPECTATION OF FUNCTION — REVISION HIPS

| | *n* | Unknown/ Not stated | | No limitation | | Slight limitation | | Moderate limitation | | Severe limitation | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Male | 53 | 13 | 25% | 18 | 34% | 18 | 34% | 3 | 6% | 1 | 2% |
| Female | 52 | 17 | 33% | 19 | 37% | 14 | 27% | 2 | 4% | 0 | 0% |
| Persons | 105 | 30 | 29% | 37 | 35% | 32 | 30% | 5 | 5% | 1 | 1% |



**Please note:** The data shown in the remainder of this PROMs section of the report only include those patients for whom six month follow-up is complete or who were deemed lost to follow-up.

### *4.4.3 Satisfaction at 6 months post-op*

SATISFACTION AT 6 MONTHS POST-OP — PRIMARY HIPS

| | *n* | Unk/NS | | Poor | | Fair | | Good | | Very good | | Excellent | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Male | 829 | 61 | 7% | 9 | 1% | 26 | 3% | 69 | 8% | 175 | 21% | 489 | 59% |
| Female | 976 | 51 | 5% | 18 | 2% | 30 | 3% | 93 | 10% | 235 | 24% | 549 | 56% |
| Persons | 1805 | 112 | 6% | 27 | 1% | 56 | 3% | 162 | 9% | 410 | 23% | 1038 | 58% |

SATISFACTION AT 6 MONTHS POST-OP — REVISION HIPS

| | *n* | Unk/NS | | Poor | | Fair | | Good | | Very good | | Excellent | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Male | 53 | 11 | 21% | 2 | 4% | 3 | 6% | 6 | 11% | 13 | 25% | 18 | 34% |
| Female | 51 | 4 | 8% | 0 | 0% | 2 | 4% | 14 | 27% | 13 | 25% | 18 | 35% |
| Persons | 104 | 15 | 14% | 2 | 2% | 5 | 5% | 20 | 19% | 26 | 25% | 36 | 35% |

### *4.4.4 Patient-perceived Success at 6 months post-op*

SUCCESS AT 6 MONTHS POST-OP — PRIMARY HIPS

| | *n* | Unk/NS | | much worse | | a little worse | | about the same | | a little better | | much better | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Male | 829 | 62 | 7% | 6 | 0.7% | 6 | 0.7% | 13 | 2% | 49 | 6% | 693 | 84% |
| Female | 976 | 50 | 5% | 7 | 0.7% | 6 | 0.6% | 22 | 2% | 76 | 8% | 815 | 84% |
| Persons | 1805 | 112 | 6% | 13 | 0.7% | 12 | 0.7% | 35 | 2% | 125 | 7% | 1508 | 84% |

SUCCESS AT 6 MONTHS POST-OP — REVISION HIPS

| | *n* | Unk/NS | | much worse | | a little worse | | about the same | | a little better | | much better | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Male | 53 | 11 | 21% | 1 | 2% | 2 | 4% | 3 | 6% | 7 | 13% | 29 | 55% |
| Female | 51 | 3 | 6% | 1 | 2% | 1 | 2% | 6 | 12% | 10 | 20% | 30 | 59% |
| Persons | 104 | 14 | 13% | 2 | 2% | 3 | 3% | 9 | 9% | 17 | 16% | 59 | 57% |

### 4.4.5 Complications in the 6 months post-op

Post-Discharge Complications (any) — Primary hips

| | *n* | None | | 1 | | 2 | | 3 or more | | Number unknown | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Male | 829 | 303 | 37% | 131 | 16% | 38 | 5% | 16 | 2% | 341 | 41% |
| Female | 976 | 351 | 36% | 174 | 18% | 62 | 6% | 29 | 3% | 360 | 37% |
| Persons | 1805 | 654 | 36% | 305 | 17% | 100 | 6% | 45 | 2% | 701 | 39% |

Post-Discharge Complications (any) — Revision hips

| | *n* | None | | 1 | | 2 | | 3 or more | | Number unknown | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Male | 53 | 16 | 30% | 12 | 23% | 4 | 8% | 2 | 4% | 19 | 36% |
| Female | 51 | 16 | 31% | 15 | 29% | 1 | 2% | 1 | 2% | 18 | 35% |
| Persons | 104 | 32 | 31% | 27 | 26% | 5 | 5% | 3 | 3% | 37 | 36% |

Post-Discharge Complications (details) in the 6 months post-op — Primary & revision hips

| | Primary hips (*n*=1805) | | Revision hips (*n*=104) | |
|---|---|---|---|---|
| SSI requiring oral antibiotics | 33 | 1.8% | 3 | 2.9% |
| SSI requiring IV antibiotics | 3 | 0.17% | 0 | 0% |
| DVT index leg | 6 | 0.33% | 0 | 0% |
| DVT other leg | 0 | 0% | 0 | 0% |
| DVT both legs | 1 | 0.055% | 0 | 0% |
| Pulmonary embolus | 3 | 0.17% | 0 | 0% |
| Dislocation | 2 | 0.11% | 2 | 1.9% |
| Joint stiffness | 98 | 5.4% | 8 | 7.7% |
| Bladder infection or retention | 27 | 1.5% | 1 | 0.96% |
| Fracture | 7 | 0.39% | 0 | 0% |
| Unexpected pain | 85 | 4.7% | 2 | 1.9% |
| Cardiac | 2 | 0.11% | 0 | 0% |
| Stroke | 1 | 0.055% | 0 | 0% |
| Leg length discrepancy | 136 | 7.5% | 8 | 7.7% |
| Joint or lower limb swelling | 61 | 3.4% | 5 | 4.8% |
| Paraesthesia or numbness | 76 | 4.2% | 3 | 2.9% |
| Cellulitis | 6 | 0.33% | 0 | 0% |
| Neuropathy | 5 | 0.28% | 1 | 0.96% |
| Muscle weakness | 24 | 1.3% | 3 | 2.9% |
| Respiratory infection | 4 | 0.22% | 0 | 0% |
| Other | 47 | 2.6% | 1 | 0.96% |

## Combined Complications (details) in the 6 months post-op — Primary & revision hips

| | Primary hips (*n*=1805) | | Revision hips (*n*=104) | |
|---|---|---|---|---|
| SSI requiring oral antibiotics | 33 | 1.8% | 3 | 2.9% |
| SSI requiring IV antibiotics | 4 | 0.22% | 0 | 0% |
| SSI requ surg c̄ prosth removal | 0 | 0% | 0 | 0% |
| SSI requ surg s̄ prosth removal | 0 | 0% | 0 | 0% |
| Deep vein thrombosis | 11 | 0.61% | 1 | 0.96% |
| Pulmonary embolus | 7 | 0.39% | 0 | 0% |
| Fat emboli | 0 | 0% | 0 | 0% |
| Drug reaction | 0 | 0% | 0 | 0% |
| Delirium | 21 | 1.2% | 0 | 0% |
| Hypotension | 33 | 1.8% | 1 | 0.96% |
| CVS | 37 | 2% | 1 | 0.96% |
| Respiratory infection | 20 | 1.1% | 0 | 0% |
| Urinary tract infection or retention | 55 | 3% | 3 | 2.9% |
| Wound dehiscence | 8 | 0.44% | 2 | 1.9% |
| Pressure area | 1 | 0.055% | 0 | 0% |
| Fall | 2 | 0.11% | 1 | 0.96% |
| Cellulitis | 7 | 0.39% | 0 | 0% |
| Death | 8 | 0.44% | 0 | 0% |
| Dislocation | 6 | 0.33% | 3 | 2.9% |
| Fracture | 24 | 1.3% | 2 | 1.9% |
| Joint stiffness | 98 | 5.4% | 8 | 7.7% |
| Unexpected pain | 85 | 4.7% | 2 | 1.9% |
| Leg length discrepancy | 136 | 7.5% | 8 | 7.7% |
| Joint or lower limb swelling | 61 | 3.4% | 5 | 4.8% |
| Nerve injury† | 82 | 4.5% | 4 | 3.8% |
| Muscle weakness | 24 | 1.3% | 3 | 2.9% |
| Re-operation | 31 | 1.7% | 7 | 6.7% |
| Other | 93 | 5.2% | 7 | 6.7% |

This table combines complications which occurred during the hospital admission in which joint replacement surgery was performed, and complications which occurred following discharge from hospital but within six months after surgery.

*SSI* Surgical Site Infection

*CVS* Cardiovascular system

* including paraesthesia & numbness

### *4.4.6 Re-admission in the 6 months post-op*

RE-ADMISSION — PRIMARY HIPS

| | *n* | Missing | | Re-admission due to arthroplasty | | Re-admission for other reasons | | Total re-admissions | |
|---|---|---|---|---|---|---|---|---|---|
| Male | 826 | 55 | 7% | 21 | 3% | 79 | 10% | 98 | 12% |
| Female | 971 | 47 | 5% | 34 | 4% | 86 | 9% | 115 | 12% |
| Persons | 1797 | 102 | 6% | 55 | 3% | 165 | 9% | 213 | 12% |

RE-ADMISSION — REVISION HIPS

| | *n* | Missing | | Re-admission due to arthroplasty | | Re-admission for other reasons | | Total re-admissions | |
|---|---|---|---|---|---|---|---|---|---|
| Male | 53 | 11 | 21% | 6 | 11% | 5 | 9% | 11 | 21% |
| Female | 51 | 3 | 6% | 7 | 14% | 6 | 12% | 13 | 25% |
| Persons | 104 | 14 | 13% | 13 | 12% | 11 | 11% | 24 | 23% |

REASONS FOR RE-ADMISSION — PRIMARY & REVISION HIPS

| | Primary (*n*=213) | | Revision (*n*=24) | |
|---|---|---|---|---|
| **Reasons related to arthroplasty** | | | | |
| DVT | 4 | 2% | 0 | 0% |
| Pulmonary embolus | 3 | 1% | 0 | 0% |
| MUA | 0 | 0% | 0 | 0% |
| Dislocation | 9 | 4% | 8 | 33% |
| Surgical site infection | 22 | 10% | 4 | 17% |
| Wound dehiscence | 1 | 0.5% | 0 | 0% |
| Index joint revision | 3 | 1% | 0 | 0% |
| Other | 11 | 5% | 1 | 4% |
| **Reasons unrelated to arthroplasty** | | | | |
| Cardiac | 25 | 12% | 0 | 0% |
| Renal/urinary tract | 12 | 6% | 2 | 8% |
| Cancer | 5 | 2% | 0 | 0% |
| Other | 121 | 58% | 9 | 38% |

### 4.4.7 *Re-operation in the 6 months post-op*

RE-OPERATION — PRIMARY HIPS

| | *n* | Re-operation due to arthroplasty | |
|---|---|---|---|
| Male | 829 | 11 | 1% |
| Female | 976 | 17 | 2% |
| Persons | 1805 | 28 | 2% |

RE-OPERATION — REVISION HIPS

| | *n* | Re-operation due to arthroplasty | |
|---|---|---|---|
| Male | 53 | 2 | 4% |
| Female | 51 | 4 | 8% |
| Persons | 104 | 6 | 6% |

REASON FOR RE-OPERATION — PRIMARY HIPS

| | Males (*n*=11) | | Females (*n*=17) | | Persons (*n*=28) | |
|---|---|---|---|---|---|---|
| SSI requiring surgery with no prosthesis removal | 6 | 55% | 5 | 29% | 11 | 39% |
| SSI requiring surgery with prosthesis removal | 2 | 18% | 1 | 6% | 3 | 11% |
| Dislocation | 1 | 9% | 4 | 24% | 5 | 18% |
| Joint stiffness | 0 | 0% | 0 | 0% | 0 | 0% |
| Periprosthetic fracture | 0 | 0% | 2 | 12% | 2 | 7% |
| Implant fracture | 0 | 0% | 1 | 6% | 1 | 4% |
| Bleeding | 1 | 9% | 1 | 6% | 2 | 7% |
| Other | 0 | 0% | 3 | 18% | 3 | 11% |
| Unknown/NS | 1 | 9% | 0 | 0% | 1 | 4% |

REASON FOR RE-OPERATION — REVISION HIPS

| | Males (*n*=2) | | Females (*n*=4) | | Persons (*n*=6) | |
|---|---|---|---|---|---|---|
| SSI requiring surgery with no prosthesis removal | 0 | 0% | 2 | 50% | 2 | 33% |
| SSI requiring surgery with prosthesis removal | 0 | 0% | 0 | 0% | 0 | 0% |
| Dislocation | 2 | 100% | 2 | 50% | 4 | 67% |
| Joint stiffness | 0 | 0% | 0 | 0% | 0 | 0% |
| Periprosthetic fracture | 0 | 0% | 0 | 0% | 0 | 0% |
| Implant fracture | 0 | 0% | 0 | 0% | 0 | 0% |
| Bleeding | 0 | 0% | 0 | 0% | 0 | 0% |
| Other | 0 | 0% | 0 | 0% | 0 | 0% |
| Unknown/NS | 0 | 0% | 0 | 0% | 0 | 0% |

*SSI* = Surgical Site Infection

### *4.4.8 Deaths in the 6 months post-op*

POST-DISCHARGE DEATH — PRIMARY HIPS

| | *n* | Unknown/ not stated | | Died in hospital | | Total deaths at 6 mths post-op | |
|---|---|---|---|---|---|---|---|
| Male | 830 | 52 | 6% | 1 | 0.1% | 6 | 0.7% |
| Female | 976 | 51 | 5% | 0 | 0% | 3 | 0.3% |
| Persons | 1806 | 103 | 6% | 1 | 0.06% | 9 | 0.5% |

POST-DISCHARGE DEATH — REVISION HIPS

| | *n* | Unknown/ not stated | | Died in hospital | | Total deaths at 6 mths post-op | |
|---|---|---|---|---|---|---|---|
| Male | 53 | 3 | 6% | 0 | 0% | 0 | 0% |
| Female | 51 | 6 | 12% | 0 | 0% | 0 | 0% |
| Persons | 104 | 9 | 9% | 0 | 0% | 0 | 0% |

---

**Please note:** The data shown in the following EQ-5D and EQ-VAS graphs and tables only refer to those patients for whom six month follow-up is complete. In the tables which follow in this section, "post-op" means at the follow-up contact, which occurs approximately six months post-operatively.

### 4.4.9 *EuroQoL EQ-5D Measures*

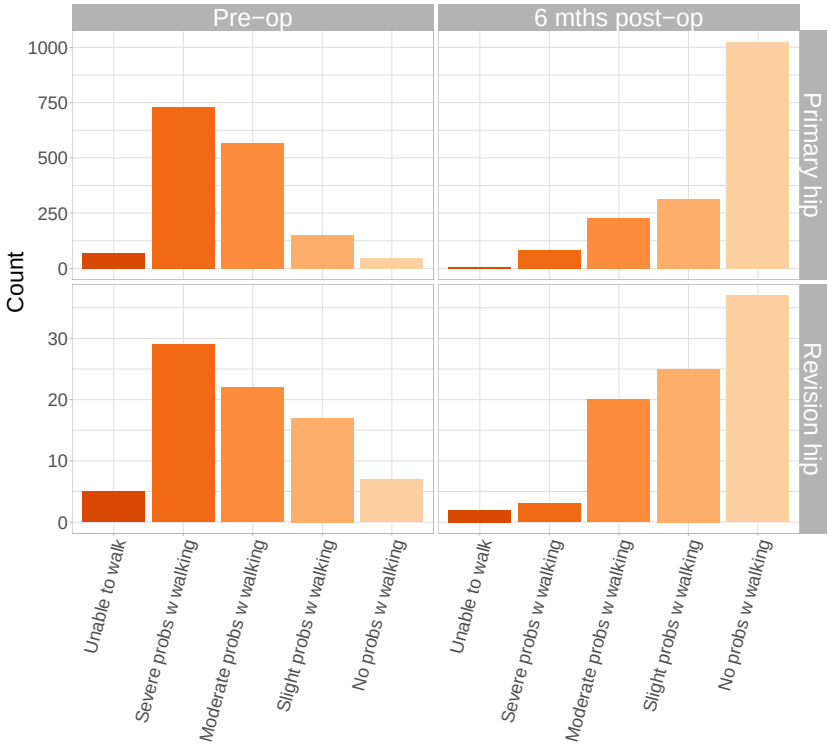



Figure 4.1: Hip Arthroplasties: Distribution of EQ-5D Mobility, pre-op versus post-op

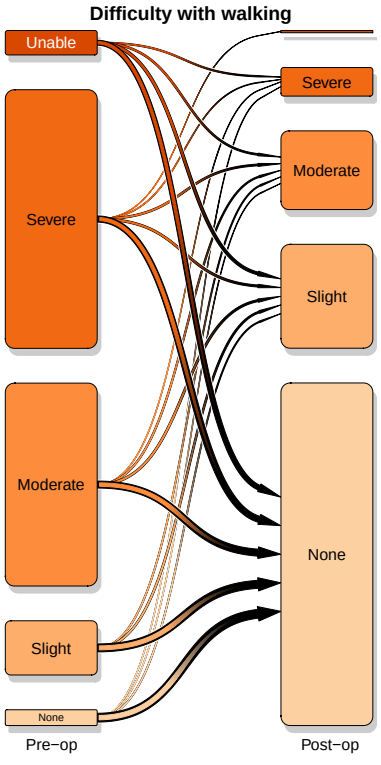
#### EQ-5D Mobility — Primary hips

| | Pre-op | | Post-op | |
|---|---|---|---|---|
| Unable to walk | 70 | 4% | 7 | 0.4% |
| Severe problems with walking | 730 | 41% | 84 | 5% |
| Moderate problems with walking | 567 | 32% | 227 | 13% |
| Slight problems with walking | 151 | 9% | 313 | 18% |
| No problems with walking | 48 | 3% | 1025 | 58% |
| Unknown/Not stated | 199 | 11% | 109 | 6% |

#### EQ-5D Mobility — Revision hips

| | Pre-op | | Post-op | |
|---|---|---|---|---|
| Unable to walk | 5 | 5% | 2 | 2% |
| Severe problems with walking | 29 | 29% | 3 | 3% |
| Moderate problems with walking | 22 | 22% | 20 | 20% |
| Slight problems with walking | 17 | 17% | 25 | 25% |
| No problems with walking | 7 | 7% | 37 | 37% |
| Unknown/Not stated | 19 | 19% | 12 | 12% |

The chart below shows the transition in mobility difficulty in **primary hip arthroplasty** patients, from pre-operatively on the left to six months post-operatively on the right.



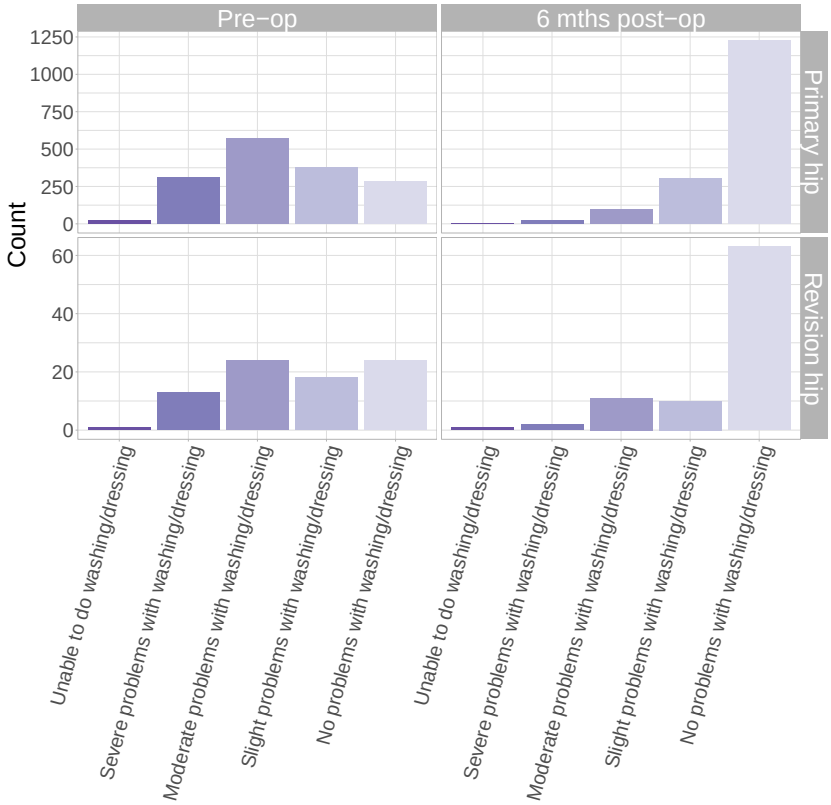



Figure 4.2: Hip Arthroplasties: Distribution of EQ-5D Personal Care, pre-op versus post-op

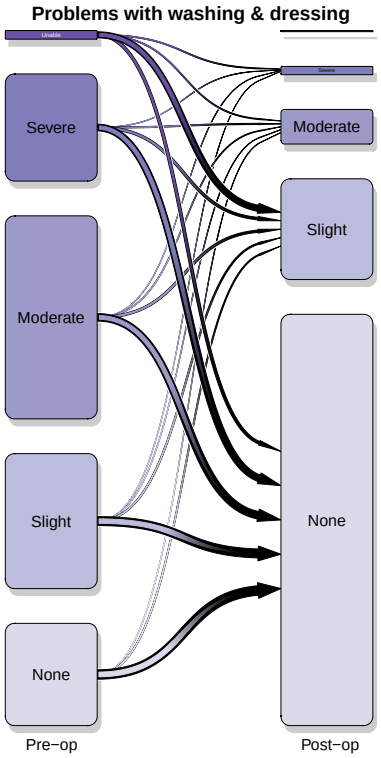
## EQ-5D Personal Care — Primary hips

| | Pre-op | | Post-op | |
|---|---|---|---|---|
| Unable to do washing/dressing | 26 | 1% | 4 | 0.2% |
| Severe problems washing/dressing | 314 | 18% | 25 | 1% |
| Mod. problems washing/dressing | 569 | 32% | 100 | 6% |
| Slight problems washing/dressing | 377 | 21% | 301 | 17% |
| No problems washing/dressing | 282 | 16% | 1227 | 69% |
| Unknown/Not stated | 198 | 11% | 109 | 6% |

## EQ-5D Personal Care — Revision hips

| | Pre-op | | Post-op | |
|---|---|---|---|---|
| Unable to do washing/dressing | 1 | 1% | 1 | 1% |
| Severe problems washing/dressing | 13 | 13% | 2 | 2% |
| Mod. problems washing/dressing | 24 | 24% | 11 | 11% |
| Slight problems washing/dressing | 18 | 18% | 10 | 10% |
| No problems washing/dressing | 24 | 24% | 63 | 64% |
| Unknown/Not stated | 19 | 19% | 12 | 12% |

The chart below shows the transition in difficulty with washing and dressing in **primary hip arthroplasty** patients, from pre-operatively on the left to six months post-operatively on the right.



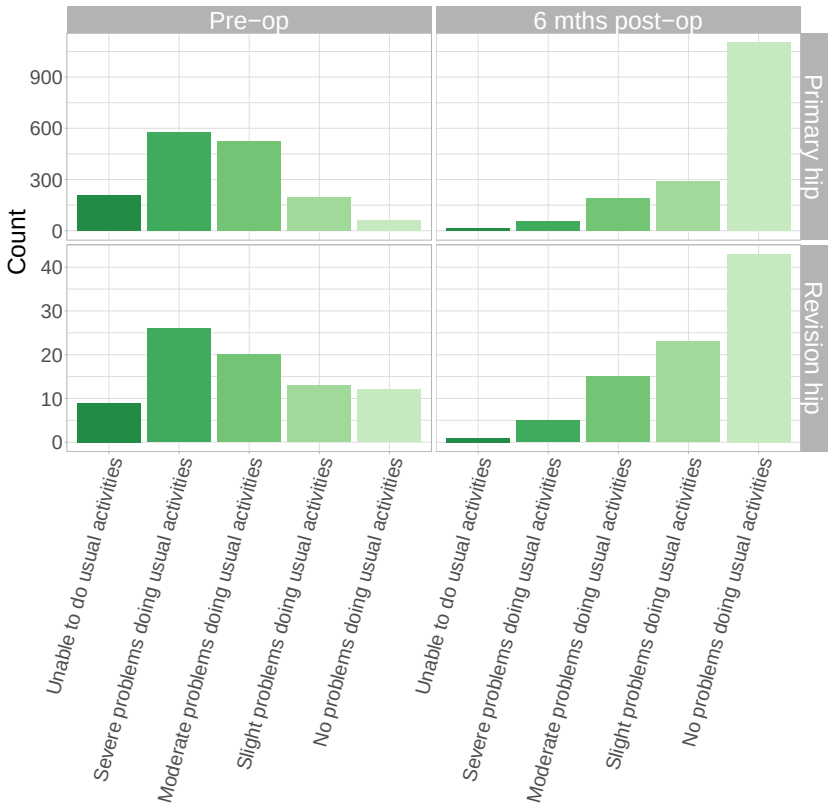



Figure 4.3: Hip Arthroplasties: Distribution of EQ-5D Usual Activities, pre-op versus post-op

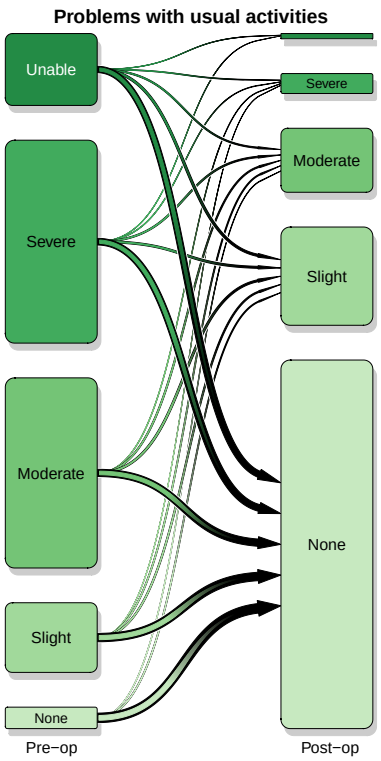
## EQ-5D Usual Activites — Primary hips

| | Pre-op | | Post-op | |
|---|---|---|---|---|
| Unable to do usual activities | 209 | 12% | 16 | 0.9% |
| Severe problems c̄ usual activities | 576 | 33% | 56 | 3% |
| Mod. problems c̄ usual activities | 526 | 30% | 190 | 11% |
| Slight problems c̄ usual activities | 195 | 11% | 292 | 17% |
| No problems c̄ usual activities | 60 | 3% | 1102 | 62% |
| Unknown/Not stated | 200 | 11% | 110 | 6% |

## EQ-5D Usual Activites — Revision hips

| | Pre-op | | Post-op | |
|---|---|---|---|---|
| Unable to do usual activities | 9 | 9% | 1 | 1% |
| Severe problems c̄ usual activities | 26 | 26% | 5 | 5% |
| Mod. problems c̄ usual activities | 20 | 20% | 15 | 15% |
| Slight problems c̄ usual activities | 13 | 13% | 23 | 23% |
| No problems c̄ usual activities | 12 | 12% | 43 | 43% |
| Unknown/Not stated | 19 | 19% | 12 | 12% |

The chart below shows the transition in difficulty with usual activities in **primary hip arthroplasty** patients, from pre-operatively on the left to six months post-operatively on the right.



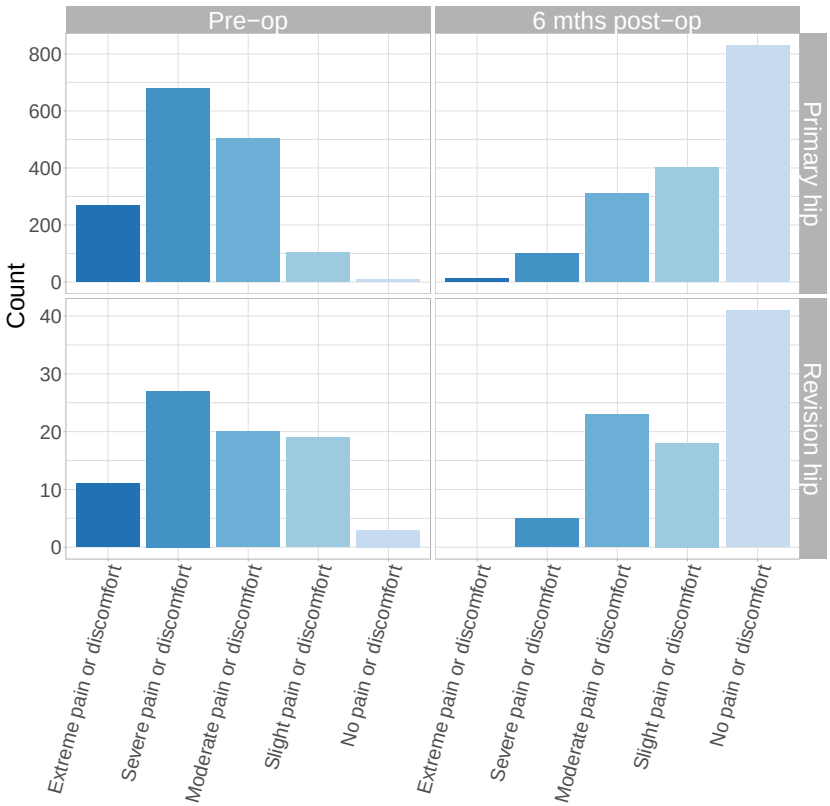



Figure 4.4: Hip Arthroplasties: Distribution of EQ-5D Discomfort, pre-op versus post-op

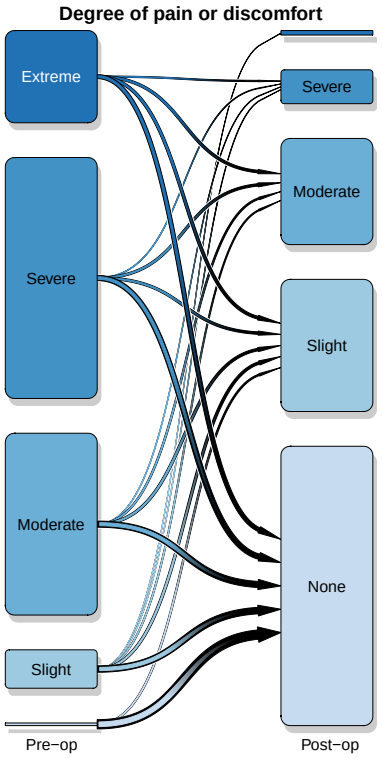
## EQ-5D Discomfort — Primary hips

| | Pre-op | | Post-op | |
|---|---|---|---|---|
| Extreme pain or discomfort | 268 | 15% | 12 | 0.7% |
| Severe pain or discomfort | 679 | 38% | 101 | 6% |
| Moderate pain or discomfort | 504 | 29% | 311 | 18% |
| Slight pain or discomfort | 105 | 6% | 401 | 23% |
| No pain or discomfort | 9 | 0.5% | 831 | 47% |
| Unknown/not stated | 200 | 11% | 109 | 6% |

## EQ-5D Discomfort — Revision hips

| | Pre-op | | Post-op | |
|---|---|---|---|---|
| Extreme pain or discomfort | 11 | 11% | 0 | 0% |
| Severe pain or discomfort | 27 | 27% | 5 | 5% |
| Moderate pain or discomfort | 20 | 20% | 23 | 23% |
| Slight pain or discomfort | 19 | 19% | 18 | 18% |
| No pain or discomfort | 3 | 3% | 41 | 41% |
| Unknown/not stated | 19 | 19% | 12 | 12% |

The chart below shows the transition in the degree of pain or discomfort in **primary hip arthroplasty** patients, from pre-operatively on the left to six months post-operatively on the right.



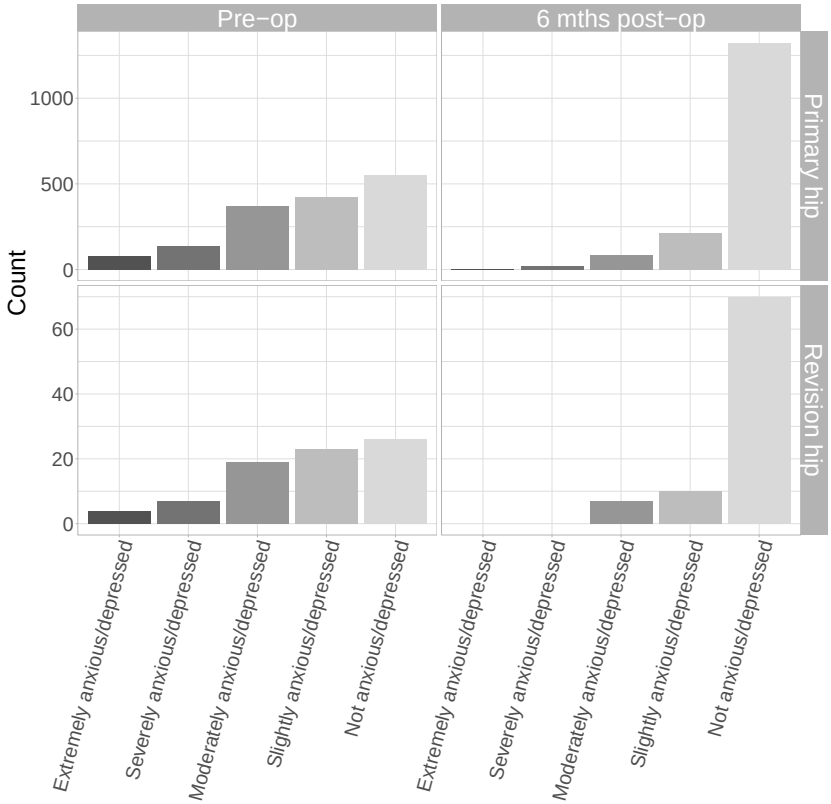



Figure 4.5: Hip Arthroplasties: Distribution of EQ-5D Anxiety/Depression, pre-op versus post-op

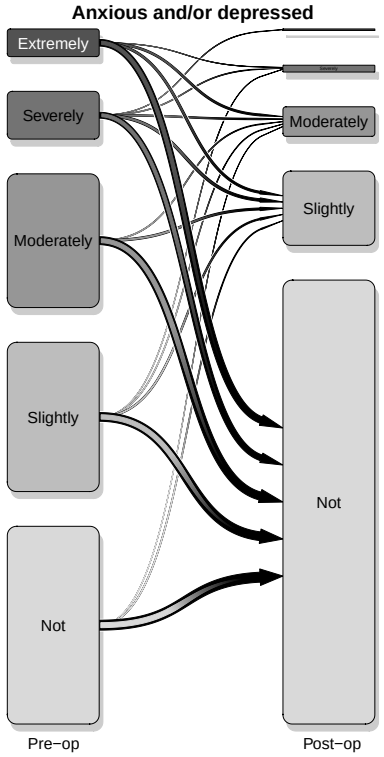
## EQ-5D Anxiety/Depression — Primary hips

| | Pre-op | | Post-op | |
|---|---|---|---|---|
| Extremely anxious/depressed | 81 | 5% | 4 | 0.2% |
| Severely anxious/depressed | 138 | 8% | 20 | 1% |
| Moderately anxious/depressed | 372 | 21% | 87 | 5% |
| Slightly anxious/depressed | 424 | 24% | 211 | 12% |
| Not anxious/depressed | 550 | 31% | 1325 | 75% |
| Unknown/not stated | 200 | 11% | 118 | 7% |

## EQ-5D Anxiety/Depression — Revision hips

| | Pre-op | | Post-op | |
|---|---|---|---|---|
| Extremely anxious/depressed | 4 | 4% | 0 | 0% |
| Severely anxious/depressed | 7 | 7% | 0 | 0% |
| Moderately anxious/depressed | 19 | 19% | 7 | 7% |
| Slightly anxious/depressed | 23 | 23% | 10 | 10% |
| Not anxious/depressed | 26 | 26% | 70 | 71% |
| Unknown/not stated | 20 | 20% | 12 | 12% |

The chart below shows the transition in the degree of anxiety/depression in **primary hip arthroplasty** patients, from pre-operatively on the left to six months post-operatively on the right.



### 4.4.10 *EuroQoL Visual Analogue Scale (EQ-VAS)*

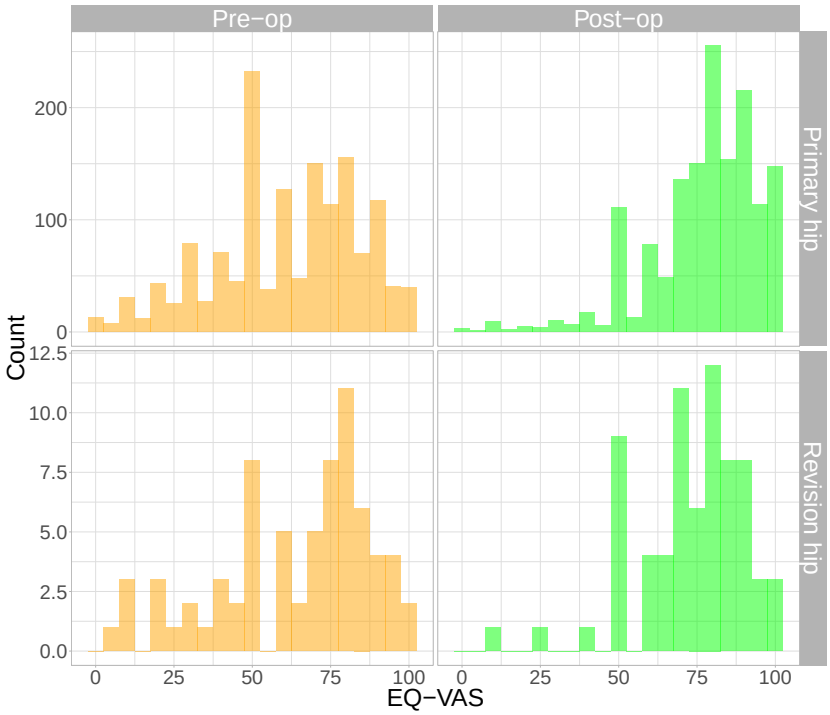



Figure 4.6: Hip Arthroplasties: Distribution of EQ-VAS, pre-op versus post-op

HIP ARTHROPLASTIES: DISTRIBUTION OF EQ-VAS, PRE-OP VERSUS POST-OP

| Procedure | Sex | Timing | *n** | Mean | 5th %ile | Median | 95th %ile |
|---|---|---|---|---|---|---|---|
| Primary hip | Males | Pre-op | 797 | 59.6 | 15.0 | 60.0 | 95.0 |
| | | Post-op | 797 | 77.0 | 50.0 | 80.0 | 100.0 |
| Primary hip | Females | Pre-op | 690 | 62.4 | 20.0 | 69.0 | 92.7 |
| | | Post-op | 690 | 77.9 | 50.0 | 80.0 | 99.5 |
| Primary hip | Persons | Pre-op | 1487 | 60.9 | 20.0 | 60.0 | 95.0 |
| | | Post-op | 1487 | 77.4 | 50.0 | 80.0 | 100.0 |
| Revision hip | Males | Pre-op | 37 | 62.2 | 9.6 | 75.0 | 96.0 |
| | | Post-op | 37 | 74.7 | 48.0 | 80.0 | 98.2 |
| Revision hip | Females | Pre-op | 34 | 65.7 | 29.8 | 70.0 | 86.7 |
| | | Post-op | 34 | 71.2 | 50.0 | 72.5 | 90.0 |
| Revision hip | Persons | Pre-op | 71 | 63.9 | 15.0 | 70.0 | 95.0 |
| | | Post-op | 71 | 73.0 | 50.0 | 75.0 | 95.0 |

* Number of cases with both pre-op and 6 months post-op EQ-VAS data available.

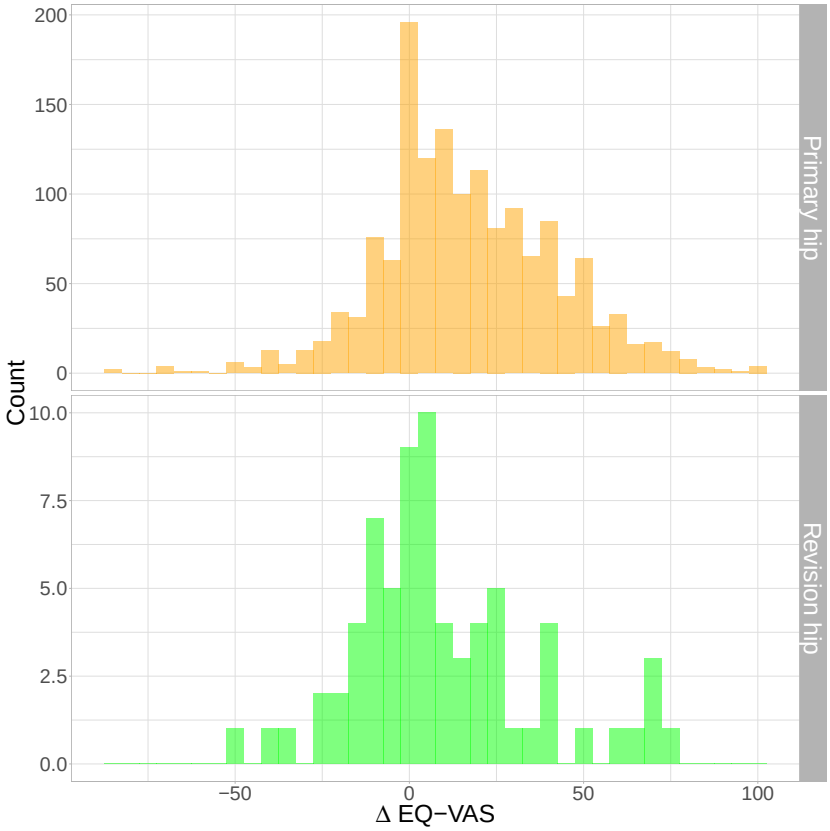



Figure 4.7: Hip Arthroplasties: Change in EQ-VAS, pre-op versus post-op

### 4.4.11 *Oxford Hip Scores*

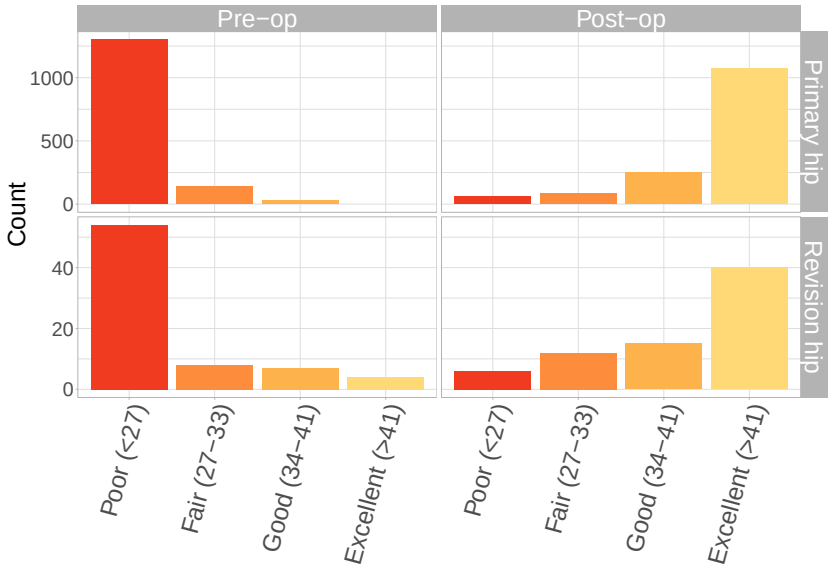



Figure 4.8: Hip Arthroplasties: Distribution of grouped total Oxford Hip Scores, pre-op to post-op

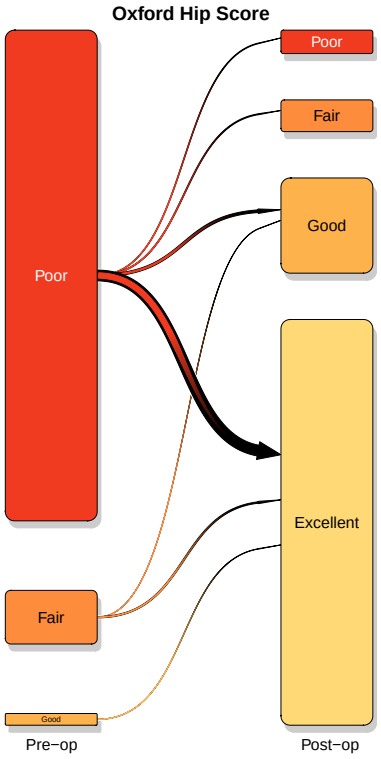
#### Partitioned total Oxford Hip Scores, pre-op and post-op — Primary hips

| Total Oxford score | Pre-op | | Post-op | |
|---|---|---|---|---|
| Poor (<27) | 1299 | 88% | 62 | 4% |
| Fair (27-33) | 142 | 10% | 84 | 6% |
| Good (34-41) | 31 | 2% | 252 | 17% |
| Excellent (>41) | 0 | 0% | 1074 | 73% |

#### Partitioned total Oxford Hip Scores, pre-op and post-op — Revision hips

| Total Oxford score | Pre-op | | Post-op | |
|---|---|---|---|---|
| Poor (<27) | 54 | 74% | 6 | 8% |
| Fair (27-33) | 8 | 11% | 12 | 16% |
| Good (34-41) | 7 | 10% | 15 | 21% |
| Excellent (>41) | 4 | 5% | 40 | 55% |

The chart below shows the transition in Oxford Hip Scores in **primary hip arthroplasty** patients, from pre-operatively on the left to six months post-operatively on the right.



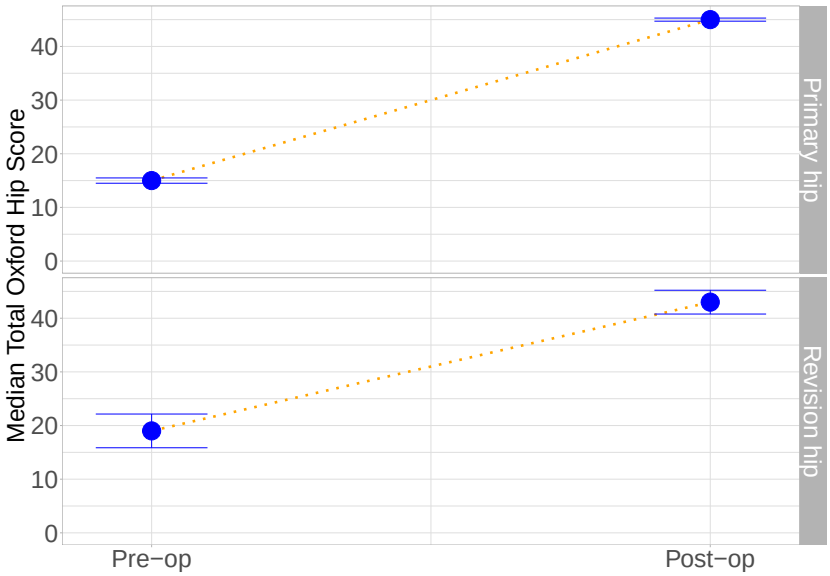



Figure 4.9: Domino plot of median Pre-op and Post-op Oxford Hip Scores

**Explanatory note**: In this "domino" plot, the central dot indicates the median Oxford Hip Score (OHS) for each group of patients (means and medians for each group are also shown in the tables on the pages which immediately follow this graph). The upper and lower horizontal lines are positioned at $\frac{1.58*IQR}{\sqrt{n}}$ (where IQR is the inter-quartile range), which represents an approximate 95% confidence interval around the median OHS. If these confidence intervals do not overlap, then the difference between the medians is almost certainly statistically significant.

Table 4.2: Hip Arthroplasties: Distribution of total Oxford Hip Scores, pre-op versus post-op

| Procedure | Sex | Timing* | *n*** | Mean | 5th %ile | Median | 95th %ile | IQRÂ¶ |
|---|---|---|---|---|---|---|---|---|
| Primary hip | Males | Pre-op | 786 | 14.5 | 4.0 | 13 | 31.0 | 11.0 |
| | | Post-op | 786 | 42.4 | 27.0 | 45 | 48.0 | 7.0 |
| | Females | Pre-op | 686 | 17.0 | 5.2 | 16 | 31.8 | 11.0 |
| | | Post-op | 686 | 43.4 | 30.0 | 46 | 48.0 | 6.0 |
| | Persons | Pre-op | 1472 | 15.7 | 4.0 | 15 | 31.0 | 12.0 |
| | | Post-op | 1472 | 42.8 | 28.0 | 45 | 48.0 | 7.0 |
| Revision hip | Males | Pre-op | 38 | 19.0 | 2.8 | 14 | 42.1 | 20.0 |
| | | Post-op | 38 | 39.0 | 21.1 | 42 | 47.0 | 11.5 |
| | Females | Pre-op | 35 | 20.9 | 6.4 | 21 | 41.0 | 11.0 |
| | | Post-op | 35 | 39.0 | 17.5 | 44 | 48.0 | 14.0 |
| | Persons | Pre-op | 73 | 19.9 | 4.6 | 19 | 41.4 | 17.0 |
| | | Post-op | 73 | 39.0 | 17.8 | 43 | 48.0 | 12.0 |

* "Post-op" means 6 months post-operative.

** Number of cases with both pre-op and 6 months post-op Oxford Hip Score data available.

¶ Inter-quartile range.

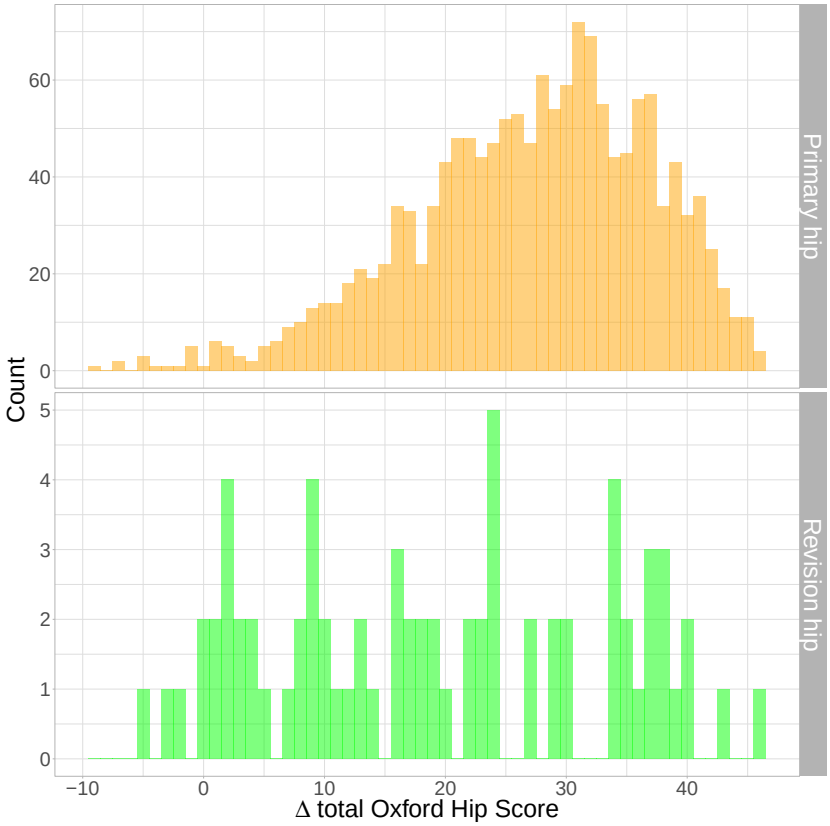



Figure 4.10: Change in total Oxford hip scores, pre-op to post-op

Table 4.3: Hip Arthroplasties: Change in total Oxford Hip Score, pre-op to post-op

| | Procedure | Sex | *n** | Mean change | 5th %ile | Median | 95th %ile |
|---|---|---|---|---|---|---|---|
| 2 | Primary hip | Males | 786 | 27.9 | 9.0 | 30 | 42.0 |
| 1 | | Females | 686 | 26.4 | 10.0 | 27 | 40.8 |
| 5 | | Persons | 1472 | 27.2 | 9.5 | 28 | 41.0 |
| 4 | Revision hip | Males | 38 | 20.0 | 0.8 | 18 | 39.1 |
| 3 | | Females | 35 | 18.1 | -0.9 | 19 | 37.9 |
| 6 | | Persons | 73 | 19.1 | 0.0 | 18 | 39.4 |

* Number of cases with both pre-op and 6 months post-op Oxford Hip Score data available.

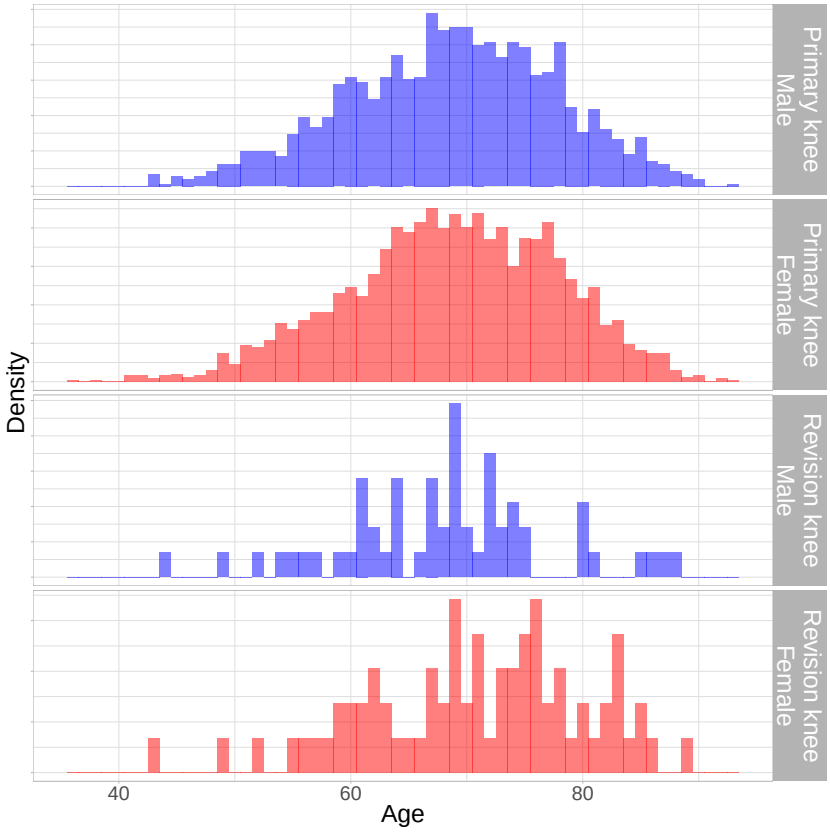
# 5
# *Knee Arthroplasty*

Knee arthroplasties are either an initial (primary) procedure on a joint or they are a subsequent (revision) procedure on a previously replaced joint. ACORN collects information on primary total or partial knee arthroplasties and revision knee arthroplasties. A primary total knee arthroplasty involves replacing both surfaces of the knee joint with or without resurfacing of the patella, and a partial arthroplasty involves arthroplasty of only part of the joint. Revision knee arthroplasty surgery is where one or more of the components are removed and/or replaced.

Between January 2013 and December 2016, primary total knee arthroplasty surgery accounted for 97% of knee arthroplasty procedures. The average age of all people having a knee procedure was 68.8 years. The most common reason for primary surgery was osteoarthritis. Knee arthroplasty surgery was more common in women (62.8%).

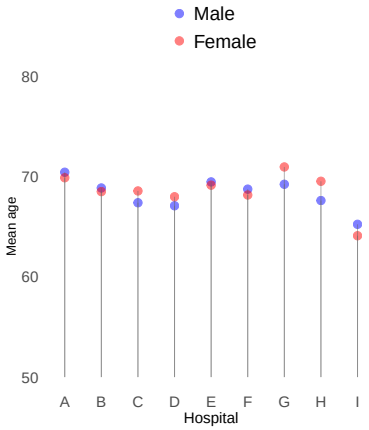
## 5.1 Demographic Profile

### 5.1.1 Age Distribution




The average age of knee arthroplasty patients is around the late 60s, with the average age for males about the same as the average age for females (*cf* hip arthroplasties, in which the male patients are on average 3 years younger then the female patients). About one-twelfth of the males and females in the ACORN registry undergoing knee replacement are aged less than 55 years.

The chart below shows the variation in the mean age of primary knee arthroplasty patients between ACORN hospitals. The order of hospitals and their labels is random.



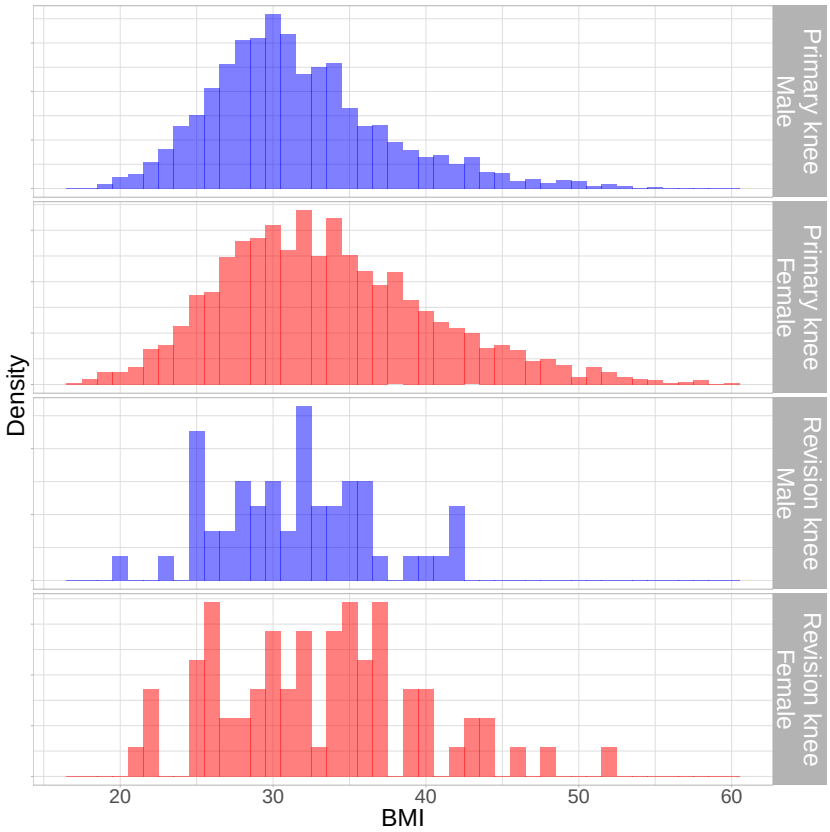

Age of Patients — Primary knees

| | *n* | % | **Mean** | StdDev | Min | Max | <55 | 55-64 | 65-74 | 75-84 | ≥ 85 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Male | 1431 | 37.0 | **68.7** | 9.13 | 42.6 | 92.7 | 7.3% | 26% | 40% | 23% | 3.4% |
| Female | 2440 | 63.0 | **68.8** | 9.07 | 36.2 | 92.8 | 7.7% | 25% | 40% | 25% | 2.5% |
| **Persons** | **3871** | **100.0** | **68.8** | **9.09** | **36.2** | **92.8** | **7.6%** | **26%** | **40%** | **24%** | **2.8%** |

Age of Patients — Revision knees

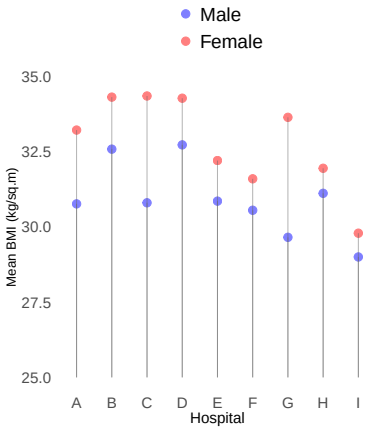
| | *n* | % | **Mean** | StdDev | Min | Max | <55 | 55-64 | 65-74 | 75-84 | ≥ 85 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Male | 57 | 43.8 | **68.0** | 9.15 | 43.5 | 87.9 | 7% | 28% | 51% | 8.8% | 5.3% |
| Female | 73 | 56.2 | **70.9** | 9.57 | 42.5 | 89.2 | 4.1% | 23% | 37% | 32% | 4.1% |
| **Persons** | **130** | **100.0** | **69.6** | **9.46** | **42.5** | **89.2** | **5.4%** | **25%** | **43%** | **22%** | **4.6%** |

### 5.1.2 *Body Mass Index (BMI)*




The average Body Mass Index (BMI) of patients undergoing primary knee arthroplasty is about 33 in both sexes, with a wide range and spread of BMI values in both sexes.

The chart below shows the variation in the mean BMI of primary knee arthroplasty patients between ACORN hospitals. The order of hospitals and their labels is random.



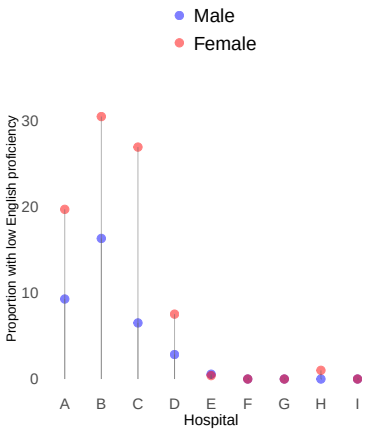

Body Mass Index (BMI) — Primary knees

| | *n* | Missing | | **Mean** | StdDev | Min | Max |
|---|---|---|---|---|---|---|---|
| Male | 1431 | 60 | 4.4% | **31.7** | 5.85 | 18.6 | 55.5 |
| Female | 2440 | 122 | 5.3% | **33.7** | 7.01 | 17 | 59.6 |
| **Persons** | **3871** | **182** | **4.9%** | **32.9** | **6.67** | **17** | **59.6** |

Body Mass Index (BMI) — Revision knees

| | *n* | Missing | | **Mean** | StdDev | Min | Max |
|---|---|---|---|---|---|---|---|
| Male | 57 | 4 | 7.5% | **31.6** | 5.08 | 20 | 42.1 |
| Female | 73 | 3 | 4.3% | **33.2** | 6.58 | 21.3 | 52.1 |
| **Persons** | **130** | **7** | **5.7%** | **32.5** | **6.01** | **20** | **52.1** |

### 5.1.3 *English Proficiency*




ENGLISH PROFICIENCY — PRIMARY & REVISION KNEES

| | *n* | Missing | | High | | Low | |
|---|---|---|---|---|---|---|---|
| Male | 1488 | 78 | 5.2% | 1293 | 86.9% | 117 | 7.9% |
| Female | 2513 | 133 | 5.3% | 1936 | 77.0% | 444 | 17.7% |
| Persons | 4001 | 211 | 5.3% | 3229 | 80.7% | 561 | 14.0% |

### 5.1.4 *Level of Education*

SCHOOL EDUCATION — PRIMARY & REVISION KNEES

| | *n* | Missing | | No schooling | | Yr 9 or below | | Yrs 10 or 11 | | Yr 12 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Male | 1488 | 128 | 8.6% | 18 | 1.2% | 483 | 32% | 593 | 40% | 266 | 18% |
| Female | 2513 | 196 | 7.8% | 83 | 3.3% | 850 | 34% | 1024 | 41% | 360 | 14% |
| Persons | 4001 | 324 | 8.1% | 101 | 2.5% | 1333 | 33% | 1617 | 40% | 626 | 16% |

POST-SCHOOL EDUCATION — PRIMARY & REVISION KNEES

| | *n* | Missing | | None | | Cert/Diploma | | Bachelor | | Postgrad | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Male | 1488 | 169 | 11% | 708 | 48% | 507 | 34% | 52 | 3.49% | 52 | 3.5% |
| Female | 2513 | 286 | 11% | 1710 | 68% | 297 | 12% | 67 | 2.7% | 153 | 6.1% |
| Persons | 4001 | 455 | 11% | 2418 | 60% | 804 | 20% | 119 | 3% | 205 | 5.1% |

## 5.2 Patient Medical & Surgical Characteristics

### 5.2.1 Comorbidities

PRE-OPERATIVE COMORBIDITIES — PRIMARY KNEES

| | *n* | Low back pain | | Other lower limb arthritis | | Heart disease | | Hypertension | |
|---|---|---|---|---|---|---|---|---|---|
| Male | 1431 | 352 | 25% | 353 | 25% | 502 | 35% | 793 | 55% |
| Female | 2440 | 803 | 33% | 657 | 27% | 853 | 35% | 1539 | 63% |
| **Persons** | **3871** | **1155** | **30%** | **1010** | **26%** | **1355** | **35%** | **2332** | **60%** |

| | *n* | Diabetes | | Gastrointestinal disease | | Respiratory disease | | Renal disease | |
|---|---|---|---|---|---|---|---|---|---|
| Male | 1431 | 318 | 22% | 248 | 17% | 222 | 16% | 81 | 6% |
| Female | 2440 | 573 | 23% | 638 | 26% | 411 | 17% | 129 | 5% |
| **Persons** | **3871** | **891** | **23%** | **886** | **23%** | **633** | **16%** | **210** | **5%** |

| | *n* | Hepatic disease | | Neurological disease | | Anxiety/ depression | |
|---|---|---|---|---|---|---|---|
| Male | 1431 | 31 | 2% | 61 | 4% | 164 | 11% |
| Female | 2440 | 63 | 3% | 135 | 6% | 498 | 20% |
| **Persons** | **3871** | **94** | **2%** | **196** | **5%** | **662** | **17%** |

| | *n* | No comorbs | | 1 comorb | | 2 comorbs | | $\geq$ 3 comorbs | |
|---|---|---|---|---|---|---|---|---|---|
| Male | 1431 | 10 | 15% | 12 | 21% | 11 | 25% | 20 | 39% |
| Female | 2440 | 10 | 11% | 7 | 16% | 8 | 24% | 27 | 49% |
| **Persons** | **3871** | **20** | **12%** | **19** | **18%** | **19** | **25%** | **47** | **45%** |

PRE-OPERATIVE COMORBIDITIES — REVISION KNEES

| | *n* | Low back pain | | Other lower limb arthritis | | Heart disease | | Hypertension | |
|---|---|---|---|---|---|---|---|---|---|
| Male | 57 | 18 | 32% | 14 | 25% | 20 | 35% | 37 | 65% |
| Female | 73 | 26 | 36% | 21 | 29% | 31 | 42% | 44 | 60% |
| **Persons** | **130** | **44** | **34%** | **35** | **27%** | **51** | **39%** | **81** | **62%** |

| | *n* | Diabetes | | Gastrointestinal disease | | Respiratory disease | | Renal disease | |
|---|---|---|---|---|---|---|---|---|---|
| Male | 57 | 12 | 21% | 13 | 23% | 7 | 12% | 3 | 5% |
| Female | 73 | 20 | 27% | 20 | 27% | 11 | 15% | 5 | 7% |
| **Persons** | **130** | **32** | **25%** | **33** | **25%** | **18** | **14%** | **8** | **6%** |

| | *n* | Hepatic disease | | Neurological disease | | Anxiety/ depression | |
|---|---|---|---|---|---|---|---|
| Male | 57 | 0 | 0% | 3 | 5% | 4 | 7% |
| Female | 73 | 2 | 3% | 9 | 12% | 20 | 27% |
| **Persons** | **130** | **2** | **2%** | **12** | **9%** | **24** | **18%** |

| | *n* | No comorbs | | 1 comorb | | 2 comorbs | | $\geq$ 3 comorbs | |
|---|---|---|---|---|---|---|---|---|---|
| Male | 57 | 10 | 16% | 12 | 16% | 11 | 30% | 20 | 39% |
| Female | 73 | 10 | 5% | 7 | 18% | 8 | 22% | 27 | 55% |
| **Persons** | **130** | **20** | **10%** | **19** | **17%** | **19** | **25%** | **47** | **48%** |

### 5.2.2 *ASA Physical Status Classification*

ASA — Primary knees

| | *n* | Missing | | ASA 1 | | ASA 2 | |
|---|---|---|---|---|---|---|---|
| Males | 1431 | 259 | 18% | 61 | 4% | 702 | 49% |
| Females | 2440 | 439 | 18% | 85 | 3% | 1167 | 48% |
| Persons | 3871 | 698 | 18% | 146 | 4% | 1869 | 48% |

| | *n* | ASA 3 | | ASA 4 | | ASA 5 | |
|---|---|---|---|---|---|---|---|
| Males | 1431 | 394 | 28% | 14 | 1% | 1 | 0.07% |
| Females | 2440 | 733 | 30% | 16 | 0.7% | 0 | 0% |
| Persons | 3871 | 1127 | 29% | 30 | 0.8% | 1 | 0.03% |

The ASA scoring system categorises patients into the following categories of pre-operative physical status, as an approximate estimate of anaesthetic risk:

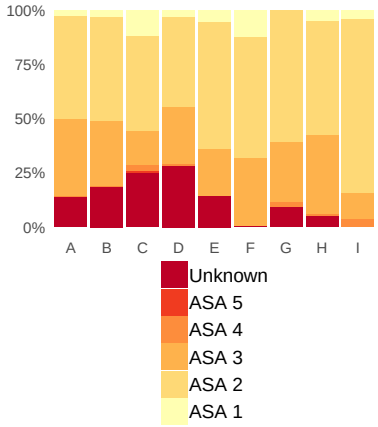
1. a normal healthy person
2. a person with mild systemic disease
3. a person with severe systemic disease
4. a person with severe systemic disease that is a constant threat to life
5. a moribund person who is not expected to survive

ASA — Revision knees

| | *n* | Missing | | ASA 1 | | ASA 2 | |
|---|---|---|---|---|---|---|---|
| Males | 57 | 14 | 25% | 2 | 4% | 22 | 39% |
| Females | 73 | 9 | 12% | 0 | 0% | 34 | 47% |
| Persons | 130 | 23 | 18% | 2 | 2% | 56 | 43% |

| | *n* | ASA 3 | | ASA 4 | | ASA 5 | |
|---|---|---|---|---|---|---|---|
| Males | 57 | 19 | 33% | 0 | 0% | 0 | 0% |
| Females | 73 | 29 | 40% | 1 | 1% | 0 | 0% |
| Persons | 130 | 48 | 37% | 1 | 0.8% | 0 | 0% |

The chart below shows the variation in the proportion of knee arthroplasty patients in each ASA category between ACORN hospitals. The order of hospitals and their labels is random.




### 5.2.3 *Type & Laterality of Surgery*

Type & Laterality — Primary & revision knees

| Type | *n* | Missing | | Left | | Right | | Bilateral | |
|---|---|---|---|---|---|---|---|---|---|
| Primary | 3871 | 1 | 0.03% | 1723 | 45% | 1875 | 48% | 272 | 7% |
| Revision | 130 | 1 | 0.8% | 52 | 40% | 77 | 59% | 0 | 0% |

**Please note**: In the interest of brevity, each joint in the primary bilateral knee arthroplasties recorded by the ACORN registry are not reported separately in this document — only data for the index joint (generally the right) of a bilateral procedure is included in this report. Future iterations of this report may provide additional details of each joint in bilateral procedures.

### 5.2.4 *Principal Reason for Surgery*

#### Reason for Surgery — Primary knees

| | *n* | OA | | RA | | DDH | |
|---|---|---|---|---|---|---|---|
| Male | 1431 | 1383 | 97% | 3 | 0.2% | 0 | 0% |
| Female | 2440 | 2345 | 96% | 22 | 0.9% | 0 | 0% |
| Persons | 3871 | 3728 | 96% | 25 | 0.6% | 0 | 0% |

| | *n* | Oth arth | | ON/AVN | | Tumour | |
|---|---|---|---|---|---|---|---|
| Male | 1431 | 1 | 0.07% | 4 | 0.3% | 0 | 0% |
| Female | 2440 | 2 | 0.08% | 6 | 0.2% | 0 | 0% |
| Persons | 3871 | 3 | 0.08% | 10 | 0.3% | 0 | 0% |

| | *n* | Other | | Missing | |
|---|---|---|---|---|---|
| Male | 1431 | 15 | 1% | 25 | 2% |
| Female | 2440 | 12 | 0.5% | 53 | 2% |
| Persons | 3871 | 27 | 0.7% | 78 | 2% |

*OA*
: osteoarthritis

*RA*
: rheumatoid arthritis

*DDH*
: developmental dysplasia of the hips

*Oth arth*
: other inflammatory arthritis

*ON/AVN*
: osteonecrosis/avascular necrosis

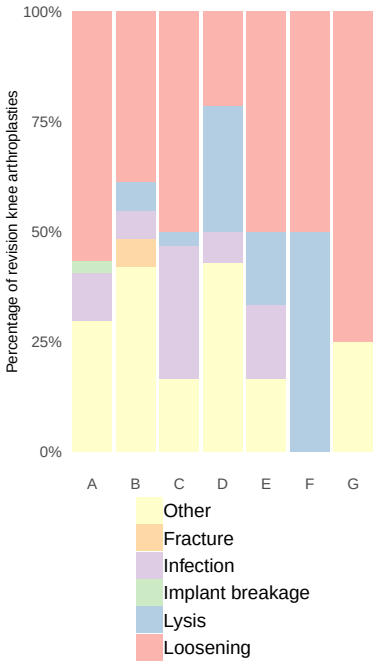
#### Reason for Surgery — Revision knees

| | *n* | Loosening | | Lysis | | Dislocation | |
|---|---|---|---|---|---|---|---|
| Male | 57 | 19 | 33% | 6 | 11% | 0 | 0% |
| Female | 73 | 39 | 53% | 3 | 4% | 0 | 0% |
| Persons | 130 | 58 | 45% | 9 | 7% | 0 | 0% |

| | *n* | Implant break | | Infection | | Fracture | |
|---|---|---|---|---|---|---|---|
| Male | 57 | 1 | 2% | 11 | 19% | 0 | 0% |
| Female | 73 | 0 | 0% | 6 | 8% | 2 | 3% |
| Persons | 130 | 1 | 0.8% | 17 | 13% | 2 | 2% |

| | *n* | Other | | Missing | |
|---|---|---|---|---|---|
| Male | 57 | 17 | 30% | 3 | 5% |
| Female | 73 | 20 | 27% | 3 | 4% |
| Persons | 130 | 37 | 28% | 6 | 5% |

The chart below shows the variation in reasons for **revision** in knee arthroplasty patients between ACORN hospitals. Revisions are relatively uncommon, and thus many of the differences may be random variation, but some systematic variation between hospitals may be present. More data would be needed to investigate this. The order of hospitals and their labels is random. One hospital did not perform any revisions.



## 5.3 Acute Care Measures

During the admitted period of care, the specific acute care measures collected by ACORN are: any requirement for a high care bed and whether this was a planned or unplanned admission to that bed; any complication experienced during the admitted acute care stay; the need for a blood transfusion; and discharge destination from the acute care ward.

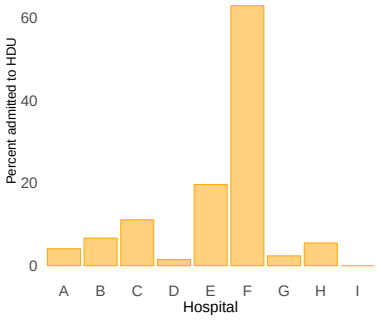
Complications are required to have been documented in the medical record. They include delirium, surgical site infection (SSI), deep venous thrombosis (DVT), pulmonary embolus (PE), respiratory infection, cardiovascular events, dislocation, fracture, nerve injury, bladder infection or retention, wound dehiscence, and death.

### 5.3.1 High Care Bed Utilisation

HIGH CARE BED UTILISATION — PRIMARY KNEES

| | *n* | Missing | | High Care Bed | | Unplanned* | |
|---|---|---|---|---|---|---|---|
| Male | 1431 | 2 | 0.1% | 136 | 10% | 104 | 76% |
| Female | 2440 | 1 | 0.04% | 178 | 7% | 111 | 62% |
| Persons | 3871 | 3 | 0.08% | 314 | 8% | 215 | 68% |

The chart below shows the variation in high care bed utilisation following **primary** knee arthroplasty between ACORN hospitals. The labelling and order of hospitals is randomised.




HIGH CARE BED UTILISATION — REVISION KNEES

| | *n* | Missing | | High Care Bed | | Unplanned* | |
|---|---|---|---|---|---|---|---|
| Male | 57 | 0 | 0% | 5 | 9% | 3 | 60% |
| Female | 73 | 0 | 0% | 4 | 5% | 3 | 75% |
| Persons | 130 | 0 | 0% | 9 | 7% | 6 | 67% |

* Percentage of admissions to high care beds which were unplanned.

### 5.3.2 *Peri-operative Blood Transfusion*

#### Blood Transfusion — Primary knees

| | *n* | Missing | | Transfused | | Mean units |
|---|---|---|---|---|---|---|
| Male | 1431 | 11 | 0.8% | 57 | 4% | 2.2 |
| Female | 2440 | 20 | 0.8% | 161 | 7% | 1.9 |
| Persons | 3871 | 31 | 0.8% | 218 | 6% | 2 |

| | *n* | Autologous † | | Donor † | | Missing source | |
|---|---|---|---|---|---|---|---|
| Male | 1431 | 2 | 4% | 42 | 74% | 11 | 19% |
| Female | 2440 | 4 | 2% | 114 | 71% | 33 | 20% |
| Persons | 3871 | 6 | 3% | 156 | 72% | 44 | 20% |

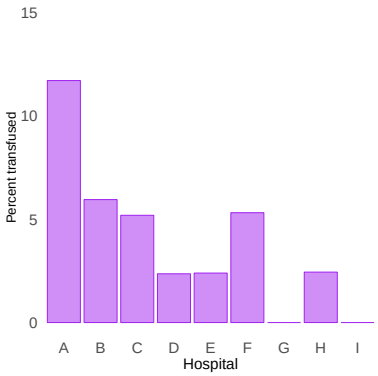
#### Blood Transfusion — Revision knees

| | *n* | Missing | | Transfused | | Mean units |
|---|---|---|---|---|---|---|
| Male | 57 | 1 | 2% | 10 | 18% | 2.3 |
| Female | 73 | 1 | 1% | 9 | 12% | 1.6 |
| Persons | 130 | 2 | 2% | 19 | 15% | 1.9 |

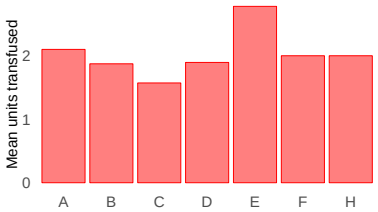
| | *n* | Autologous † | | Donor † | | Missing source | |
|---|---|---|---|---|---|---|---|
| Male | 57 | 0 | 0% | 7 | 70% | 1 | 10% |
| Female | 73 | 1 | 11% | 6 | 67% | 1 | 11% |
| Persons | 130 | 1 | 5% | 13 | 68% | 2 | 11% |

* percentages are of patients who received transfusions.

The chart below shows the variation in blood transfusion utilisation following **primary** knee arthroplasty between ACORN hospitals. The labelling and order of hospitals is randomised.




The variation between hospitals in the mean number of units transfused (in those patients receiving a transfusion) for primary knee arthroplasty patients is shown below.



### *5.3.3 Complications during Index Admission*

COMPLICATIONS (ANY) DURING ADMISSION — PRIMARY KNEES

| | *n* | 1 or more | | None | | Unk/NS | |
|---|---|---|---|---|---|---|---|
| Males | 1431 | 233 | (16%) | 1178 | (82%) | 14 | (1%) |
| Females | 2440 | 307 | (13%) | 2098 | (86%) | 30 | (1%) |
| Persons | 3871 | 540 | (14%) | 3276 | (85%) | 44 | (1%) |

COMPLICATIONS (DETAILS) DURING ADMISSION — PRIMARY KNEES

| Complications | Males | | Females | | Persons | |
|---|---|---|---|---|---|---|
| Drug reaction | 1 | 0.07% | 1 | 0.041% | 2 | 0.052% |
| Delirium | 21 | 1.5% | 16 | 0.66% | 37 | 0.96% |
| SSI requiring oral antibiotics | 0 | 0% | 0 | 0% | 0 | 0% |
| SSI requiring IV antibiotics | 0 | 0% | 4 | 0.16% | 4 | 0.1% |
| SSI requ surg c̄ prosth removal | 0 | 0% | 0 | 0% | 0 | 0% |
| SSI requ surg s̄ prosth removal | 0 | 0% | 0 | 0% | 0 | 0% |
| Deep vein thrombosis | 5 | 0.35% | 8 | 0.33% | 13 | 0.34% |
| Pulmonary embolus | 4 | 0.28% | 17 | 0.7% | 21 | 0.54% |
| Fat emboli | 0 | 0% | 1 | 0.041% | 1 | 0.026% |
| Respiratory infection | 4 | 0.28% | 18 | 0.74% | 22 | 0.57% |
| CVS | 27 | 1.9% | 52 | 2.1% | 79 | 2% |
| Dislocation | 0 | 0% | 0 | 0% | 0 | 0% |
| Fracture | 3 | 0.21% | 11 | 0.45% | 14 | 0.36% |
| Nerve injury | 2 | 0.14% | 4 | 0.16% | 6 | 0.15% |
| Urinary tract infection | 20 | 1.4% | 17 | 0.7% | 37 | 0.96% |
| Urinary retention | 44 | 3.1% | 15 | 0.61% | 59 | 1.5% |
| Wound dehiscence | 18 | 1.3% | 17 | 0.7% | 35 | 0.9% |
| Reoperation during index adm | 0 | 0% | 2 | 0.082% | 2 | 0.052% |
| Pressure area | 1 | 0.07% | 3 | 0.12% | 4 | 0.1% |
| Fall | 6 | 0.42% | 9 | 0.37% | 15 | 0.39% |
| Hypotension | 10 | 0.7% | 19 | 0.78% | 29 | 0.75% |
| Cellulitis | 5 | 0.35% | 7 | 0.29% | 12 | 0.31% |
| Death | 0 | 0% | 1 | 0.041% | 1 | 0.026% |
| Other | 55 | 3.8% | 82 | 3.4% | 137 | 3.5% |

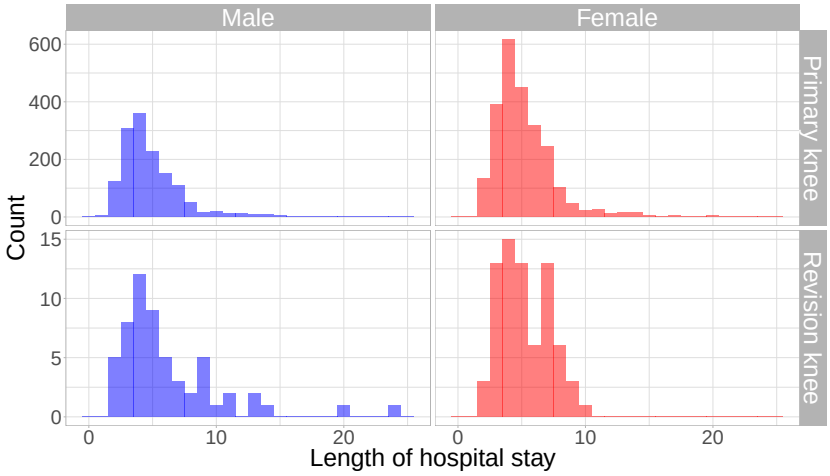
### Complications (any) during Admission — Revision knees

| | *n* | 1 or more | | None | | Unk/NS | |
|---|---|---|---|---|---|---|---|
| Males | 57 | 6 | (11%) | 50 | (88%) | 1 | (2%) |
| Females | 73 | 6 | (8%) | 66 | (90%) | 1 | (1%) |
| Persons | 130 | 12 | (9%) | 116 | (89%) | 2 | (2%) |

### Complications (details) during Admission — Revision knees

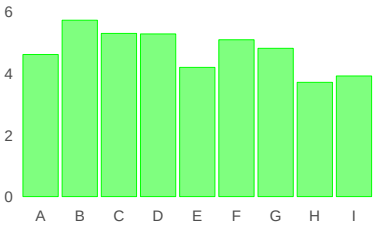
| Complications | Males | | Females | | Persons | |
|---|---|---|---|---|---|---|
| Drug reaction | 0 | 0% | 0 | 0% | 0 | 0% |
| Delirium | 0 | 0% | 0 | 0% | 0 | 0% |
| SSI requiring oral antibiotics | 0 | 0% | 0 | 0% | 0 | 0% |
| SSI requiring IV antibiotics | 0 | 0% | 0 | 0% | 0 | 0% |
| SSI requ surg c̄ prosth removal | 0 | 0% | 0 | 0% | 0 | 0% |
| SSI requ surg s̄ prosth removal | 0 | 0% | 0 | 0% | 0 | 0% |
| Deep vein thrombosis | 0 | 0% | 1 | 1.4% | 1 | 0.77% |
| Pulmonary embolus | 0 | 0% | 0 | 0% | 0 | 0% |
| Fat emboli | 0 | 0% | 0 | 0% | 0 | 0% |
| Respiratory infection | 0 | 0% | 1 | 1.4% | 1 | 0.77% |
| CVS | 1 | 1.8% | 0 | 0% | 1 | 0.77% |
| Dislocation | 0 | 0% | 0 | 0% | 0 | 0% |
| Fracture | 0 | 0% | 0 | 0% | 0 | 0% |
| Nerve injury | 0 | 0% | 0 | 0% | 0 | 0% |
| Urinary tract infection | 0 | 0% | 1 | 1.4% | 1 | 0.77% |
| Urinary retention | 0 | 0% | 1 | 1.4% | 1 | 0.77% |
| Wound dehiscence | 1 | 1.8% | 0 | 0% | 1 | 0.77% |
| Reoperation during index adm | 0 | 0% | 0 | 0% | 0 | 0% |
| Pressure area | 0 | 0% | 0 | 0% | 0 | 0% |
| Fall | 0 | 0% | 0 | 0% | 0 | 0% |
| Hypotension | 1 | 1.8% | 0 | 0% | 1 | 0.77% |
| Cellulitis | 0 | 0% | 0 | 0% | 0 | 0% |
| Death | 0 | 0% | 0 | 0% | 0 | 0% |
| Other | 3 | 5.3% | 1 | 1.4% | 4 | 3.1% |

### 5.3.4 *Length of Stay in Hospital*




The plot at left excludes 5 cases in which the length of stay in hospital was greater than 25 days.

The variation between hospitals in the mean length of stay (in days) for primary knee arthroplasty patients is shown below.




#### Length of Stay in Hospital — Primary knees

| | *n* | | Missing | | Mean | Median | 75th %ile | 95th %ile |
|---|---|---|---|---|---|---|---|---|
| Male | 1431 | 37% | 3 | 0.2% | 4.9 | 4 | 6 | 10 |
| Female | 2440 | 63% | 10 | 0.4% | 5.2 | 5 | 6 | 9 |
| Persons | 3871 | 100% | 13 | 0.3% | 5.1 | 4 | 6 | 10 |

#### Length of Stay in Hospital — Revision knees

| | *n* | | Missing | | Mean | Median | 75th %ile | 95th %ile |
|---|---|---|---|---|---|---|---|---|
| Male | 57 | 44% | 0 | 0% | 6.2 | 5 | 8 | 13 |
| Female | 73 | 56% | 0 | 0% | 5.2 | 5 | 7 | 8.4 |
| Persons | 130 | 100% | 0 | 0% | 5.7 | 5 | 7 | 11 |

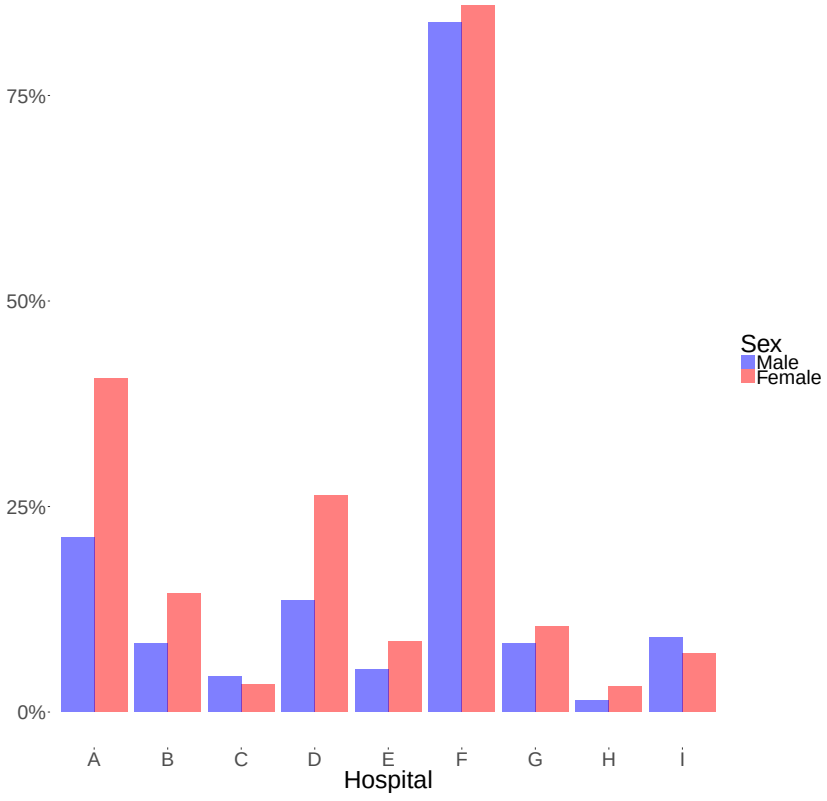
### 5.3.5 *Discharge Destination*

DISCHARGE DESTINATION — PRIMARY KNEES

| | *n* | Unk/NS | | Usual residence | | Inpatient rehab | | Other | |
|---|---|---|---|---|---|---|---|---|---|
| Male | 1431 | 18 | 1% | 1206 | 84% | 202 | 14% | 5 | 0.3% |
| Female | 2440 | 33 | 1% | 1852 | 76% | 545 | 22% | 10 | 0.4% |
| Persons | 3871 | 51 | 1% | 3058 | 79% | 747 | 19% | 15 | 0.4% |

DISCHARGE DESTINATION — REVISION KNEES

| | *n* | Unk/NS | | Usual residence | | Inpatient rehab | | Other | |
|---|---|---|---|---|---|---|---|---|---|
| Male | 57 | 2 | 4% | 47 | 82% | 8 | 14% | 0 | 0% |
| Female | 73 | 0 | 0% | 55 | 75% | 18 | 25% | 0 | 0% |
| Persons | 130 | 2 | 2% | 102 | 78% | 26 | 20% | 0 | 0% |




There is considerable variation between hospitals in the proportion of knee arthroplasty patients who are discharged to inpatient rehabilitation. The graph at left demonstrates this variation for primary knee arthroplasty patients. Hospital identities have been randomised.

## *5.4 Patient-Reported Outcome Measures (PROMs)*

Patient-reported outcome measures (PROMs) are measures of health status collected directly from the person. In ACORN, they provide a personal perspective of the impact of surgery by comparing health status at two different points in time, therefore allowing comparison of not only clinical measures but also the perceptions of the individual.

Since March 2013, ACORN has included measures of the individual's expectations of surgical outcome. Prior to admission, each person is asked "what are your expectations of your hip/knee pain six months after your surgery?" and "what are your expectations of your functional ability six months after your surgery?" At follow-up, questions to measure perceived satisfaction and success are asked. These replicate the questions used by the PROMs programme in England and Wales. They have been incorporated into ACORN's post-operative follow-up with permission from the National Joint Registry (NJR) England & Wales.

For satisfaction, the question asked is "how would you describe the results of your operation?" with five options provided: excellent; very good; good; fair; or poor.

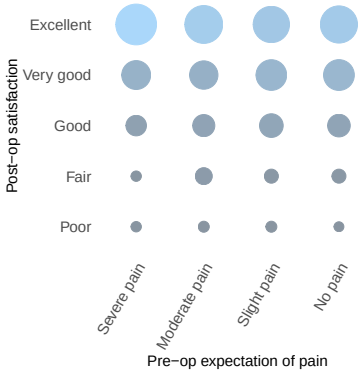
For success, the question asked is "overall, how are the problems now with your hip/knee on which you had surgery, compared to before your operation?" This question also allows the person to choose one of five options: much better; a little better; about the same; a little worse; and much worse.

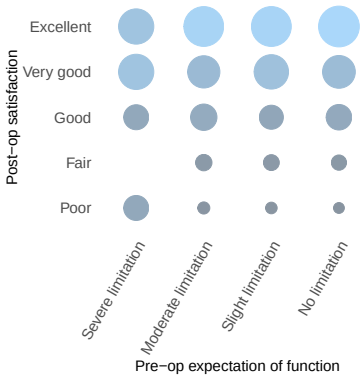
In addition, ACORN asks participants whether they have been re-admitted to hospital since discharge, had another operation on the joint that was replaced six months earlier, and whether they have experienced any other problem not requiring re-admission or re-operation. By asking this additional question about problems not requiring re-admission or re-operation, ACORN is able to capture those outcomes that continue to impact the individual or have resulted in additional services being utilised in the primary or community care setting, although they have not resulted in additional utilisation of admitted hospital services.

The Oxford Hip Score (OHS) and the Oxford Knee Score (OKS) are 12-item, person-reported instruments developed to assess pain and function in people undergoing hip or knee arthroplasty. The questionnaires explore a person's perception of their pain and functional impairment in tasks of daily living over the previous four weeks. The least difficulty undertaking tasks or the least severity of symptoms scores four points, and the most severe symptoms and dysfunction scores zero. The individual scores are summed to achieve a single score, with the highest attainable score of 48 indicating a person who experiences no functional impairment and no pain. The lowest score of 0 means the person has severe pain and functional impairment as a result of their joint problems. In reporting the

A person's pre-operative expectations of their post-operative pain and function are considered to be important predictors of the outcome of joint replacement surgery.

The charts below illustrate this relationship between pre-operative expectation of pain following surgery and 6-month satisfaction rating (top chart), and pre-operative expectation of joint function following surgery and 6-month satisfaction rating (lower chart) for **primary knee arthroplasty** patients. The area of each circle indicates the proportion of patients in each pre-operative expectation category who end up in each the 6-month post-operative satisfaction categories.



Oxford Hip and Knee Scores, outcomes are additionally grouped into four score categories, as reported by the New Zealand Joint Registry. Prior to surgery, the surveys are patient-completed. After surgery, an interviewer completes the surveys by the telephone.

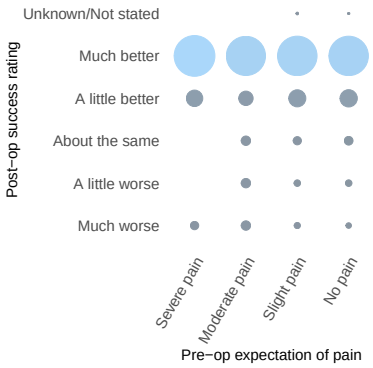
The EQ-VAS records a person's self-rated health on a 20 cm vertical scale with 0 at the bottom representing "worst health imaginable" and 100 at the top representing "best health imaginable". Prior to surgery, the surveys are completed by patients on paper. After surgery, the surveys are completed over the telephone by an interviewer.

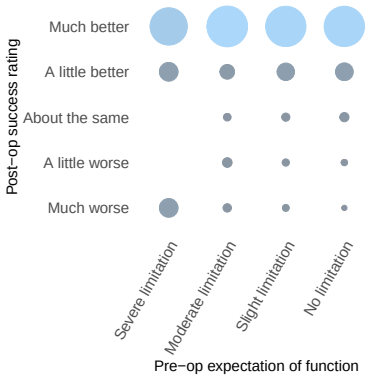
The EQ-5D-5L is a descriptive system of five dimensions of a person's general health. The dimensions are Mobility, Self-care, Usual Activities, Pain or Discomfort, and Anxiety or Depression. Each dimension has five levels: no problems, slight problems, moderate problems, severe problems, or extreme problems. A person is asked to indicate his/her health state by marking the box beside the most appropriate statement in each of the five dimensions on the day the survey is administered. Prior to surgery, the surveys are patient-completed. After surgery, the surveys are completed over the telephone by an interviewer.

**Please note**: Only those patients for whom 6 month follow-up is complete or who have been declared lost to follow-up appear in the tables and graphs below that show 6 month follow-up data.

The EQ-5D quality of life scores provide a measure of the overall effect of the procedure on a person's health and well-being. They also allow different types of procedures to be compared.

The charts below illustrate this relationship between pre-operative expectation of pain following surgery and 6-month rating of success (top chart), and pre-operative expectation of joint function following surgery and 6-month rating of success (lower chart) for **primary knee arthroplasty** patients. The area of each circle indicates the proportion of patients in each pre-operative expectation category who end up in each the 6-month post-operative success rating categories.



### 5.4.1 *Pre-op Expectation of Pain at 6 months post-op*

EXPECTATION OF PAIN — PRIMARY KNEES

| | *n* | Unknown/ Not stated | | No pain | | Slight pain | | Moderate pain | | Severe pain | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Male | 1431 | 244 | 17% | 731 | 51% | 369 | 26% | 71 | 5% | 16 | 1% |
| Female | 2440 | 453 | 19% | 1144 | 47% | 698 | 29% | 130 | 5% | 15 | 0.6% |
| Persons | 3871 | 697 | 18% | 1875 | 48% | 1067 | 28% | 201 | 5% | 31 | 0.8% |

EXPECTATION OF PAIN — REVISION KNEES

| | *n* | Unknown/ Not stated | | No pain | | Slight pain | | Moderate pain | | Severe pain | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Male | 57 | 11 | 19% | 21 | 37% | 17 | 30% | 7 | 12% | 1 | 2% |
| Female | 73 | 11 | 15% | 28 | 38% | 30 | 41% | 4 | 5% | 0 | 0% |
| Persons | 130 | 22 | 17% | 49 | 38% | 47 | 36% | 11 | 8% | 1 | 0.8% |

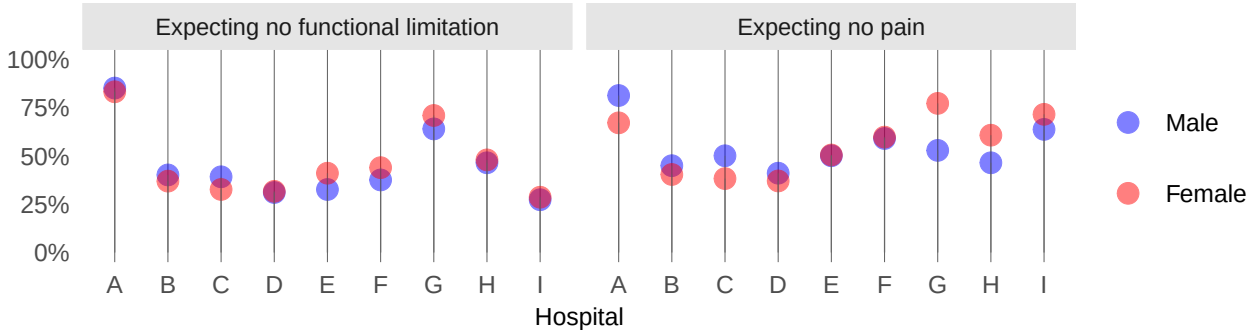
### 5.4.2 *Pre-op Expectation of Function at 6 months post-op*

EXPECTATION OF FUNCTION — PRIMARY KNEES

| | *n* | Unknown/ Not stated | | No limitation | | Slight limitation | | Moderate limitation | | Severe limitation | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Male | 1431 | 246 | 17% | 644 | 45% | 471 | 33% | 67 | 5% | 3 | 0.2% |
| Female | 2440 | 450 | 18% | 1102 | 45% | 750 | 31% | 134 | 5% | 4 | 0.2% |
| Persons | 3871 | 696 | 18% | 1746 | 45% | 1221 | 32% | 201 | 5% | 7 | 0.2% |

EXPECTATION OF FUNCTION — REVISION KNEES

| | *n* | Unknown/ Not stated | | No limitation | | Slight limitation | | Moderate limitation | | Severe limitation | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Male | 57 | 11 | 19% | 22 | 39% | 18 | 32% | 6 | 11% | 0 | 0% |
| Female | 73 | 11 | 15% | 33 | 45% | 28 | 38% | 1 | 1% | 0 | 0% |
| Persons | 130 | 22 | 17% | 55 | 42% | 46 | 35% | 7 | 5% | 0 | 0% |



**Please note:** The data shown in the remainder of this PROMs section of the report only include those patients for whom six month follow-up is complete or who were deemed lost to follow-up.

### *5.4.3 Satisfaction at 6 months post-op*

SATISFACTION AT 6 MONTHS POST-OP — PRIMARY KNEES

| | *n* | Unk/NS | | Poor | | Fair | | Good | | Very good | | Excellent | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Male | 1428 | 103 | 7% | 45 | 3% | 80 | 6% | 196 | 14% | 404 | 28% | 600 | 42% |
| Female | 2436 | 203 | 8% | 75 | 3% | 151 | 6% | 391 | 16% | 684 | 28% | 932 | 38% |
| Persons | 3864 | 306 | 8% | 120 | 3% | 231 | 6% | 587 | 15% | 1088 | 28% | 1532 | 40% |

SATISFACTION AT 6 MONTHS POST-OP — REVISION KNEES

| | *n* | Unk/NS | | Poor | | Fair | | Good | | Very good | | Excellent | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Male | 57 | 6 | 11% | 5 | 9% | 6 | 11% | 16 | 28% | 10 | 18% | 14 | 25% |
| Female | 73 | 1 | 1% | 6 | 8% | 5 | 7% | 15 | 21% | 24 | 33% | 22 | 30% |
| Persons | 130 | 7 | 5% | 11 | 8% | 11 | 8% | 31 | 24% | 34 | 26% | 36 | 28% |

### *5.4.4 Patient-perceived Success at 6 months post-op*

SUCCESS AT 6 MONTHS POST-OP — PRIMARY KNEES

| | *n* | Unk/NS | | much worse | | a little worse | | about the same | | a little better | | much better | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Male | 1428 | 102 | 7% | 23 | 2% | 32 | 2% | 48 | 3% | 189 | 13% | 1034 | 72% |
| Female | 2436 | 203 | 8% | 43 | 2% | 46 | 2% | 81 | 3% | 334 | 14% | 1729 | 71% |
| Persons | 3864 | 305 | 8% | 66 | 2% | 78 | 2% | 129 | 3% | 523 | 14% | 2763 | 72% |

SUCCESS AT 6 MONTHS POST-OP — REVISION KNEES

| | *n* | Unk/NS | | much worse | | a little worse | | about the same | | a little better | | much better | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Male | 57 | 7 | 12% | 2 | 4% | 5 | 9% | 5 | 9% | 11 | 19% | 27 | 47% |
| Female | 73 | 2 | 3% | 2 | 3% | 2 | 3% | 5 | 7% | 14 | 19% | 48 | 66% |
| Persons | 130 | 9 | 7% | 4 | 3% | 7 | 5% | 10 | 8% | 25 | 19% | 75 | 58% |

### *5.4.5 Complications in the 6 months post-op*

POST-DISCHARGE COMPLICATIONS (ANY) — PRIMARY KNEES

| | *n* | None | | 1 | | 2 | | 3 or more | | Number unknown | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Male | 1428 | 501 | 35% | 255 | 18% | 129 | 9% | 106 | 7% | 437 | 31% |
| Female | 2436 | 880 | 36% | 436 | 18% | 223 | 9% | 165 | 7% | 732 | 30% |
| Persons | 3864 | 1381 | 36% | 691 | 18% | 352 | 9% | 271 | 7% | 1169 | 30% |

POST-DISCHARGE COMPLICATIONS (ANY) — REVISION KNEES

| | *n* | None | | 1 | | 2 | | 3 or more | | Number unknown | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Male | 57 | 14 | 25% | 12 | 21% | 4 | 7% | 5 | 9% | 22 | 39% |
| Female | 73 | 23 | 32% | 17 | 23% | 9 | 12% | 5 | 7% | 19 | 26% |
| Persons | 130 | 37 | 28% | 29 | 22% | 13 | 10% | 10 | 8% | 41 | 32% |

POST-DISCHARGE COMPLICATIONS (DETAILS) IN THE 6 MONTHS POST-OP — PRIMARY & REVISION KNEES

| | Primary knees (*n*=3864) | | Revision knees (*n*=130) | |
|---|---|---|---|---|
| SSI requiring oral antibiotics | 154 | 4% | 6 | 4.6% |
| SSI requiring IV antibiotics | 6 | 0.16% | 0 | 0% |
| DVT index leg | 57 | 1.5% | 1 | 0.77% |
| DVT other leg | 1 | 0.026% | 0 | 0% |
| DVT both legs | 0 | 0% | 1 | 0.77% |
| Pulmonary embolus | 7 | 0.18% | 1 | 0.77% |
| Dislocation | 3 | 0.078% | 0 | 0% |
| Joint stiffness | 491 | 13% | 22 | 17% |
| Bladder infection or retention | 5 | 0.13% | 2 | 1.5% |
| Fracture | 3 | 0.078% | 1 | 0.77% |
| Unexpected pain | 323 | 8.4% | 17 | 13% |
| Cardiac | 3 | 0.078% | 0 | 0% |
| Stroke | 0 | 0% | 0 | 0% |
| Leg length discrepancy | 64 | 1.7% | 3 | 2.3% |
| Joint or lower limb swelling | 452 | 12% | 14 | 11% |
| Paraesthesia or numbness | 459 | 12% | 12 | 9.2% |
| Cellulitis | 14 | 0.36% | 0 | 0% |
| Neuropathy | 36 | 0.93% | 0 | 0% |
| Muscle weakness | 50 | 1.3% | 3 | 2.3% |
| Respiratory infection | 3 | 0.078% | 0 | 0% |
| Other | 129 | 3.3% | 6 | 4.6% |

## Combined Complications (details) in the 6 months post-op — Primary & revision knees

| | Primary knees (*n*=3865) | | Revision knees (*n*=130) | |
|---|---|---|---|---|
| SSI requiring oral antibiotics | 154 | 4% | 6 | 4.6% |
| SSI requiring IV antibiotics | 10 | 0.26% | 0 | 0% |
| SSI requ surg c̄ prosth removal | 0 | 0% | 0 | 0% |
| SSI requ surg s̄ prosth removal | 0 | 0% | 0 | 0% |
| Deep vein thrombosis | 70 | 1.8% | 2 | 1.5% |
| Pulmonary embolus | 27 | 0.7% | 1 | 0.77% |
| Fat emboli | 1 | 0.026% | 0 | 0% |
| Drug reaction | 2 | 0.052% | 0 | 0% |
| Delirium | 37 | 0.96% | 0 | 0% |
| Hypotension | 29 | 0.75% | 1 | 0.77% |
| CVS | 82 | 2.1% | 1 | 0.77% |
| Respiratory infection | 25 | 0.65% | 1 | 0.77% |
| Urinary tract infection or retention | 96 | 2.5% | 4 | 3.1% |
| Wound dehiscence | 35 | 0.91% | 1 | 0.77% |
| Pressure area | 4 | 0.1% | 0 | 0% |
| Fall | 15 | 0.39% | 0 | 0% |
| Cellulitis | 26 | 0.67% | 0 | 0% |
| Death | 12 | 0.31% | 0 | 0% |
| Dislocation | 3 | 0.078% | 0 | 0% |
| Fracture | 17 | 0.44% | 1 | 0.77% |
| Joint stiffness | 491 | 13% | 22 | 17% |
| Unexpected pain | 323 | 8.4% | 17 | 13% |
| Leg length discrepancy | 64 | 1.7% | 3 | 2.3% |
| Joint or lower limb swelling | 452 | 12% | 14 | 11% |
| Nerve injury† | 491 | 13% | 12 | 9.2% |
| Muscle weakness | 50 | 1.3% | 3 | 2.3% |
| Re-operation | 80 | 2.1% | 3 | 2.3% |
| Other | 260 | 6.7% | 10 | 7.7% |

This table combines complications which occurred during the hospital admission in which joint replacement surgery was performed, and complications which occurred following discharge from hospital but within six months after surgery.

*SSI* Surgical Site Infection

*CVS* Cardiovascular system

* including paraesthesia & numbness

### *5.4.6 Re-admission in the 6 months post-op*

RE-ADMISSION — PRIMARY KNEES

| | *n* | Missing | | Re-admission due to arthroplasty | | Re-admission for other reasons | | Total re-admissions | |
|---|---|---|---|---|---|---|---|---|---|
| Male | 1428 | 87 | 6% | 88 | 6% | 108 | 8% | 186 | 13% |
| Female | 2436 | 187 | 8% | 128 | 5% | 176 | 7% | 291 | 12% |
| Persons | 3864 | 274 | 7% | 216 | 6% | 284 | 7% | 477 | 12% |

RE-ADMISSION — REVISION KNEES

| | *n* | Missing | | Re-admission due to arthroplasty | | Re-admission for other reasons | | Total re-admissions | |
|---|---|---|---|---|---|---|---|---|---|
| Male | 57 | 6 | 11% | 4 | 7% | 4 | 7% | 7 | 12% |
| Female | 73 | 1 | 1% | 6 | 8% | 10 | 14% | 15 | 21% |
| Persons | 130 | 7 | 5% | 10 | 8% | 14 | 11% | 22 | 17% |

REASON FOR RE-ADMISSION — PRIMARY & REVISION KNEES

| | Primary (*n*=475) | | Revision (*n*=22) | |
|---|---|---|---|---|
| **Reasons related to arthroplasty** | | | | |
| DVT | 14 | 3% | 1 | 5% |
| Pulmonary embolus | 5 | 1% | 1 | 5% |
| MUA | 63 | 13% | 1 | 5% |
| Dislocation | 0 | 0% | 0 | 0% |
| Surgical site infection | 80 | 17% | 3 | 14% |
| Wound dehiscence | 3 | 0.6% | 0 | 0% |
| Index joint revision | 0 | 0% | 1 | 5% |
| Other | 49 | 10% | 3 | 14% |
| **Reasons unrelated to arthroplasty** | | | | |
| Cardiac | 20 | 4% | 1 | 5% |
| Renal/urinary tract | 23 | 5% | 3 | 14% |
| Cancer | 6 | 1% | 2 | 9% |
| Other | 232 | 49% | 8 | 36% |

### 5.4.7 *Re-operation in the 6 months post-op*

Re-operation — Primary knees

| | *n* | Re-operation due to arthroplasty | |
|---|---|---|---|
| Male | 1428 | 33 | 2% |
| Female | 2436 | 45 | 2% |
| Persons | 3864 | 78 | 2% |

Re-operation — Revision knees

| | *n* | Re-operation due to arthroplasty | |
|---|---|---|---|
| Male | 57 | 2 | 4% |
| Female | 73 | 1 | 1% |
| Persons | 130 | 3 | 2% |

Reason for Re-operation — Primary knees

| | Males (*n*=33) | | Females (*n*=45) | | Persons (*n*=78) | |
|---|---|---|---|---|---|---|
| SSI requiring surgery with no prosthesis removal | 9 | 27% | 11 | 24% | 20 | 26% |
| SSI requiring surgery with prosthesis removal | 1 | 3% | 6 | 13% | 7 | 9% |
| Dislocation | 0 | 0% | 0 | 0% | 0 | 0% |
| Joint stiffness | 19 | 58% | 22 | 49% | 41 | 53% |
| Periprosthetic fracture | 0 | 0% | 0 | 0% | 0 | 0% |
| Implant fracture | 0 | 0% | 1 | 2% | 1 | 1% |
| Bleeding | 0 | 0% | 0 | 0% | 0 | 0% |
| Other | 4 | 12% | 5 | 11% | 9 | 12% |
| Unknown/NS | 0 | 0% | 0 | 0% | 0 | 0% |

Reason for Re-operation — Revision knees

| | Males (*n*=2) | | Females (*n*=1) | | Persons (*n*=3) | |
|---|---|---|---|---|---|---|
| SSI requiring surgery with no prosthesis removal | 0 | 0% | 0 | 0% | 0 | 0% |
| SSI requiring surgery with prosthesis removal | 1 | 50% | 1 | 100% | 2 | 67% |
| Dislocation | 0 | 0% | 0 | 0% | 0 | 0% |
| Joint stiffness | 0 | 0% | 0 | 0% | 0 | 0% |
| Periprosthetic fracture | 0 | 0% | 0 | 0% | 0 | 0% |
| Implant fracture | 0 | 0% | 0 | 0% | 0 | 0% |
| Bleeding | 0 | 0% | 0 | 0% | 0 | 0% |
| Other | 1 | 50% | 0 | 0% | 1 | 33% |
| Unknown/NS | 0 | 0% | 0 | 0% | 0 | 0% |

*SSI* = Surgical Site Infection

### *5.4.8 Deaths in the 6 months post-op*

POST-DISCHARGE DEATH — PRIMARY KNEES

| | *n* | Unknown/ not stated | | Died in hospital | | Total deaths at 6 mths post-op | |
|---|---|---|---|---|---|---|---|
| Male | 1428 | 93 | 7% | 0 | 0% | 7 | 0.5% |
| Female | 2436 | 185 | 8% | 1 | 0.04% | 5 | 0.2% |
| Persons | 3864 | 278 | 7% | 1 | 0.03% | 12 | 0.3% |

POST-DISCHARGE DEATH — REVISION KNEES

| | *n* | Unknown/ not stated | | Died in hospital | | Total deaths at 6 mths post-op | |
|---|---|---|---|---|---|---|---|
| Male | 57 | 10 | 18% | 0 | 0% | 0 | 0% |
| Female | 73 | 4 | 5% | 0 | 0% | 0 | 0% |
| Persons | 130 | 14 | 11% | 0 | 0% | 0 | 0% |

---

**Please note:** The data shown in the following EQ-5D and EQ-VAS graphs and tables only refer to those patients for whom six month follow-up is complete. In the tables which follow in this section, "post-op" means at the follow-up contact, which occurs approximately six months post-operatively.

### 5.4.9 *EuroQoL EQ-5D Measures*

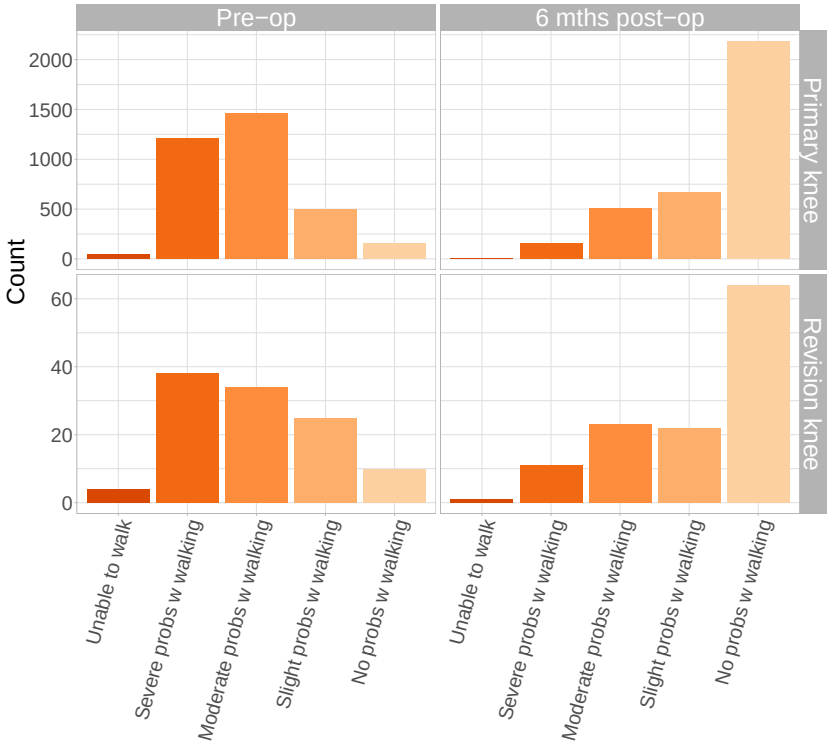



Figure 5.1: Knee Arthroplasties: Distribution of EQ-5D Mobility, pre-op versus post-op

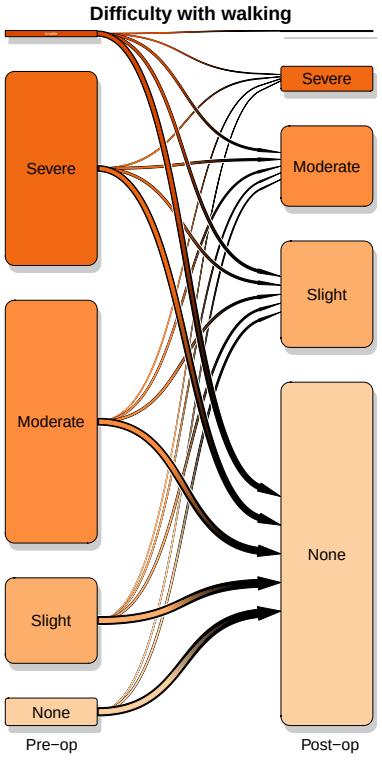
#### EQ-5D Mobility — Primary knees

| | Pre-op | | Post-op | |
|---|---|---|---|---|
| Unable to walk | 41 | 1% | 6 | 0.2% |
| Severe problems with walking | 1211 | 32% | 159 | 4% |
| Moderate problems with walking | 1462 | 38% | 505 | 13% |
| Slight problems with walking | 500 | 13% | 668 | 18% |
| No problems with walking | 156 | 4% | 2183 | 57% |
| Unknown/Not stated | 439 | 12% | 288 | 8% |

#### EQ-5D Mobility — Revision knees

| | Pre-op | | Post-op | |
|---|---|---|---|---|
| Unable to walk | 4 | 3% | 1 | 0.8% |
| Severe problems with walking | 38 | 29% | 11 | 9% |
| Moderate problems with walking | 34 | 26% | 23 | 18% |
| Slight problems with walking | 25 | 19% | 22 | 17% |
| No problems with walking | 10 | 8% | 64 | 50% |
| Unknown/Not stated | 18 | 14% | 8 | 6% |

The chart below shows the transition in mobility difficulty in **primary knee arthroplasty** patients, from pre-operatively on the left to six months post-operatively on the right.



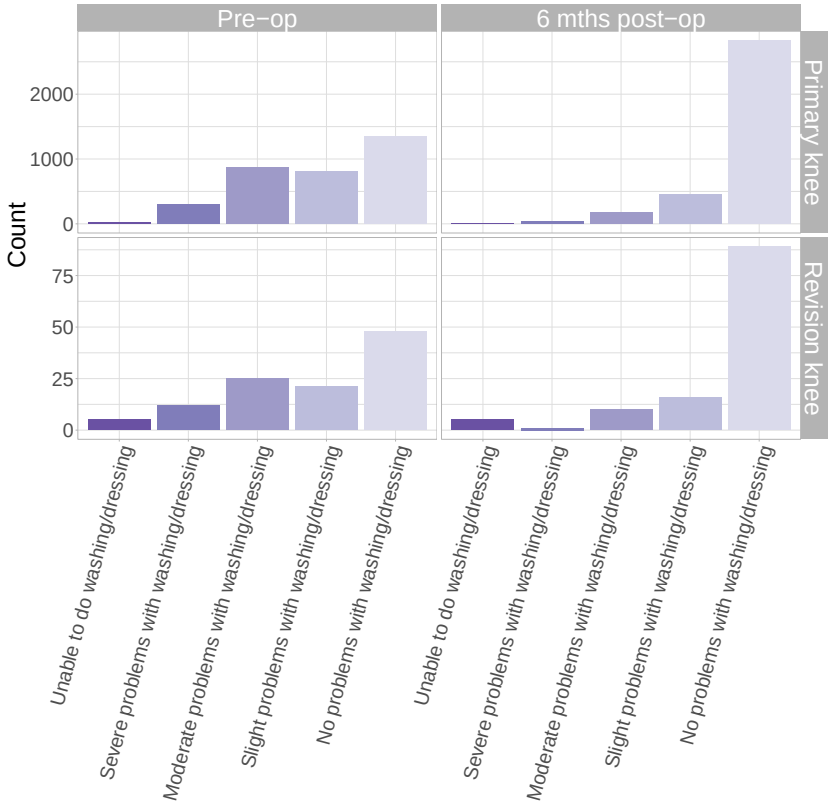



Figure 5.2: Knee Arthroplasties: Distribution of EQ-5D Personal Care, pre-op versus post-op

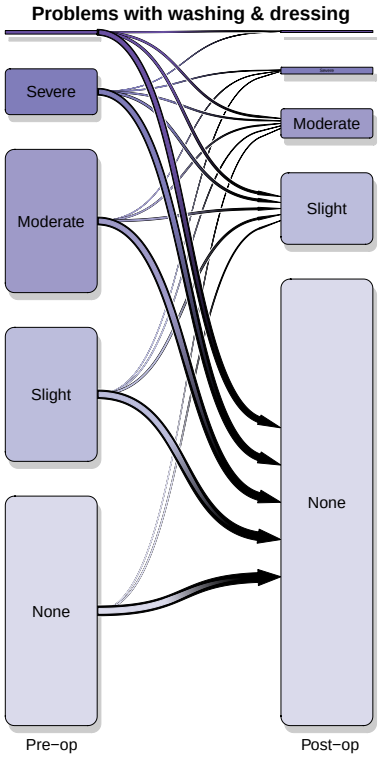
## EQ-5D Personal Care — Primary knees

| | Pre-op | | Post-op | |
|---|---|---|---|---|
| Unable to do washing/dressing | 26 | 0.7% | 11 | 0.3% |
| Severe problems washing/dressing | 307 | 8% | 43 | 1% |
| Mod. problems washing/dressing | 875 | 23% | 182 | 5% |
| Slight problems washing/dressing | 813 | 21% | 452 | 12% |
| No problems washing/dressing | 1350 | 35% | 2830 | 74% |
| Unknown/Not stated | 438 | 11% | 291 | 8% |

## EQ-5D Personal Care — Revision knees

| | Pre-op | | Post-op | |
|---|---|---|---|---|
| Unable to do washing/dressing | 5 | 4% | 5 | 4% |
| Severe problems washing/dressing | 12 | 9% | 1 | 0.8% |
| Mod. problems washing/dressing | 25 | 19% | 10 | 8% |
| Slight problems washing/dressing | 21 | 16% | 16 | 12% |
| No problems washing/dressing | 48 | 37% | 89 | 69% |
| Unknown/Not stated | 18 | 14% | 8 | 6% |

The chart below shows the transition in difficulty with washing and dressing in **primary knee arthroplasty** patients, from pre-operatively on the left to six months post-operatively on the right.



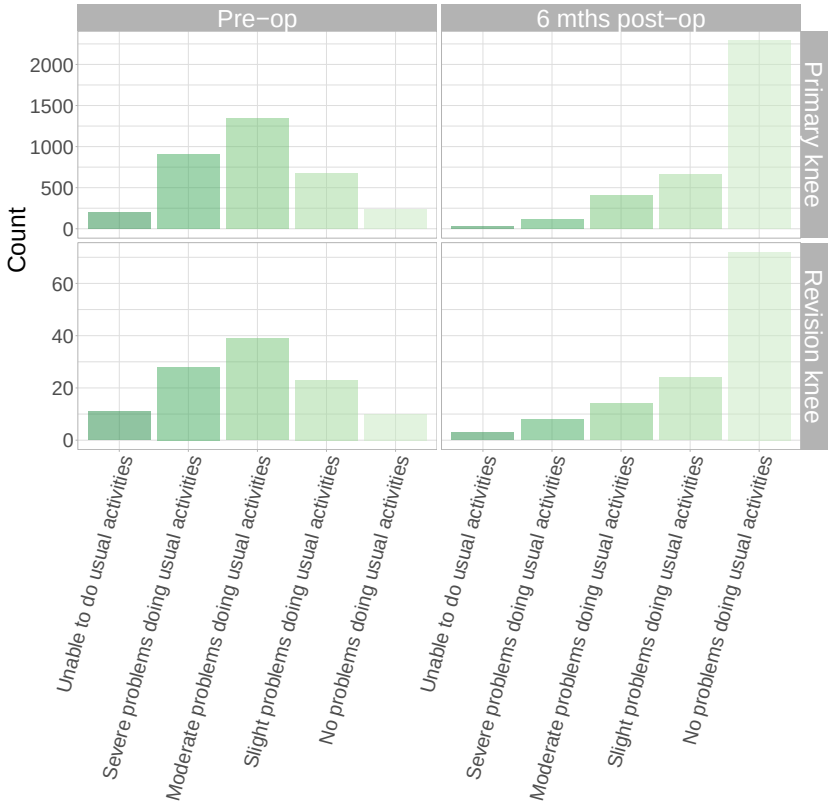



Figure 5.3: Knee Arthroplasties: Distribution of EQ-5D Usual Activities, pre-op versus post-op

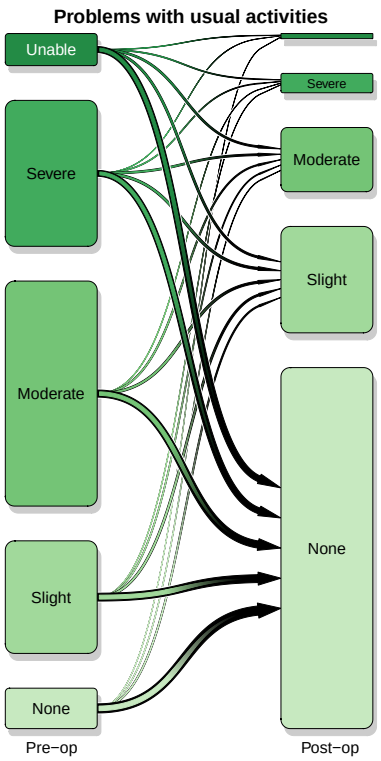
## EQ-5D Usual Activites — Primary knees

| | Pre-op | | Post-op | |
|---|---|---|---|---|
| Unable to do usual activities | 200 | 5% | 34 | 0.9% |
| Severe problems c̄ usual activities | 911 | 24% | 119 | 3% |
| Mod. problems c̄ usual activities | 1346 | 35% | 409 | 11% |
| Slight problems c̄ usual activities | 675 | 18% | 667 | 18% |
| No problems c̄ usual activities | 240 | 6% | 2290 | 60% |
| Unknown/Not stated | 437 | 11% | 290 | 8% |

## EQ-5D Usual Activites — Revision knees

| | Pre-op | | Post-op | |
|---|---|---|---|---|
| Unable to do usual activities | 11 | 9% | 3 | 2% |
| Severe problems c̄ usual activities | 28 | 22% | 8 | 6% |
| Mod. problems c̄ usual activities | 39 | 30% | 14 | 11% |
| Slight problems c̄ usual activities | 23 | 18% | 24 | 19% |
| No problems c̄ usual activities | 10 | 8% | 72 | 56% |
| Unknown/Not stated | 18 | 14% | 8 | 6% |

The chart below shows the transition in difficulty with usual activities in **primary knee arthroplasty** patients, from pre-operatively on the left to six months post-operatively on the right.



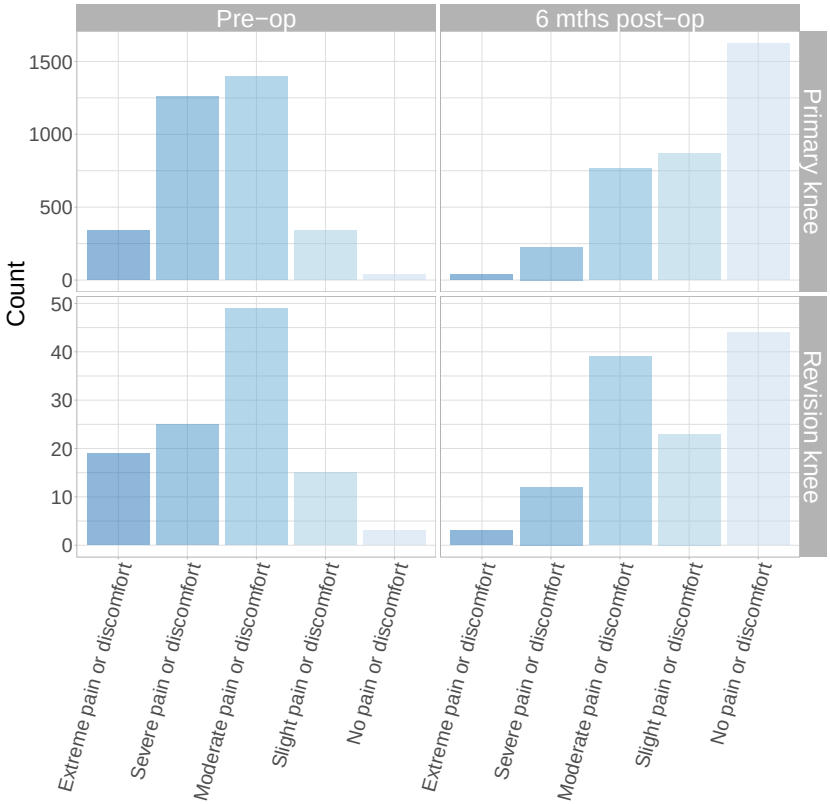



Figure 5.4: Knee Arthroplasties: Distribution of EQ-5D Discomfort, pre-op versus post-op

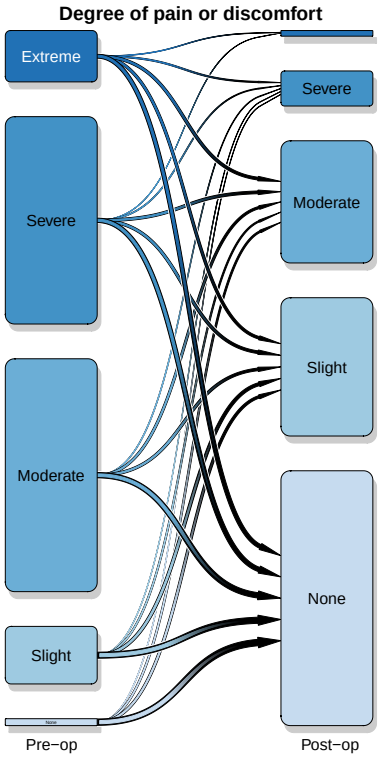
## EQ-5D Discomfort — Primary knees

| | Pre-op | | Post-op | |
|---|---|---|---|---|
| Extreme pain or discomfort | 338 | 9% | 36 | 0.9% |
| Severe pain or discomfort | 1260 | 33% | 227 | 6% |
| Moderate pain or discomfort | 1395 | 37% | 765 | 20% |
| Slight pain or discomfort | 341 | 9% | 866 | 23% |
| No pain or discomfort | 40 | 1% | 1626 | 43% |
| Unknown/not stated | 435 | 11% | 289 | 8% |

## EQ-5D Discomfort — Revision knees

| | Pre-op | | Post-op | |
|---|---|---|---|---|
| Extreme pain or discomfort | 19 | 15% | 3 | 2% |
| Severe pain or discomfort | 25 | 19% | 12 | 9% |
| Moderate pain or discomfort | 49 | 38% | 39 | 30% |
| Slight pain or discomfort | 15 | 12% | 23 | 18% |
| No pain or discomfort | 3 | 2% | 44 | 34% |
| Unknown/not stated | 18 | 14% | 8 | 6% |

The chart below shows the transition in the degree of pain or discomfort in **primary knee arthroplasty** patients, from pre-operatively on the left to six months post-operatively on the right.



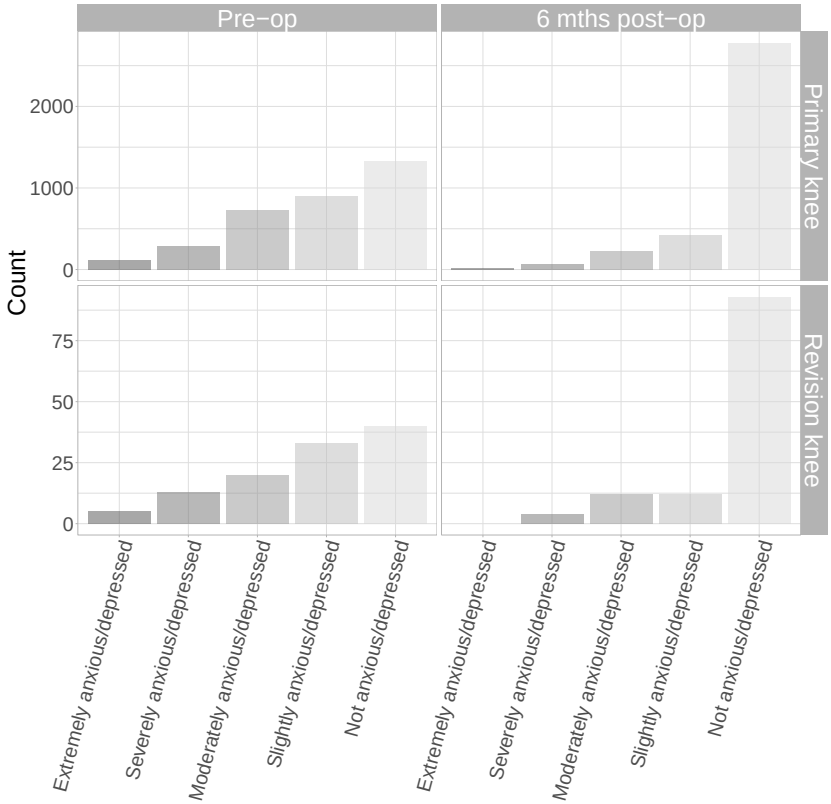



Figure 5.5: Knee Arthroplasties: Distribution of EQ-5D Anxiety/Depression, pre-op versus post-op

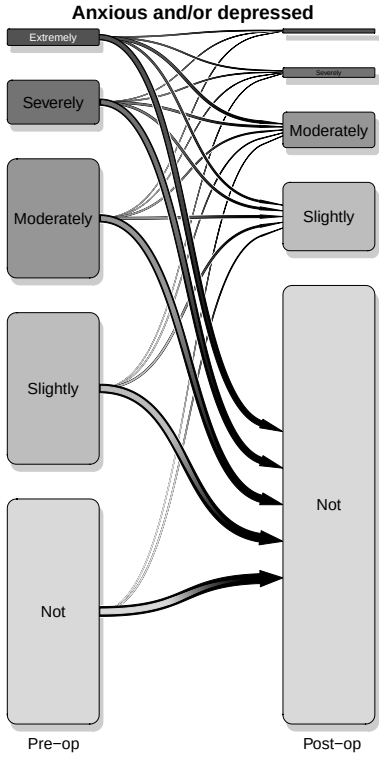
## EQ-5D Anxiety/Depression — Primary knees

| | Pre-op | | Post-op | |
|---|---|---|---|---|
| Extremely anxious/depressed | 115 | 3% | 23 | 0.6% |
| Severely anxious/depressed | 286 | 8% | 64 | 2% |
| Moderately anxious/depressed | 734 | 19% | 223 | 6% |
| Slightly anxious/depressed | 907 | 24% | 422 | 11% |
| Not anxious/depressed | 1327 | 35% | 2783 | 73% |
| Unknown/not stated | 437 | 11% | 291 | 8% |

## EQ-5D Anxiety/Depression — Revision knees

| | Pre-op | | Post-op | |
|---|---|---|---|---|
| Extremely anxious/depressed | 5 | 4% | 0 | 0% |
| Severely anxious/depressed | 13 | 10% | 4 | 3% |
| Moderately anxious/depressed | 20 | 16% | 12 | 9% |
| Slightly anxious/depressed | 33 | 26% | 12 | 9% |
| Not anxious/depressed | 40 | 31% | 93 | 72% |
| Unknown/not stated | 18 | 14% | 8 | 6% |

The chart below shows the transition in the degree of anxiety/depression in **primary knee arthroplasty** patients, from pre-operatively on the left to six months post-operatively on the right.



### *5.4.10 EuroQoL Visual Analogue Scale (EQ-VAS)*

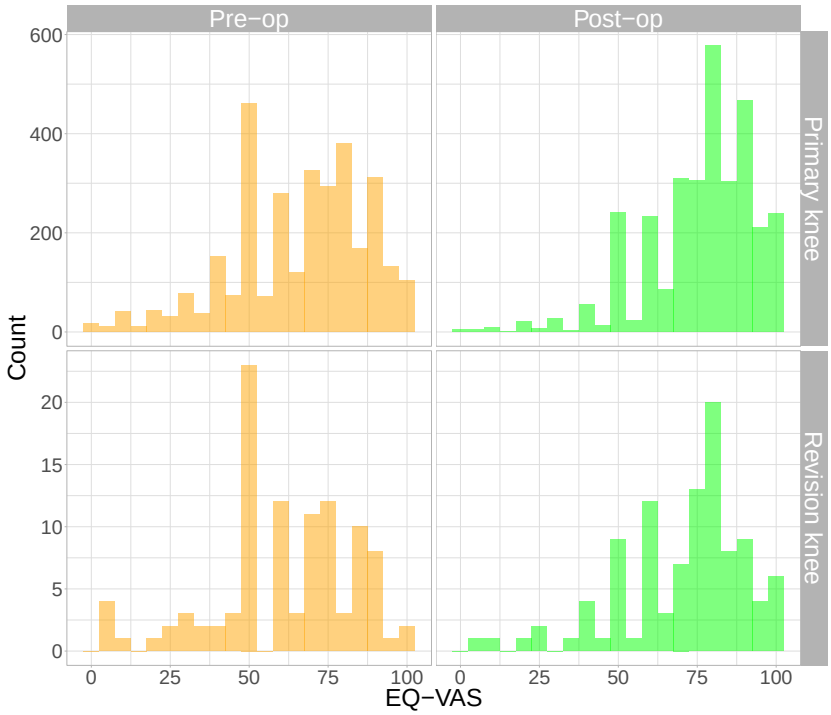



Figure 5.6: Knee Arthroplasties: Distribution of EQ-VAS, pre-op versus post-op

Table 5.1: knee Arthroplasties: Distribution of EQ-VAS, pre-op versus post-op

| Procedure | Sex | Timing | *n** | Mean | 5th %ile | Median | 95th %ile |
|---|---|---|---|---|---|---|---|
| Primary knee | Males | Pre-op | 1966 | 63.9 | 25.0 | 70 | 95.0 |
| | | Post-op | 1966 | 75.3 | 45.8 | 80 | 100.0 |
| Primary knee | Females | Pre-op | 1181 | 69.3 | 35.0 | 75 | 95.0 |
| | | Post-op | 1181 | 77.9 | 50.0 | 80 | 100.0 |
| Primary knee | Persons | Pre-op | 3147 | 65.9 | 28.6 | 70 | 95.0 |
| | | Post-op | 3147 | 76.3 | 50.0 | 80 | 100.0 |
| Revision knee | Males | Pre-op | 60 | 60.4 | 29.8 | 60 | 90.0 |
| | | Post-op | 60 | 69.6 | 25.0 | 75 | 100.0 |
| Revision knee | Females | Pre-op | 43 | 62.6 | 10.1 | 70 | 90.0 |
| | | Post-op | 43 | 72.1 | 50.0 | 75 | 90.0 |
| Revision knee | Persons | Pre-op | 103 | 61.3 | 20.5 | 60 | 90.0 |
| | | Post-op | 103 | 70.7 | 35.5 | 75 | 98.6 |

* Number of cases with both pre-op and 6 months post-op EQ-VAS data available.

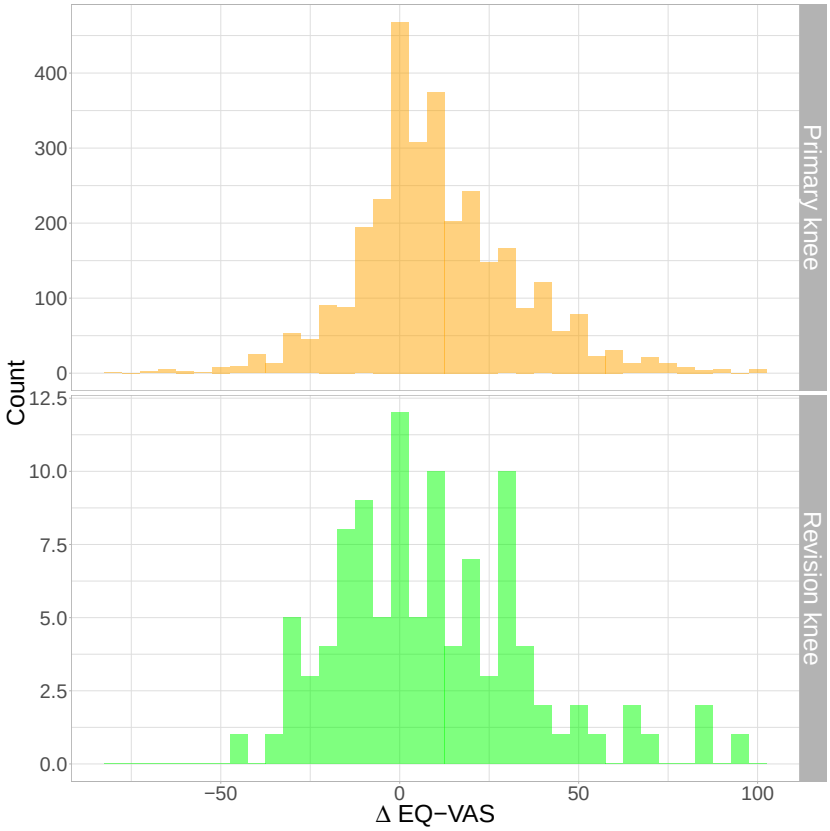



Figure 5.7: Knee Arthroplasties: Change in EQ-VAS, pre-op to post-op

### 5.4.11 *Oxford Knee Scores*

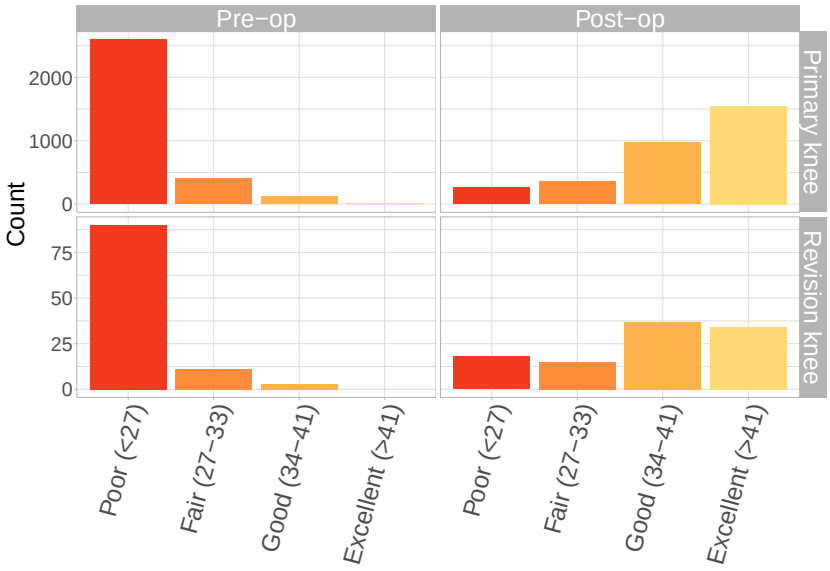



Figure 5.8: Distribution of grouped total Oxford Knee Scores, pre-op to post-op

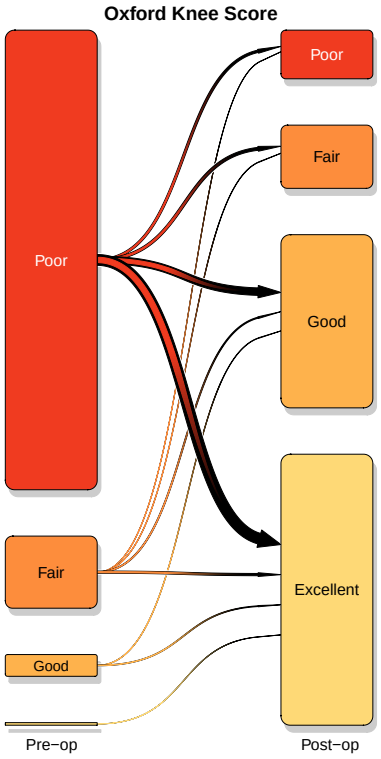
#### Partitioned total Oxford knee Scores, pre-op and post-op — Primary knees

| Total Oxford score | Pre-op | | Post-op | |
|---|---|---|---|---|
| Poor (<27) | 2593 | 83% | 266 | 8% |
| Fair (27-33) | 410 | 13% | 354 | 11% |
| Good (34-41) | 124 | 4% | 974 | 31% |
| Excellent (>41) | 15 | 0.5% | 1548 | 49% |

#### Partitioned total Oxford knee Scores, pre-op and post-op — Revision knees

| Total Oxford score | Pre-op | | Post-op | |
|---|---|---|---|---|
| Poor (<27) | 90 | 87% | 18 | 17% |
| Fair (27-33) | 11 | 11% | 15 | 14% |
| Good (34-41) | 3 | 3% | 37 | 36% |
| Excellent (>41) | 0 | 0% | 34 | 33% |

The chart below shows the transition in Oxford Knee Scores in **primary knee arthroplasty** patients, from pre-operatively on the left to six months post-operatively on the right.



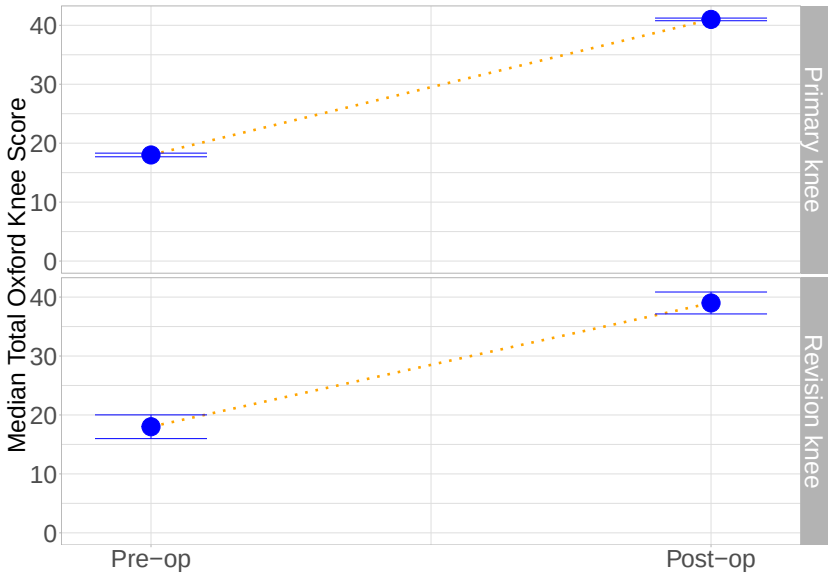



Figure 5.9: Domino plot of median Pre-op and Post-op Oxford Knee Scores

**Explanatory note**: In this "domino" plot, the central dot indicates the median Oxford Knee Score (OKS) for each group of patients (means and medians for each group are also shown in the tables on the pages which immediately follow this graph). The upper and lower horizontal lines are positioned at $\frac{1.58*IQR}{\sqrt{n}}$ (where IQR is the inter-quartile range), which represents an approximate 95% confidence interval around the median OKS. If these confidence intervals do not overlap, then the difference between the medians is almost certainly statistically significant.

Table 5.2: knee Arthroplasties: Distribution of total Oxford knee Scores, pre-op versus post-op

| Procedure | Sex | Timing* | *n*** | Mean | 5th %ile | Median | 95th %ile | IQRÂ¶ |
|---|---|---|---|---|---|---|---|---|
| Primary knee | Males | Pre-op | 1962 | 17.4 | 6.0 | 17.0 | 31.0 | 11.0 |
| | | Post-op | 1962 | 38.1 | 21.0 | 41.0 | 47.0 | 9.0 |
| | Females | Pre-op | 1180 | 21.0 | 8.0 | 21.0 | 35.0 | 12.0 |
| | | Post-op | 1180 | 39.7 | 23.0 | 43.0 | 47.0 | 7.0 |
| | Persons | Pre-op | 3142 | 18.7 | 6.0 | 18.0 | 33.0 | 11.0 |
| | | Post-op | 3142 | 38.7 | 22.0 | 41.0 | 47.0 | 8.0 |
| Revision knee | Males | Pre-op | 60 | 16.7 | 4.0 | 15.5 | 33.1 | 13.2 |
| | | Post-op | 60 | 36.1 | 21.7 | 40.0 | 45.0 | 11.0 |
| | Females | Pre-op | 44 | 17.9 | 4.4 | 20.0 | 27.0 | 12.2 |
| | | Post-op | 44 | 35.1 | 18.1 | 38.5 | 44.9 | 12.2 |
| | Persons | Pre-op | 104 | 17.2 | 4.0 | 18.0 | 30.0 | 13.0 |
| | | Post-op | 104 | 35.7 | 18.1 | 39.0 | 45.0 | 12.0 |

* "Post-op" means 6 months post-operative.

** Number of cases with both pre-op and 6 months post-op Oxford knee Score data available.

¶ Inter-quartile range.

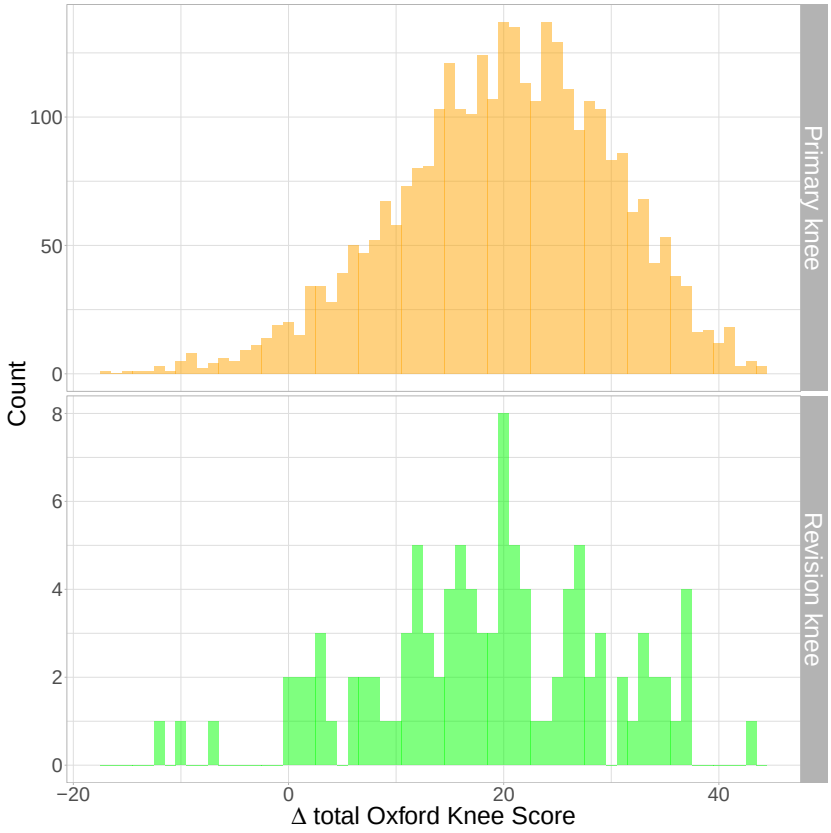



Figure 5.10: Change in total Oxford knee scores, pre-op to post-op

Table 5.3: Knee Arthroplasties: Change in total Oxford Knee Score, pre-op to post-op

| | Procedure | Sex | *n** | Mean change | 5th %ile | Median | 95th %ile |
|---|---|---|---|---|---|---|---|
| 2 | Primary knee | Males | 1962 | 20.8 | 3.0 | 21.0 | 36.0 |
| 1 | | Females | 1180 | 18.6 | 1.0 | 19.0 | 34.0 |
| 5 | | Persons | 3142 | 20.0 | 2.0 | 21.0 | 35.0 |
| 4 | Revision knee | Males | 60 | 19.4 | 2.0 | 20.0 | 35.0 |
| 3 | | Females | 44 | 17.2 | 0.1 | 17.5 | 36.1 |
| 6 | | Persons | 104 | 18.5 | 1.0 | 19.0 | 35.8 |

* Number of cases with both pre-op and 6 months post-op Oxford knee Score data available.