WHITLAM ORTHOPAEDIC RESEARCH CENTRE

ACORN ANNUAL REPORT 2017

ACORN

Arthroplasty Clinical Outcomes Registry National

2017 Annual Report

1st January 2013 to 31st December 2017

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

Prof Ian Harris, Committee Chair	A/Prof Justine Naylor
Dr Samuel Macdessi	Dr Robert Molnar
Dr Tim Churches	Ms Juliette Proctor
Dr Rami Sorial	Dr Richard Walker

CORRESPONDENCE & ENQUIRIES

Arthroplasty Clinical Outcomes Registry National (ACORN)
Whitlam Orthopaedic Research Centre
Level 2
Ingham Institute for Applied Medical Research
1 Campbell Street
Liverpool NSW 2170
AUSTRALIA
T: +61 2 8738 9252
F: +61 2 9602 7187
E: arthroplastyregistry@worc.org.au
W: www.acornregistry.org

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- Whitlam Orthopaedic Research Centre
- Calvary Health Care Tasmania St Luke's Campus
- 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, Cheryl Ryce and Eunice Raymond for participant follow-up and administrative support.

Hospital	Co-ordinator	Role
Canterbury Hospital	Vanessa Falzon	Admissions Office Supervisor, 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	Kiran Singh	Clinical Support Officer, Orthopaedics and Surgery
Bowral Hospital	Loretta Andersen	Head, Physiotherapy
Southern Highlands Private Hospital	Melissa Hennessy	Practice Manager, Orthopaedics and Surgery
Launceston General Hospital	Maree Manley	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.

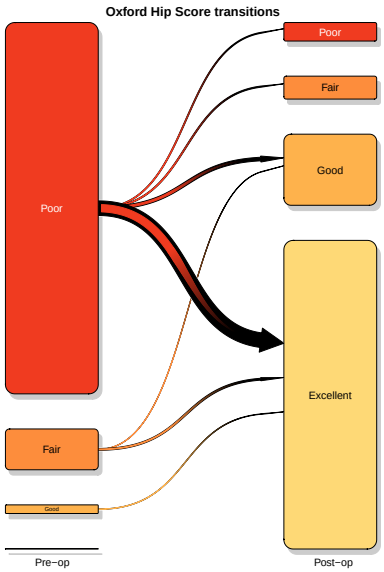
This report uses data from nine institutions. The report is restricted to reporting on sites with outcome data for the 2013 to 2017 calendar years. The report includes data on 7782 elective hip and knee arthroplasty procedures. As reflected in other reports, knee arthroplasty outnumbered hip arthroplasty by over two to one. Revision surgeries made up only 4% of all procedures recorded in the registry.

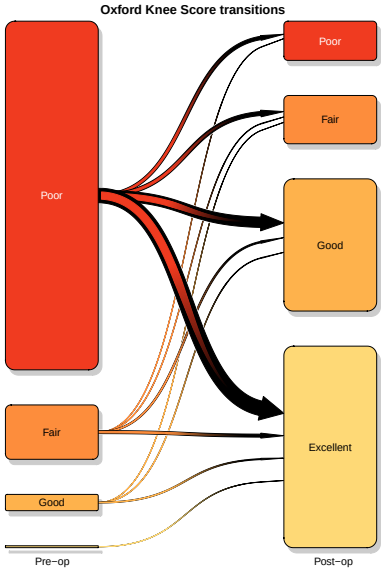
Overall, satisfaction and success after hip and knee arthroplasty were high, although patient-reported satisfaction was higher after primary hip arthroplasty than after knee arthroplasty. There was also substantial improvement in pain and function, as measured by the Oxford Hip or Knee Score, and in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





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.

In 2018, the AOANJRR is launching a pilot program to collect PROMs data. If successful, ACORN will no longer be required as ACORN sites are participating in this program.

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 organi-

sations 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

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.

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

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 2017

- *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	65.9	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	86.4	5.7	0.6
2016	4	456	21	4.7	2.7	5.4	0.2	90.0	4.0	0.7
2017	1	430	21	4.9	2.9	7.2	0.7	91.6	2.3	0.0
2017	2	522	23	4.4	2.9	9.8	0.4	91.6	3.1	0.2
2017	3	448	14	3.1	2.6	9.1	0.4	95.5	0.2	0.4
2017	4	459	16	3.5	2.9	10.8	0.0	95.6	0.4	0.4

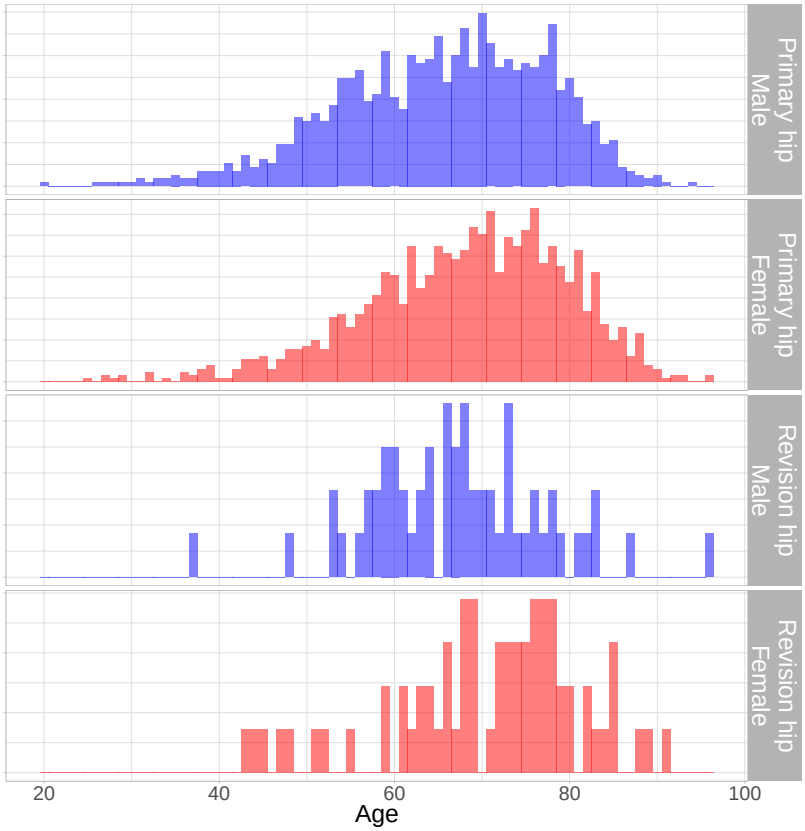
4
Hip Arthroplasty

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 2017, primary total hip arthroplasty surgery accounted for 95% 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 (53.6%).

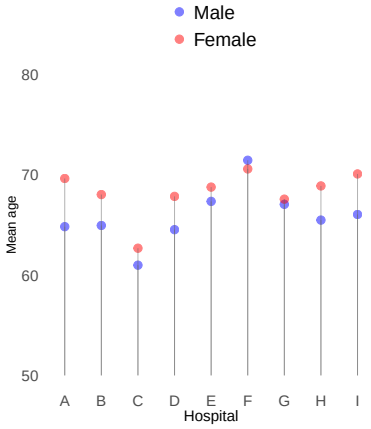
4.1 Demographic Profile

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.



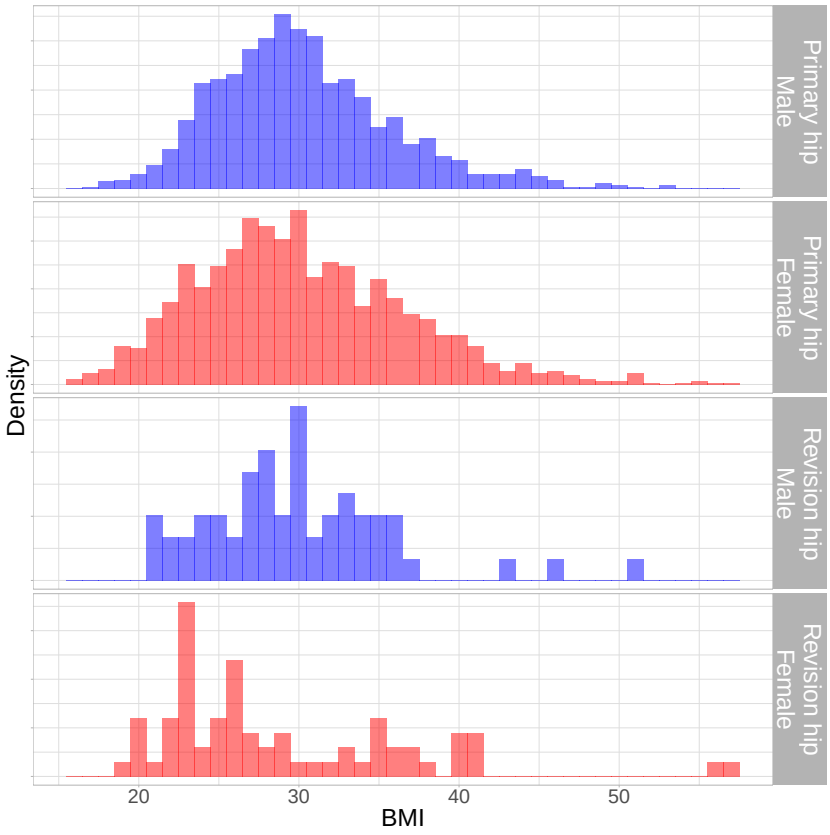
Age of Patients — Primary hips

	n	%	**Mean**	StdDev	Min	Max	<55	55-64	65-74	75-84	≥ 85
Male	1132	46.4	**65.5**	11.90	20.1	93.8	20%	25%	30%	22%	2.2%
Female	1307	53.6	**68.3**	11.51	24.6	96.2	12%	23%	33%	26%	4.8%
Persons	**2440**	**100.0**	**67.0**	**11.78**	**20.1**	**96.2**	**16%**	**24%**	**32%**	**24%**	**3.6%**

Age of Patients — Revision hips

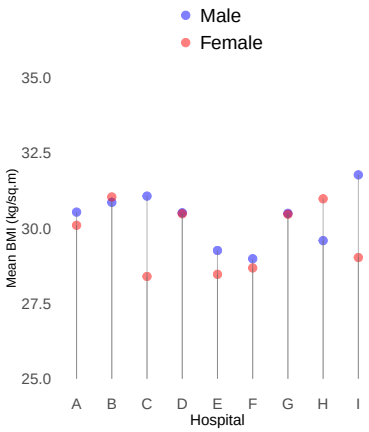
	n	%	**Mean**	StdDev	Min	Max	<55	55-64	65-74	75-84	≥ 85
Male	60	46.5	**67.2**	10.07	36.5	95.9	8.3%	32%	40%	17%	3.3%
Female	69	53.5	**70.5**	11.00	42.6	90.5	10%	14%	36%	33%	5.8%
Persons	**129**	**100.0**	**69.0**	**10.66**	**36.5**	**95.9**	**9.3%**	**22%**	**38%**	**26%**	**4.7%**

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	1132	35	3.2%	**30.4**	5.62	16.8	53.1
Female	1307	57	4.6%	**30.3**	6.66	16	56.9
Persons	**2440**	**92**	**3.9%**	**30.3**	**6.19**	**16**	**56.9**

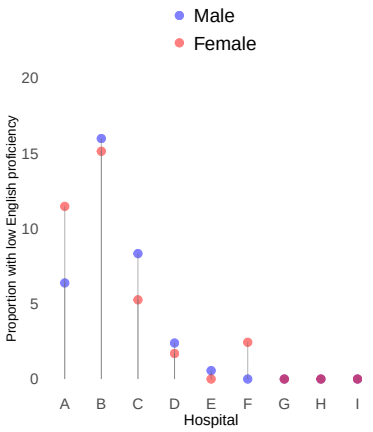
Body Mass Index (BMI) — Revision hips

	n	Missing		**Mean**	StdDev	Min	Max
Male	60	1	1.7%	**30**	5.76	21.3	51.3
Female	69	2	3.0%	**29**	7.91	19.5	56.7
Persons	**129**	**3**	**2.4%**	**29.5**	**6.98**	**19.5**	**56.7**

4.1.3 *English Proficiency*

ENGLISH PROFICIENCY — PRIMARY & REVISION HIPS

	n	Missing		High		Low	
Male	1192	45	3.8%	1066	89.4%	81	6.8%
Female	1376	70	5.1%	1202	87.4%	104	7.6%
Persons	**2569**	**115**	**4.5%**	**2269**	**88.3%**	**185**	**7.2%**



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	1192	83	7%	12	1%	305	26%	555	47%	237	20%
Female	1376	99	7.2%	27	2%	372	27%	597	43%	281	20%
Persons	**2569**	**182**	**7.1%**	**39**	**1.5%**	**677**	**26%**	**1153**	**45%**	**518**	**20%**

POST-SCHOOL EDUCATION — PRIMARY & REVISION HIPS

	n	Missing		None		Cert/Diploma		Bachelor		Postgrad	
Male	1192	98	8.2%	585	49%	397	33%	56	4.7%	56	4.7%
Female	1376	132	9.6%	882	64%	178	13%	66	4.8%	118	8.6%
Persons	**2569**	**230**	**9%**	**1468**	**57%**	**575**	**22%**	**122**	**4.7%**	**174**	**6.8%**

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	1132	430	38%	313	28%	361	32%	554	49%
Female	1307	550	42%	409	31%	414	32%	674	52%
Persons	**2440**	**980**	**40%**	**722**	**30%**	**776**	**32%**	**1229**	**50%**

	n	Diabetes		Gastrointestinal disease		Respiratory disease		Renal disease	
Male	1132	183	16%	171	15%	143	13%	76	7%
Female	1307	206	16%	269	21%	229	18%	69	5%
Persons	**2440**	**390**	**16%**	**440**	**18%**	**373**	**15%**	**145**	**6%**

	n	Hepatic disease		Neurological disease		Anxiety/ depression	
Male	1132	26	2%	62	5%	152	13%
Female	1307	30	2%	68	5%	283	22%
Persons	**2440**	**56**	**2%**	**130**	**5%**	**435**	**18%**

	n	No comorbs		1 comorb		2 comorbs		$\geq$ 3 comorbs	
Male	1132	180	16%	231	20%	278	25%	443	39%
Female	1307	169	13%	240	18%	300	23%	598	46%
Persons	**2440**	**349**	**14%**	**471**	**19%**	**578**	**24%**	**1042**	**43%**

PRE-OPERATIVE COMORBIDITIES — REVISION HIPS

	n	Low back pain		Other lower limb arthritis		Heart disease		Hypertension	
Male	60	17	28%	17	28%	20	33%	26	43%
Female	69	32	46%	19	28%	33	48%	34	49%
Persons	**129**	**49**	**38%**	**36**	**28%**	**53**	**41%**	**60**	**47%**

	n	Diabetes		Gastrointestinal disease		Respiratory disease		Renal disease	
Male	60	7	12%	11	18%	12	20%	4	7%
Female	69	9	13%	19	28%	7	10%	6	9%
Persons	**129**	**16**	**12%**	**30**	**23%**	**19**	**15%**	**10**	**8%**

	n	Hepatic disease		Neurological disease		Anxiety/ depression	
Male	60	2	3%	4	7%	9	15%
Female	69	0	0%	6	9%	15	22%
Persons	**129**	**2**	**2%**	**10**	**8%**	**24**	**19%**

	n	No comorbs		1 comorb		2 comorbs		$\geq$ 3 comorbs	
Male	60	10	17%	12	20%	14	23%	24	40%
Female	69	11	16%	8	12%	13	19%	37	54%
Persons	**129**	**21**	**16%**	**20**	**16%**	**27**	**21%**	**61**	**47%**

4.2.2 *ASA Physical Status Classification*

ASA — Primary hips

	n	Missing		ASA 1		ASA 2	
Males	1132	158	14%	72	6%	561	50%
Females	1307	185	14%	60	5%	625	48%
Persons	2440	343	14%	132	5%	1186	49%

	n	ASA 3		ASA 4		ASA 5	
Males	1132	332	29%	9	0.8%	0	0%
Females	1307	423	32%	14	1%	0	0%
Persons	2440	756	31%	23	0.9%	0	0%

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

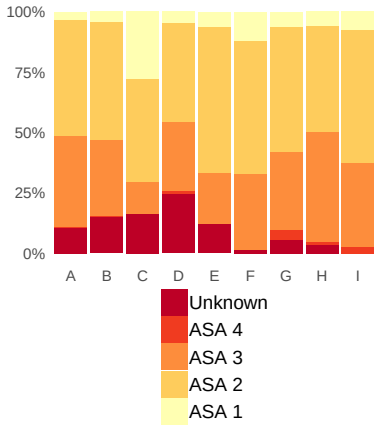
1. a normal healthy person
2. a person with mild systemic disease
3. a person with severe systemic disease
4. a person with severe systemic disease that is a constant threat to life
5. a moribund person who is not expected to survive

ASA — Revision hips

	n	Missing		ASA 1		ASA 2	
Males	60	12	20%	3	5%	18	30%
Females	69	19	28%	1	1%	24	35%
Persons	129	31	24%	4	3%	42	33%

	n	ASA 3		ASA 4		ASA 5	
Males	60	26	43%	1	2%	0	0%
Females	69	24	35%	1	1%	0	0%
Persons	129	50	39%	2	2%	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	2440	2	0.08%	1063	44%	1342	55%	33	1%
Revision	129	1	0.8%	60	47%	68	53%	0	0%

4.2.4 *Principal Reason for Surgery*

Reason for Surgery — Primary hips

	n	OA		RA		DDH	
Male	1132	1026	91%	3	0.3%	5	0.4%
Female	1307	1194	91%	16	1%	14	1%
Persons	2440	2221	91%	19	0.8%	19	0.8%

	n	Oth arth		ON/AVN		Tumour	
Male	1132	1	0.09%	67	6%	0	0%
Female	1307	6	0.5%	41	3%	0	0%
Persons	2440	7	0.3%	108	4%	0	0%

	n	Other		Missing	
Male	1132	19	2%	11	1%
Female	1307	21	2%	15	1%
Persons	2440	40	2%	26	1%

OA
: osteoarthritis

RA
: rheumatoid arthritis

DDH
: developmental dysplasia of the hips

Oth arth
: other inflammatory arthritis

ON/AVN
: osteonecrosis/avascular necrosis

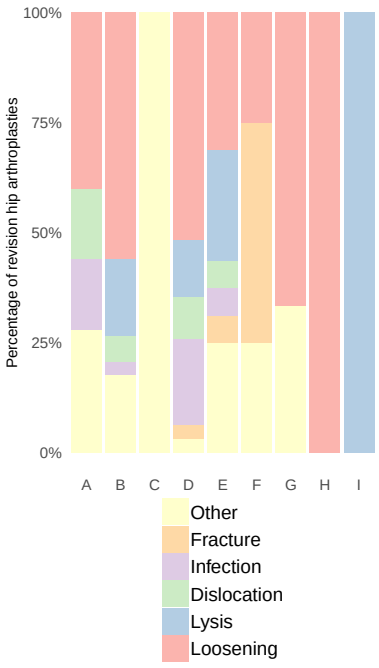
Reason for Surgery — Revision hips

	n	Loosening		Lysis		Dislocation	
Male	60	26	43%	4	7%	4	7%
Female	69	31	45%	11	16%	6	9%
Persons	129	57	44%	15	12%	10	8%

	n	Implant break		Infection		Fracture	
Male	60	0	0%	9	15%	2	3%
Female	69	2	3%	3	4%	2	3%
Persons	129	2	2%	12	9%	4	3%

	n	Other		Missing	
Male	60	13	22%	2	3%
Female	69	9	13%	5	7%
Persons	129	22	17%	7	5%

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.

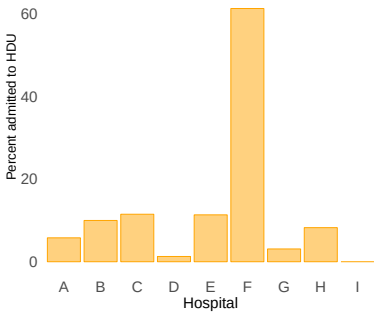
Complications are required to have been documented in the medical record. They include delirium, surgical site infection (SSI), deep venous thrombosis (DVT), pulmonary embolus (PE), respiratory infection, cardiovascular events, dislocation, fracture, nerve injury, bladder infection or retention, wound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

4.3.1 High Care Bed Utilisation

HIGH CARE BED UTILISATION — PRIMARY HIPS

	n	Missing		High Care Bed		Unplanned*	
Male	1132	1	0.09%	106	9%	75	71%
Female	1307	0	0%	100	8%	60	60%
Persons	2440	1	0.04%	206	8%	135	66%

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	60	0	0%	14	23%	9	64%
Female	69	0	0%	13	19%	9	69%
Persons	129	0	0%	27	21%	18	67%

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

4.3.2 *Peri-operative Blood Transfusion*

Blood Transfusion — Primary hips

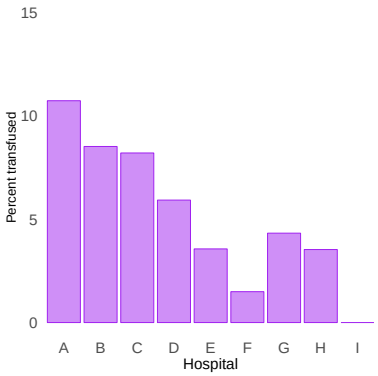
	n	Missing		Transfused		Mean units
Male	1132	4	0.4%	45	4%	2.1
Female	1307	6	0.5%	128	10%	2
Persons	2440	10	0.4%	173	7%	2

Blood Transfusion — Revision hips

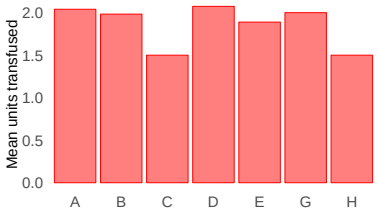
	n	Missing		Transfused		Mean units
Male	60	3	5%	14	23%	3.3
Female	69	1	1%	14	20%	2.2
Persons	129	4	3%	28	22%	2.8

* 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	1132	144	(13%)	978	(86%)	10	(0.9%)
Females	1307	167	(13%)	1128	(86%)	9	(0.7%)
Persons	2440	311	(13%)	2107	(86%)	19	(0.8%)

COMPLICATIONS (DETAILS) DURING ADMISSION — PRIMARY HIPS

Complications	Males		Females		Persons	
Drug reaction	0	0%	0	0%	0	0%
Delirium	17	1.5%	9	0.69%	26	1.1%
SSI requiring oral antibiotics	0	0%	1	0.077%	1	0.041%
SSI requiring IV antibiotics	1	0.088%	0	0%	1	0.041%
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	0.18%	2	0.15%	4	0.16%
Pulmonary embolus	1	0.088%	3	0.23%	4	0.16%
Fat emboli	0	0%	0	0%	0	0%
Respiratory infection	11	0.97%	10	0.77%	21	0.86%
CVS	17	1.5%	22	1.7%	39	1.6%
Dislocation	2	0.18%	5	0.38%	7	0.29%
Fracture	6	0.53%	14	1.1%	20	0.82%
Nerve injury	1	0.088%	5	0.38%	6	0.25%
Urinary tract infection	8	0.71%	14	1.1%	22	0.9%
Urinary retention	22	1.9%	8	0.61%	30	1.2%
Wound dehiscence	5	0.44%	4	0.31%	9	0.37%
Reoperation during index adm	2	0.18%	5	0.38%	7	0.29%
Pressure area	0	0%	1	0.077%	1	0.041%
Fall	0	0%	3	0.23%	3	0.12%
Hypotension	14	1.2%	29	2.2%	43	1.8%
Cellulitis	1	0.088%	1	0.077%	2	0.082%
Death	1	0.088%	0	0%	1	0.041%
Other	43	3.8%	45	3.4%	88	3.6%

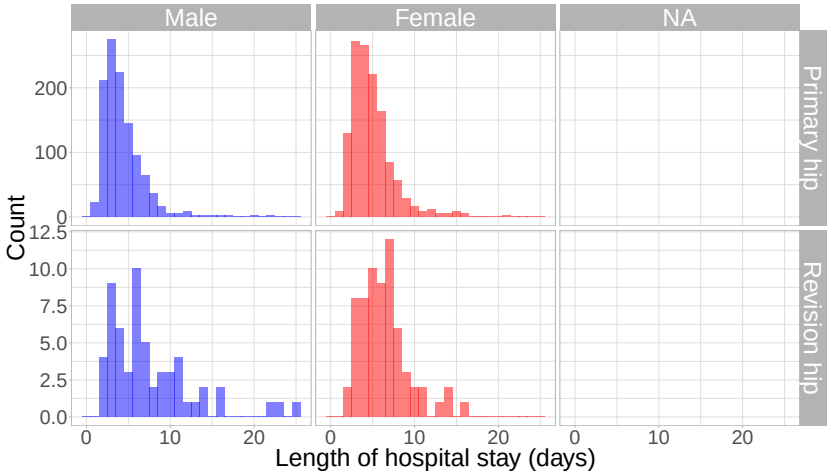
Complications (any) during Admission — Revision hips

	n	1 or more		None		Unk/NS	
Males	60	11	(18%)	49	(82%)	0	(0%)
Females	69	18	(26%)	50	(72%)	1	(1%)
Persons	129	29	(22%)	99	(77%)	1	(0.8%)

Complications (details) during Admission — Revision hips

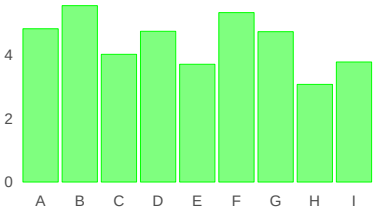
Complications	Males		Females		Persons	
Drug reaction	0	0%	0	0%	0	0%
Delirium	0	0%	0	0%	0	0%
SSI requiring oral antibiotics	0	0%	0	0%	0	0%
SSI requiring IV antibiotics	0	0%	0	0%	0	0%
SSI requ surg c̄ prosth removal	0	0%	0	0%	0	0%
SSI requ surg s̄ prosth removal	0	0%	0	0%	0	0%
Deep vein thrombosis	0	0%	1	1.4%	1	0.78%
Pulmonary embolus	0	0%	0	0%	0	0%
Fat emboli	0	0%	0	0%	0	0%
Respiratory infection	0	0%	1	1.4%	1	0.78%
CVS	1	1.7%	0	0%	1	0.78%
Dislocation	3	5%	0	0%	3	2.3%
Fracture	1	1.7%	2	2.9%	3	2.3%
Nerve injury	0	0%	1	1.4%	1	0.78%
Urinary tract infection	0	0%	1	1.4%	1	0.78%
Urinary retention	0	0%	1	1.4%	1	0.78%
Wound dehiscence	2	3.3%	0	0%	2	1.6%
Reoperation during index adm	0	0%	1	1.4%	1	0.78%
Pressure area	0	0%	0	0%	0	0%
Fall	0	0%	2	2.9%	2	1.6%
Hypotension	1	1.7%	1	1.4%	2	1.6%
Cellulitis	0	0%	0	0%	0	0%
Death	0	0%	0	0%	0	0%
Other	1	1.7%	7	10%	8	6.2%

4.3.4 *Length of Stay in Hospital*



The plot at left excludes 15 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	1132	46%	4	0.4%	4.3	4	5	8
Female	1307	54%	4	0.3%	5.3	4	6	10
Persons	2440	100%	8	0.3%	4.8	4	6	9

Length of Stay in Hospital — Revision hips

	n		Missing		Mean	Median	75th %ile	95th %ile
Male	60	47%	0	0%	9.2	6	10	23
Female	69	53%	0	0%	8	6	8	15
Persons	129	100%	0	0%	8.6	6	9	23

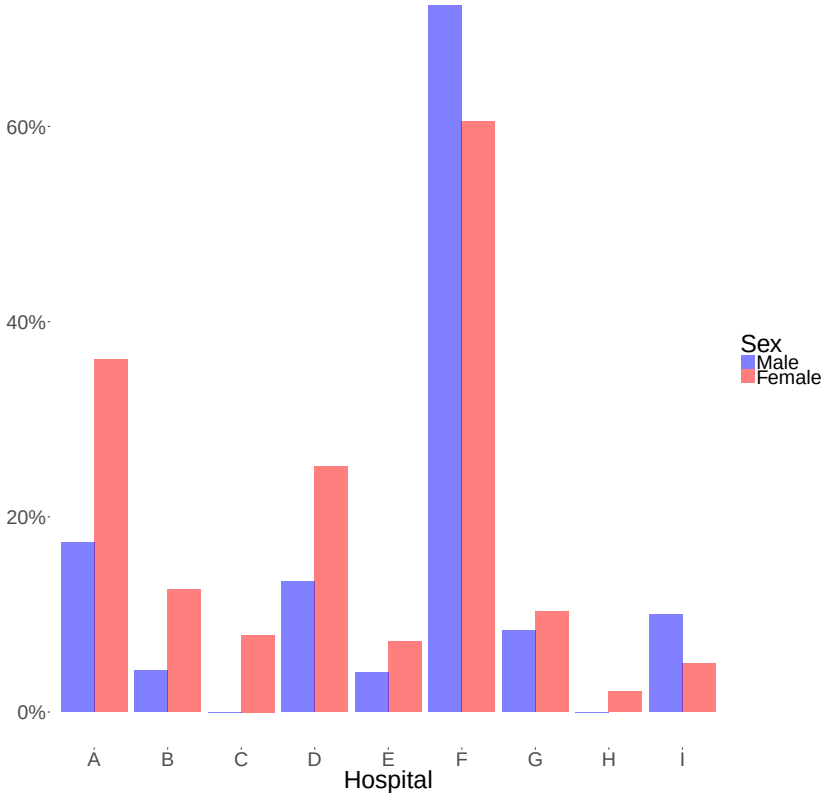
4.3.5 *Discharge Destination*

DISCHARGE DESTINATION — PRIMARY HIPS

	n	Unk/NS		Usual residence		Inpatient rehab		Other	
Male	1132	7	0.6%	999	88%	116	10%	10	0.9%
Female	1307	9	0.7%	1027	79%	264	20%	7	0.5%
Persons	2440	16	0.7%	2027	83%	380	16%	17	0.7%

DISCHARGE DESTINATION — REVISION HIPS

	n	Unk/NS		Usual residence		Inpatient rehab		Other	
Male	60	2	3%	41	68%	14	23%	3	5%
Female	69	3	4%	41	59%	24	35%	1	1%
Persons	129	5	4%	82	64%	38	29%	4	3%



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.

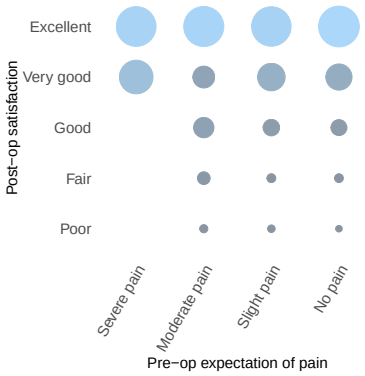
For success, the question asked is "overall, how are the problems now with your hip/knee on which you had surgery, compared to before your operation?" This question also allows the person to choose one of five options: much better; a little better; about the same; a little worse; and much worse.

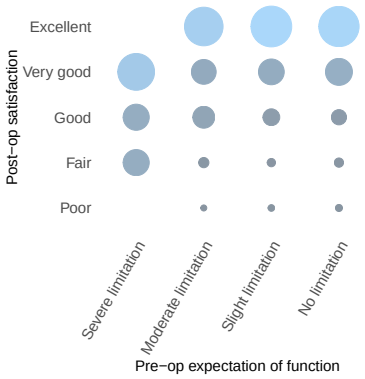
In addition, ACORN asks participants whether they have been re-admitted to hospital since discharge, had another operation on the joint that was replaced six months earlier, and whether they have experienced any other problem not requiring re-admission or re-operation. By asking this additional question 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.

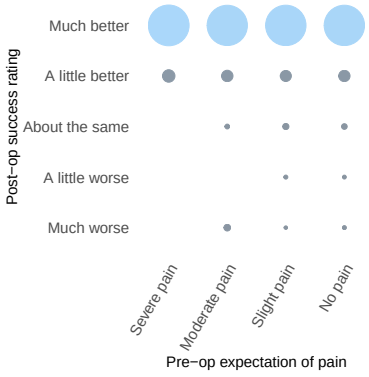
The EQ-VAS records a person's self-rated health on a 20 cm vertical scale with 0 at the bottom representing "worst health imaginable" and 100 at the top representing "best health imaginable". Prior to surgery, the surveys are patient-completed. After surgery, the surveys are completed over the telephone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

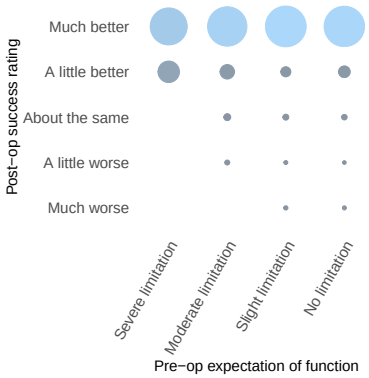
The EQ-5D-5L is a descriptive system of five dimensions of a person's general health. The dimensions are Mobility, Self-care, Usual Activities, Pain or Discomfort, and Anxiety or Depression. Each dimension has five levels: no problems, slight problems, moderate problems, severe problems, or extreme problems. 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	1132	163	14%	688	61%	224	20%	51	5%	6	0.5%
Female	1307	217	17%	741	57%	303	23%	39	3%	7	0.5%
Persons	2440	380	16%	1429	59%	528	22%	90	4%	13	0.5%

EXPECTATION OF PAIN — REVISION HIPS

	n	Unknown/ Not stated		No pain		Slight pain		Moderate pain		Severe pain	
Male	60	13	22%	29	48%	14	23%	3	5%	1	2%
Female	69	26	38%	30	43%	9	13%	4	6%	0	0%
Persons	129	39	30%	59	46%	23	18%	7	5%	1	0.8%

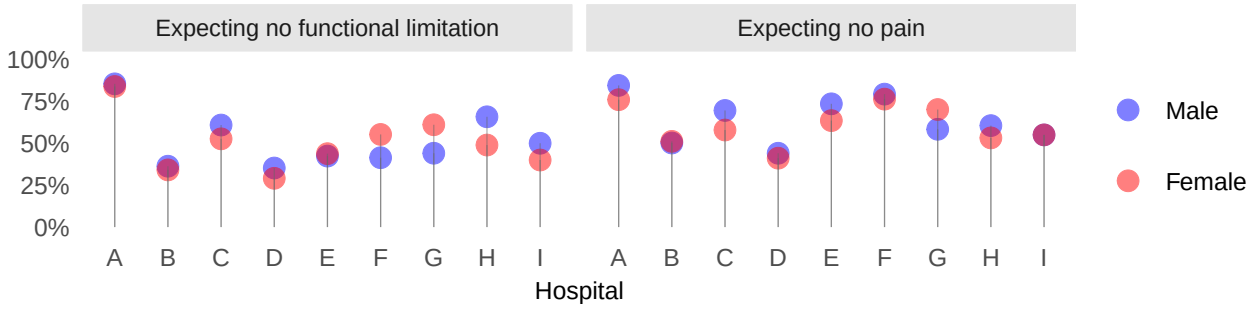
4.4.2 *Pre-op Expectation of Function at 6 months post-op*

EXPECTATION OF FUNCTION — PRIMARY HIPS

	n	Unknown/ Not stated		No limitation		Slight limitation		Moderate limitation		Severe limitation	
Male	1132	167	15%	547	48%	373	33%	44	4%	1	0.09%
Female	1307	220	17%	608	47%	434	33%	42	3%	3	0.2%
Persons	2440	387	16%	1155	47%	808	33%	86	4%	4	0.2%

EXPECTATION OF FUNCTION — REVISION HIPS

	n	Unknown/ Not stated		No limitation		Slight limitation		Moderate limitation		Severe limitation	
Male	60	13	22%	20	33%	22	37%	4	7%	1	2%
Female	69	26	38%	22	32%	19	28%	2	3%	0	0%
Persons	129	39	30%	42	33%	41	32%	6	5%	1	0.8%



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	1130	70	6%	16	1%	33	3%	99	9%	260	23%	652	58%
Female	1307	62	5%	27	2%	37	3%	135	10%	318	24%	728	56%
Persons	2437	132	5%	43	2%	70	3%	234	10%	578	24%	1380	57%

SATISFACTION AT 6 MONTHS POST-OP — REVISION HIPS

	n	Unk/NS		Poor		Fair		Good		Very good		Excellent	
Male	60	11	18%	4	7%	3	5%	8	13%	15	25%	19	32%
Female	68	5	7%	0	0%	2	3%	16	24%	21	31%	24	35%
Persons	128	16	12%	4	3%	5	4%	24	19%	36	28%	43	34%

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	1130	71	6%	10	0.9%	7	0.6%	14	1%	68	6%	960	85%
Female	1307	61	5%	13	1%	8	0.6%	28	2%	97	7%	1100	84%
Persons	2437	132	5%	23	0.9%	15	0.6%	42	2%	165	7%	2060	85%

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	60	12	20%	2	3%	2	3%	4	7%	7	12%	33	55%
Female	68	4	6%	1	1%	1	1%	6	9%	12	18%	44	65%
Persons	128	16	12%	3	2%	3	2%	10	8%	19	15%	77	60%

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	1130	304	27%	188	17%	61	5%	28	2%	549	49%
Female	1307	351	27%	250	19%	98	7%	48	4%	560	43%
Persons	2437	655	27%	438	18%	159	7%	76	3%	1109	46%

POST-DISCHARGE COMPLICATIONS (ANY) — REVISION HIPS

	n	None		1		2		3 or more		Number unknown	
Male	60	16	27%	16	27%	4	7%	3	5%	21	35%
Female	68	16	24%	17	25%	2	3%	2	3%	31	46%
Persons	128	32	25%	33	26%	6	5%	5	4%	52	41%

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

	Primary hips (*n*=2437)		Revision hips (*n*=128)	
SSI requiring oral antibiotics	36	1.5%	4	3.1%
SSI requiring IV antibiotics	3	0.12%	0	0%
DVT index leg	11	0.45%	0	0%
DVT other leg	2	0.082%	0	0%
DVT both legs	1	0.041%	0	0%
Pulmonary embolus	5	0.21%	0	0%
Dislocation	3	0.12%	2	1.6%
Joint stiffness	165	6.8%	10	7.8%
Bladder infection or retention	30	1.2%	1	0.78%
Fracture	8	0.33%	0	0%
Unexpected pain	124	5.1%	3	2.3%
Cardiac	5	0.21%	0	0%
Stroke	1	0.041%	0	0%
Leg length discrepancy	164	6.7%	9	7%
Joint or lower limb swelling	104	4.3%	8	6.2%
Paraesthesia or numbness	119	4.9%	4	3.1%
Cellulitis	9	0.37%	0	0%
Neuropathy	11	0.45%	1	0.78%
Muscle weakness	40	1.6%	3	2.3%
Respiratory infection	5	0.21%	0	0%
Other	87	3.6%	5	3.9%

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

	Primary hips (*n*=2438)		Revision hips (*n*=128)	
SSI requiring oral antibiotics	37	1.5%	4	3.1%
SSI requiring IV antibiotics	4	0.16%	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	18	0.74%	1	0.78%
Pulmonary embolus	9	0.37%	0	0%
Fat emboli	0	0%	0	0%
Drug reaction	0	0%	0	0%
Delirium	26	1.1%	0	0%
Hypotension	43	1.8%	1	0.78%
CVS	45	1.8%	1	0.78%
Respiratory infection	26	1.1%	1	0.78%
Urinary tract infection or retention	71	2.9%	3	2.3%
Wound dehiscence	9	0.37%	2	1.6%
Pressure area	1	0.041%	0	0%
Fall	3	0.12%	2	1.6%
Cellulitis	11	0.45%	0	0%
Death	9	0.37%	0	0%
Dislocation	10	0.41%	4	3.1%
Fracture	28	1.1%	3	2.3%
Joint stiffness	165	6.8%	10	7.8%
Unexpected pain	124	5.1%	3	2.3%
Leg length discrepancy	164	6.7%	9	7%
Joint or lower limb swelling	104	4.3%	8	6.2%
Nerve injury†	132	5.4%	5	3.9%
Muscle weakness	40	1.6%	3	2.3%
Re-operation	49	2%	8	6.2%
Other	167	6.8%	13	10%

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	1126	63	6%	41	4%	97	9%	135	12%
Female	1302	57	4%	48	4%	111	9%	152	12%
Persons	2428	120	5%	89	4%	208	9%	287	12%

RE-ADMISSION — REVISION HIPS

	n	Missing		Re-admission due to arthroplasty		Re-admission for other reasons		Total re-admissions	
Male	60	11	18%	8	13%	5	8%	13	22%
Female	68	4	6%	7	10%	9	13%	16	24%
Persons	128	15	12%	15	12%	14	11%	29	23%

REASONS FOR RE-ADMISSION — PRIMARY & REVISION HIPS

	Primary (*n*=287)		Revision (*n*=29)	
Reasons related to arthroplasty				
DVT	4	1%	0	0%
Pulmonary embolus	3	1%	0	0%
MUA	0	0%	0	0%
Dislocation	13	5%	9	32%
Surgical site infection	37	13%	5	18%
Wound dehiscence	1	0.4%	0	0%
Index joint revision	4	1%	0	0%
Other	25	9%	1	4%
Reasons unrelated to arthroplasty				
Cardiac	36	13%	0	0%
Renal/urinary tract	17	6%	2	7%
Cancer	7	2%	0	0%
Other	147	52%	11	39%

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

Re-operation — Primary hips

	n	Re-operation due to arthroplasty	
Male	1130	18	2%
Female	1307	26	2%
Persons	2437	44	2%

Re-operation — Revision hips

	n	Re-operation due to arthroplasty	
Male	60	3	5%
Female	68	4	6%
Persons	128	7	5%

Reason for Re-operation — Primary hips

	Males (*n*=18)		Females (*n*=26)		Persons (*n*=44)	
SSI requiring surgery with no prosthesis removal	8	44%	7	27%	15	34%
SSI requiring surgery with prosthesis removal	5	28%	5	19%	10	23%
Dislocation	2	11%	5	19%	7	16%
Joint stiffness	0	0%	0	0%	0	0%
Periprosthetic fracture	0	0%	3	12%	3	7%
Implant fracture	0	0%	1	4%	1	2%
Bleeding	1	6%	1	4%	2	5%
Other	1	6%	3	12%	4	9%
Unknown/NS	1	6%	1	4%	2	5%

Reason for Re-operation — Revision hips

	Males (*n*=3)		Females (*n*=4)		Persons (*n*=7)	
SSI requiring surgery with no prosthesis removal	0	0%	2	50%	2	29%
SSI requiring surgery with prosthesis removal	1	33%	0	0%	1	14%
Dislocation	2	67%	2	50%	4	57%
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	1131	52	5%	1	0.09%	6	0.5%
Female	1307	51	4%	0	0%	4	0.3%
Persons	2438	103	4%	1	0.04%	10	0.4%

POST-DISCHARGE DEATH — REVISION HIPS

	n	Unknown/ not stated		Died in hospital		Total deaths at 6 mths post-op	
Male	60	3	5%	0	0%	0	0%
Female	68	6	9%	0	0%	0	0%
Persons	128	9	7%	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*

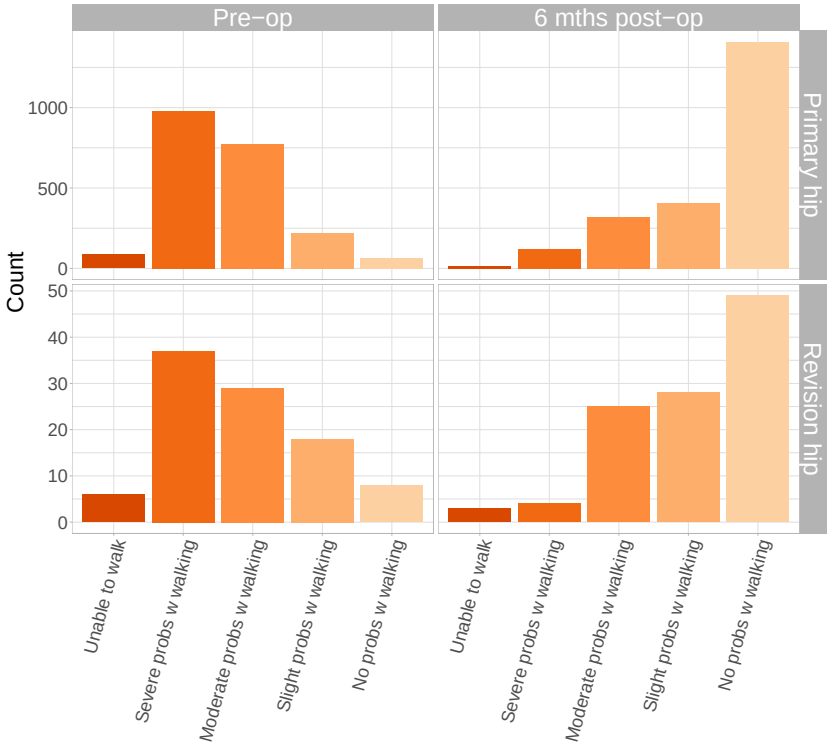


Figure 4.1: Hip Arthroplasties: Distribution of EQ-5D Mobility, pre-op versus post-op

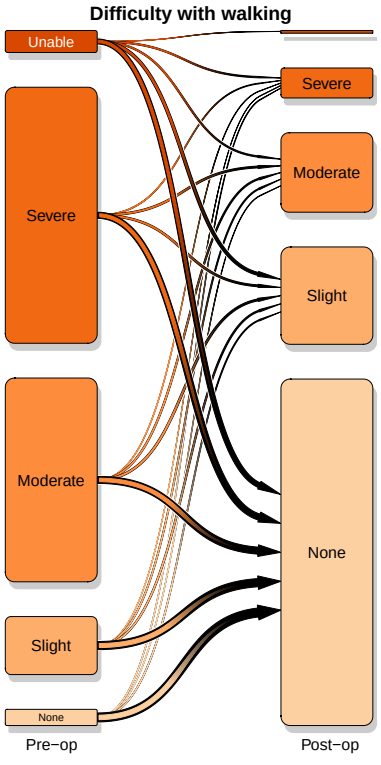
EQ-5D Mobility — Primary hips

	Pre-op		Post-op	
Unable to walk	86	4%	13	0.5%
Severe problems with walking	980	41%	119	5%
Moderate problems with walking	772	32%	321	13%
Slight problems with walking	220	9%	406	17%
No problems with walking	66	3%	1409	59%
Unknown/Not stated	272	11%	128	5%

EQ-5D Mobility — Revision hips

	Pre-op		Post-op	
Unable to walk	6	5%	3	2%
Severe problems with walking	37	30%	4	3%
Moderate problems with walking	29	24%	25	20%
Slight problems with walking	18	15%	28	23%
No problems with walking	8	7%	49	40%
Unknown/Not stated	25	20%	14	11%

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.



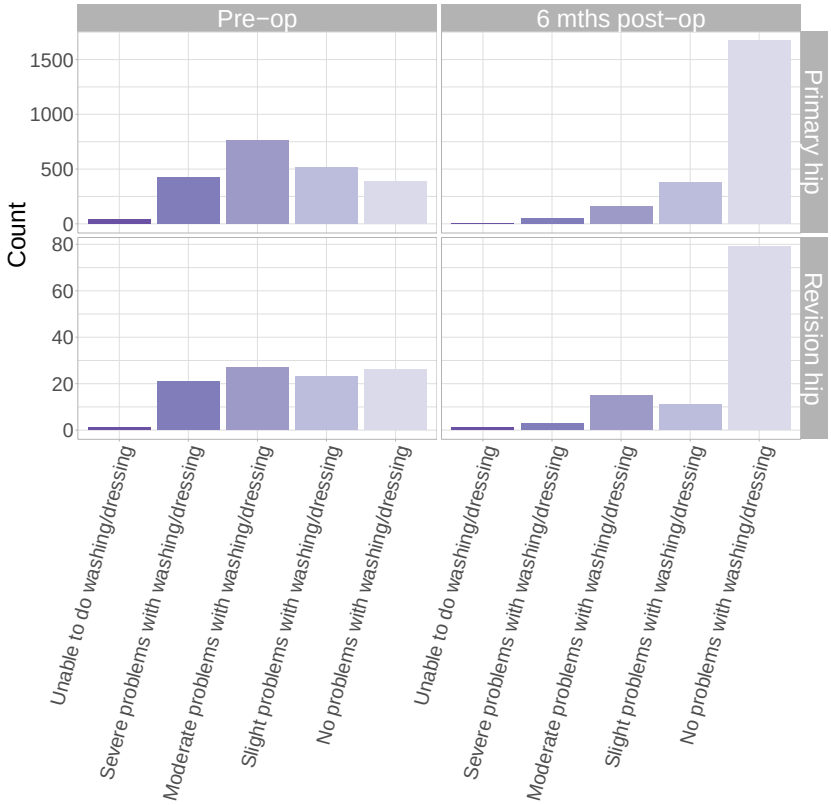


Figure 4.2: Hip Arthroplasties: Distribution of EQ-5D Personal Care, pre-op versus post-op

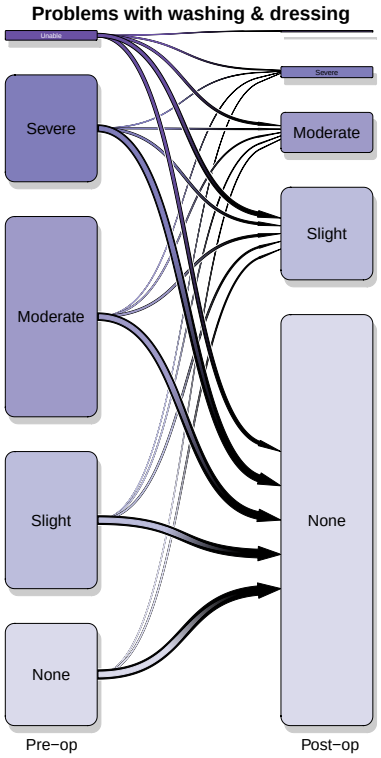
EQ-5D Personal Care — Primary hips

	Pre-op		Post-op	
Unable to do washing/dressing	40	2%	7	0.3%
Severe problems washing/dressing	421	18%	46	2%
Mod. problems washing/dressing	763	32%	162	7%
Slight problems washing/dressing	518	22%	379	16%
No problems washing/dressing	384	16%	1675	70%
Unknown/Not stated	271	11%	128	5%

EQ-5D Personal Care — Revision hips

	Pre-op		Post-op	
Unable to do washing/dressing	1	0.8%	1	0.8%
Severe problems washing/dressing	21	17%	3	2%
Mod. problems washing/dressing	27	22%	15	12%
Slight problems washing/dressing	23	19%	11	9%
No problems washing/dressing	26	21%	79	64%
Unknown/Not stated	25	20%	14	11%

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.



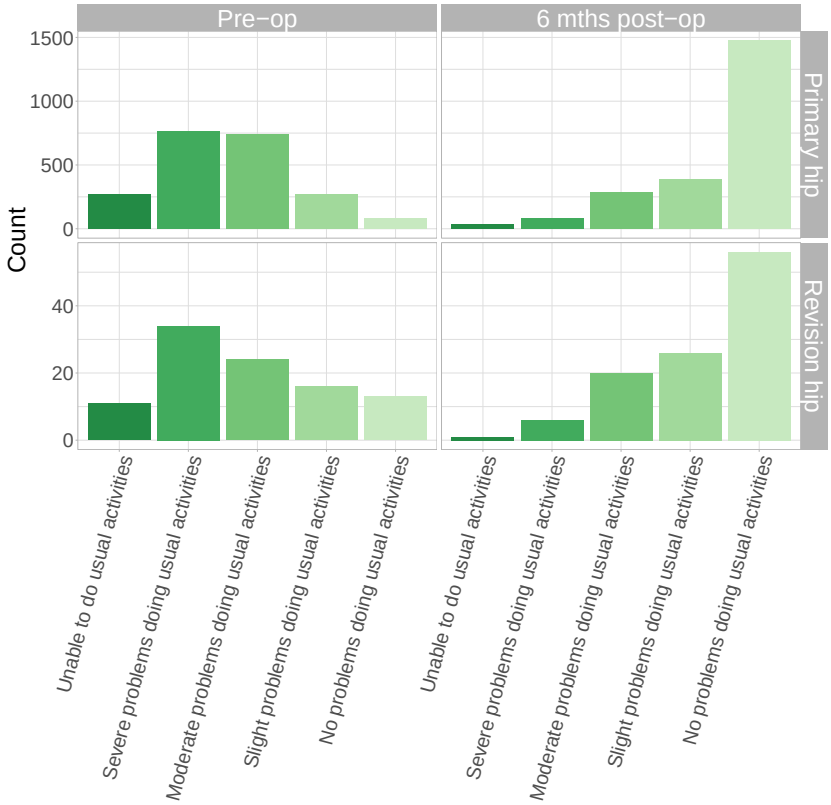


Figure 4.3: Hip Arthroplasties: Distribution of EQ-5D Usual Activities, pre-op versus post-op

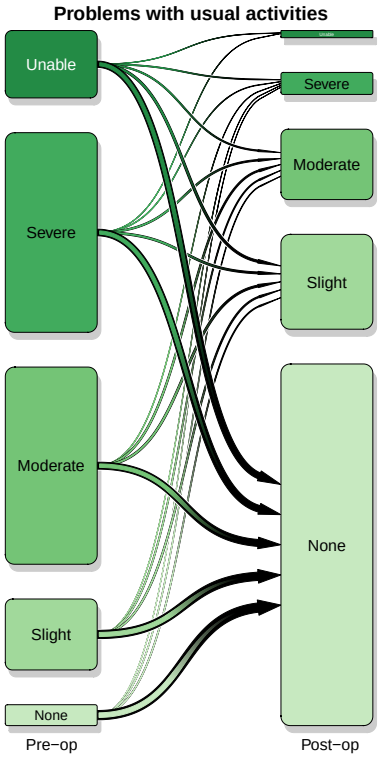
EQ-5D Usual Activites — Primary hips

	Pre-op		Post-op	
Unable to do usual activities	267	11%	32	1%
Severe problems c̄ usual activities	767	32%	86	4%
Mod. problems c̄ usual activities	740	31%	285	12%
Slight problems c̄ usual activities	270	11%	390	16%
No problems c̄ usual activities	80	3%	1475	62%
Unknown/Not stated	273	11%	129	5%

EQ-5D Usual Activites — Revision hips

	Pre-op		Post-op	
Unable to do usual activities	11	9%	1	0.8%
Severe problems c̄ usual activities	34	28%	6	5%
Mod. problems c̄ usual activities	24	20%	20	16%
Slight problems c̄ usual activities	16	13%	26	21%
No problems c̄ usual activities	13	11%	56	46%
Unknown/Not stated	25	20%	14	11%

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.



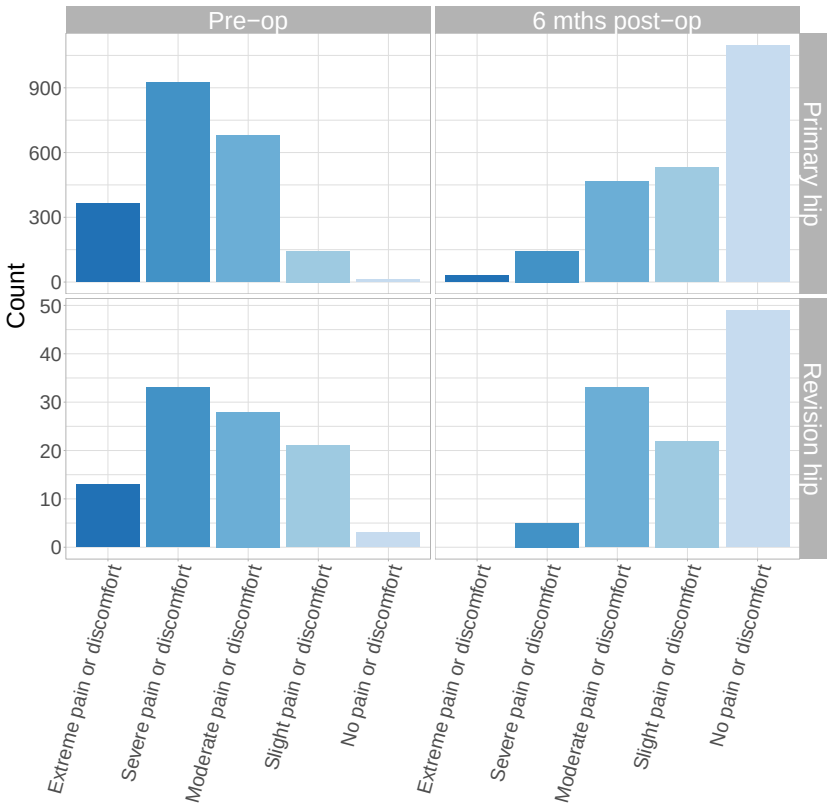


Figure 4.4: Hip Arthroplasties: Distribution of EQ-5D Discomfort, pre-op versus post-op

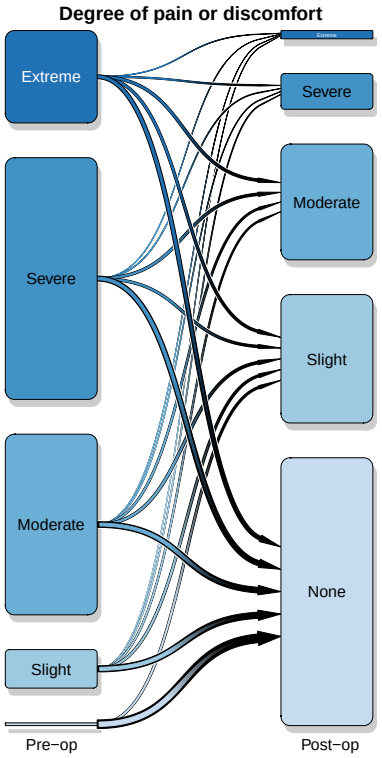
EQ-5D Discomfort — Primary hips

	Pre-op		Post-op	
Extreme pain or discomfort	362	15%	31	1%
Severe pain or discomfort	924	39%	144	6%
Moderate pain or discomfort	681	28%	465	19%
Slight pain or discomfort	144	6%	530	22%
No pain or discomfort	12	0.5%	1098	46%
Unknown/not stated	273	11%	128	5%

EQ-5D Discomfort — Revision hips

	Pre-op		Post-op	
Extreme pain or discomfort	13	11%	0	0%
Severe pain or discomfort	33	27%	5	4%
Moderate pain or discomfort	28	23%	33	27%
Slight pain or discomfort	21	17%	22	18%
No pain or discomfort	3	2%	49	40%
Unknown/not stated	25	20%	14	11%

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.



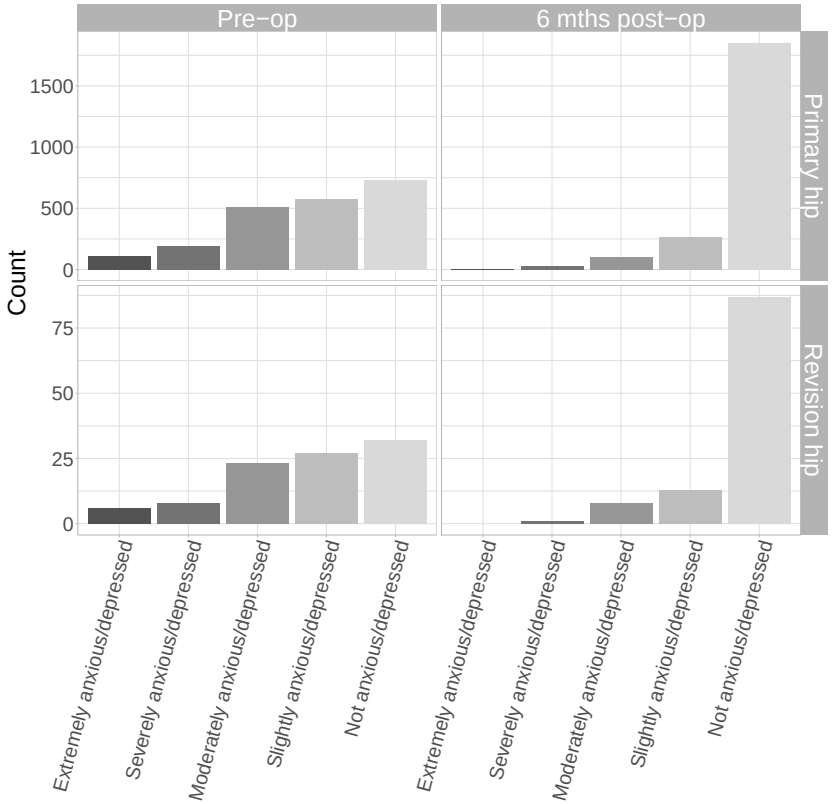


Figure 4.5: Hip Arthroplasties: Distribution of EQ-5D Anxiety/Depression, pre-op versus post-op

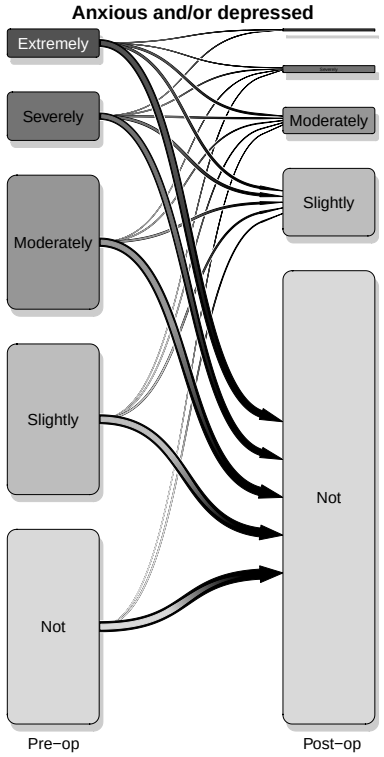
EQ-5D Anxiety/Depression — Primary hips

	Pre-op		Post-op	
Extremely anxious/depressed	112	5%	7	0.3%
Severely anxious/depressed	188	8%	29	1%
Moderately anxious/depressed	507	21%	105	4%
Slightly anxious/depressed	577	24%	264	11%
Not anxious/depressed	734	31%	1854	77%
Unknown/not stated	278	12%	137	6%

EQ-5D Anxiety/Depression — Revision hips

	Pre-op		Post-op	
Extremely anxious/depressed	6	5%	0	0%
Severely anxious/depressed	8	7%	1	0.8%
Moderately anxious/depressed	23	19%	8	7%
Slightly anxious/depressed	27	22%	13	11%
Not anxious/depressed	32	26%	87	71%
Unknown/not stated	27	22%	14	11%

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)*

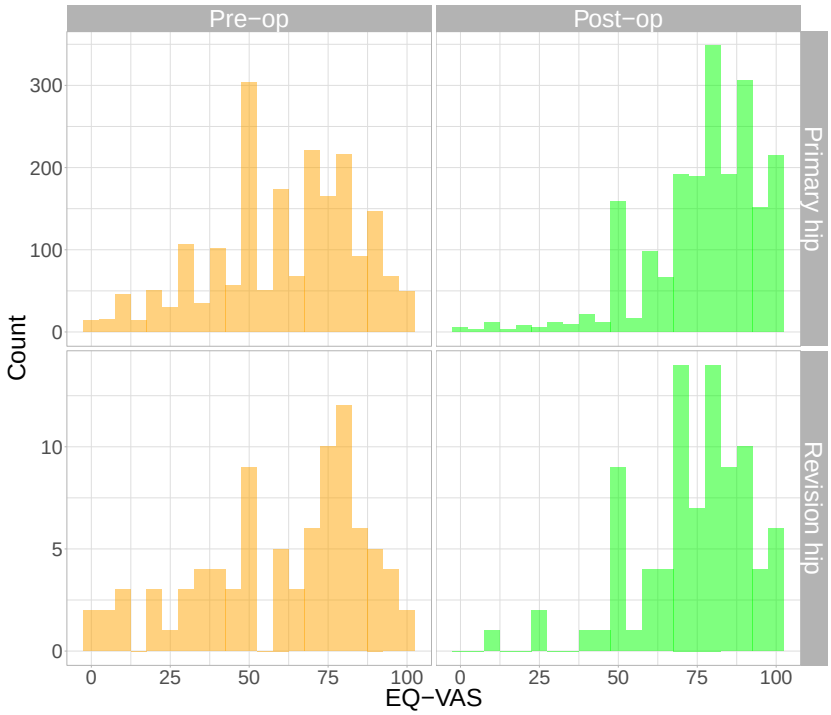


Figure 4.6: Hip Arthroplasties: Distribution of EQ-VAS, pre-op versus post-op

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	1073	59.5	15.0	60.0	95.0
		Post-op	1073	77.0	50.0	80.0	100.0
Primary hip	Females	Pre-op	948	63.2	20.0	70.0	95.0
		Post-op	948	78.0	50.0	80.0	100.0
Primary hip	Persons	Pre-op	2021	61.2	20.0	65.0	95.0
		Post-op	2021	77.5	50.0	80.0	100.0
Revision hip	Males	Pre-op	47	59.5	8.6	70.0	95.0
		Post-op	47	75.4	46.5	80.0	98.7
Revision hip	Females	Pre-op	40	61.7	19.3	70.0	85.2
		Post-op	40	71.8	48.8	72.5	90.5
Revision hip	Persons	Pre-op	87	60.5	8.6	70.0	95.0
		Post-op	87	73.7	46.5	75.0	98.7

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

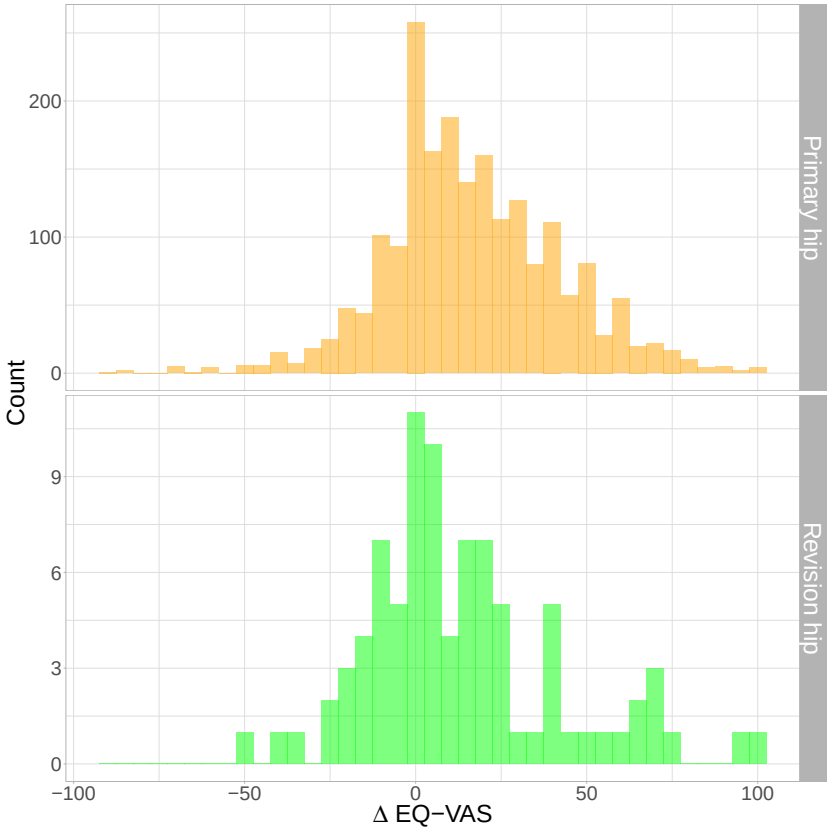


Figure 4.7: Hip Arthroplasties: Change in EQ-VAS, pre-op versus post-op

4.4.11 *Oxford Hip Scores*

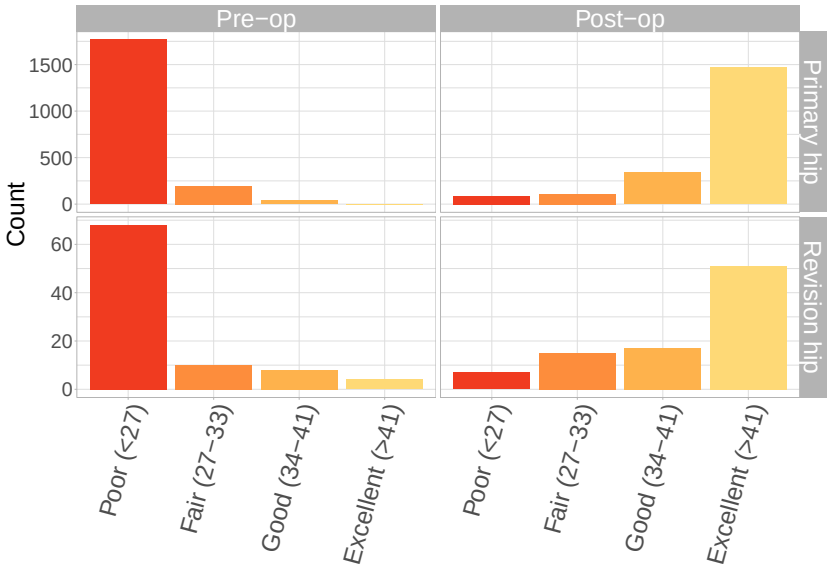


Figure 4.8: Hip Arthroplasties: Distribution of grouped total Oxford Hip Scores, pre-op to post-op

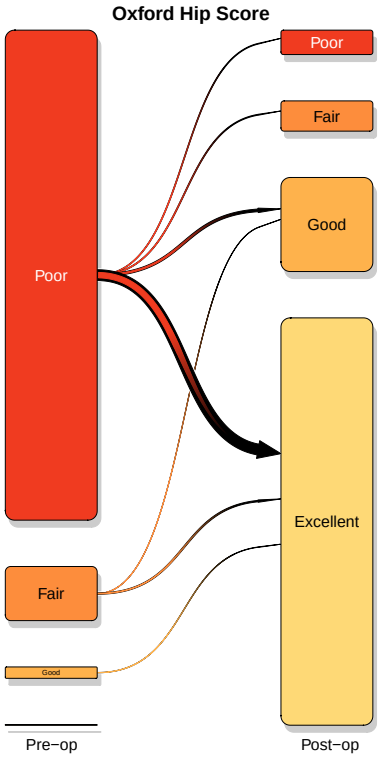
Partitioned total Oxford Hip Scores, pre-op and post-op — Primary hips

Total Oxford score	Pre-op		Post-op	
Poor (<27)	1766	88%	88	4%
Fair (27-33)	195	10%	109	5%
Good (34-41)	41	2%	339	17%
Excellent (>41)	2	0.1%	1468	73%

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

Total Oxford score	Pre-op		Post-op	
Poor (<27)	68	76%	7	8%
Fair (27-33)	10	11%	15	17%
Good (34-41)	8	9%	17	19%
Excellent (>41)	4	4%	51	57%

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.



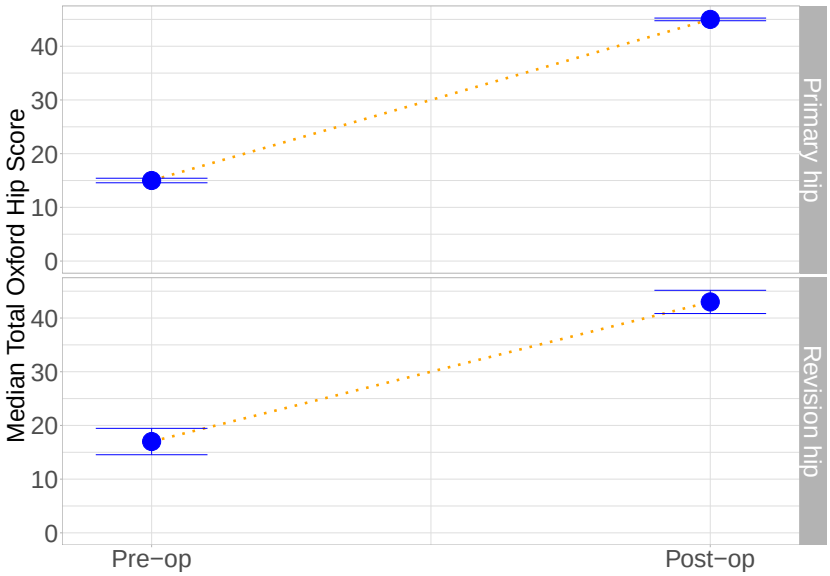


Figure 4.9: Domino plot of median Pre-op and Post-op Oxford Hip Scores

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	1059	14.4	3.9	13	31.0	11.0
		Post-op	1059	42.3	26.0	45	48.0	7.0
	Females	Pre-op	945	17.2	5.0	16	32.0	12.0
		Post-op	945	43.5	30.0	46	48.0	6.0
	Persons	Pre-op	2004	15.7	4.0	15	31.0	12.0
		Post-op	2004	42.9	28.0	45	48.0	7.0
Revision hip	Males	Pre-op	49	18.6	3.8	14	40.4	17.0
		Post-op	49	39.8	24.4	42	48.0	10.0
	Females	Pre-op	41	19.9	6.0	20	41.0	13.0
		Post-op	41	38.7	14.0	44	48.0	14.0
	Persons	Pre-op	90	19.2	5.0	17	41.0	14.8
		Post-op	90	39.3	17.4	43	48.0	13.0

* "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.

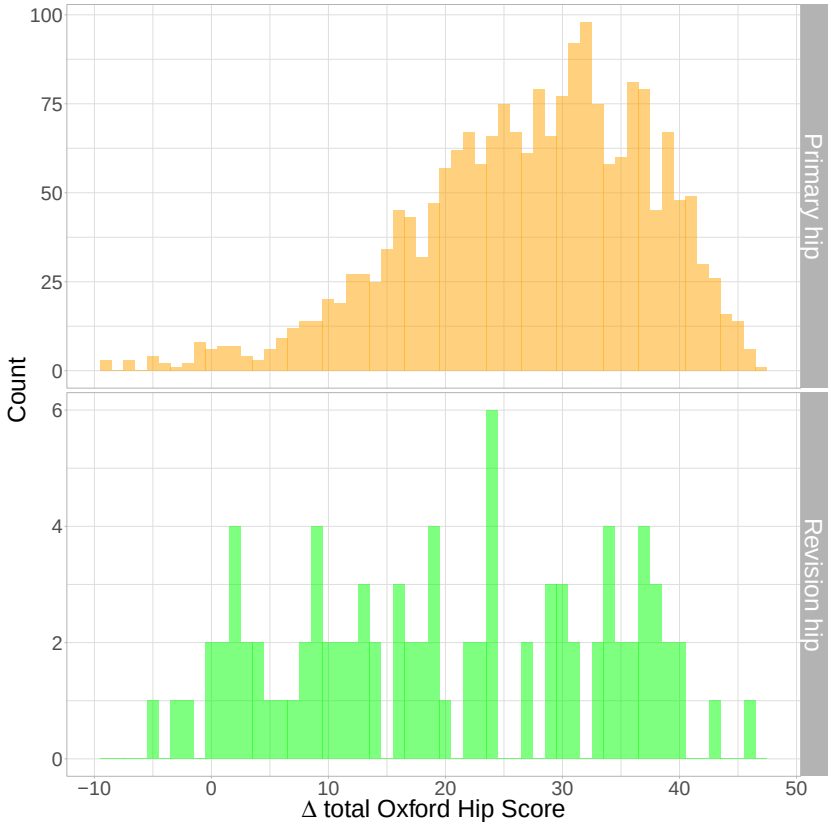


Figure 4.10: Change in total Oxford hip scores, pre-op to post-op

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	1059	27.9	9.0	30	42
1		Females	945	26.4	9.0	27	41
5		Persons	2004	27.2	9.0	28	41
4	Revision hip	Males	49	21.2	1.0	22	39
3		Females	41	18.8	0.0	19	37
6		Persons	90	20.1	0.5	19	39

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

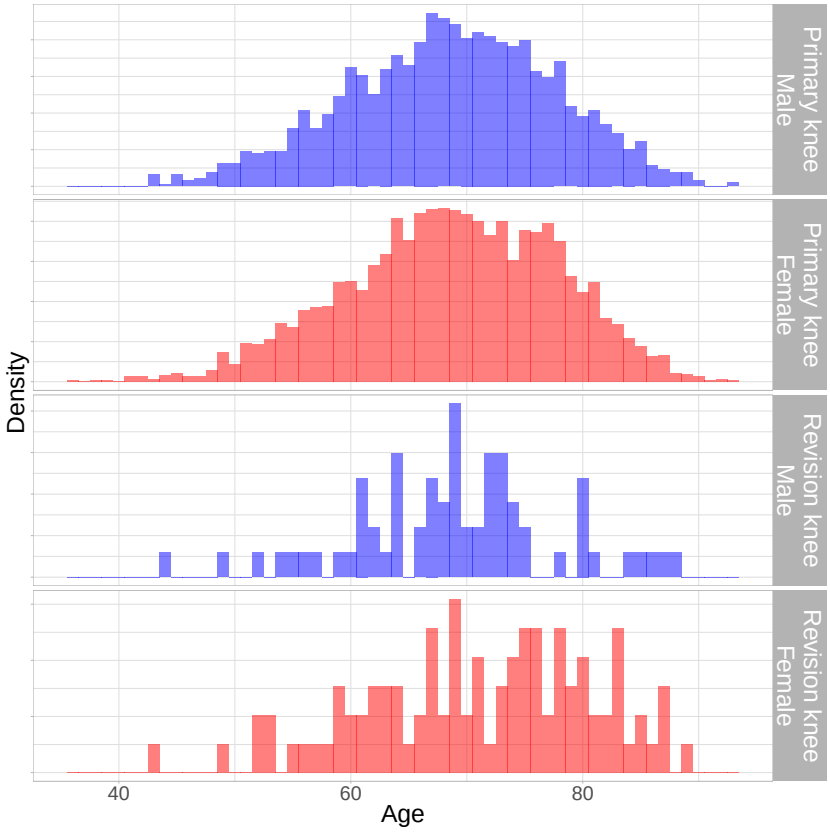
5
Knee Arthroplasty

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 2017, 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 (62.5%).

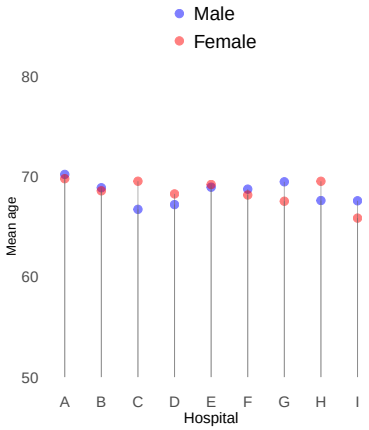
5.1 Demographic Profile

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.



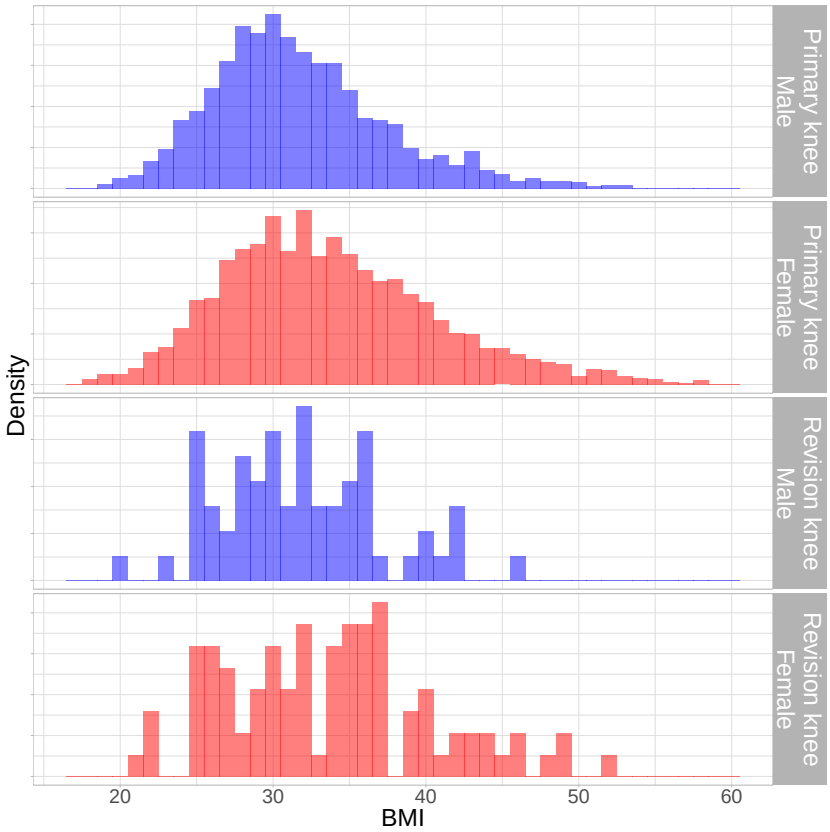
Age of Patients — Primary knees

	n	%	**Mean**	StdDev	Min	Max	<55	55-64	65-74	75-84	≥ 85
Male	1882	37.4	**68.6**	9.02	42.6	92.9	7.2%	26%	41%	22%	2.9%
Female	3147	62.6	**68.8**	9.05	36.2	92.8	7.7%	25%	39%	25%	2.4%
Persons	**5029**	**100.0**	**68.7**	**9.04**	**36.2**	**92.9**	**7.5%**	**26%**	**40%**	**24%**	**2.6%**

Age of Patients — Revision knees

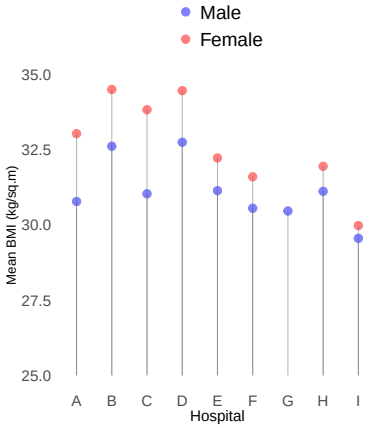
	n	%	**Mean**	StdDev	Min	Max	<55	55-64	65-74	75-84	≥ 85
Male	67	40.9	**68.8**	8.93	43.5	87.9	6%	25%	52%	12%	4.5%
Female	97	59.1	**71.1**	9.89	42.5	89.2	6.2%	22%	33%	33%	6.2%
Persons	**164**	**100.0**	**70.1**	**9.55**	**42.5**	**89.2**	**6.1%**	**23%**	**41%**	**24%**	**5.5%**

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.



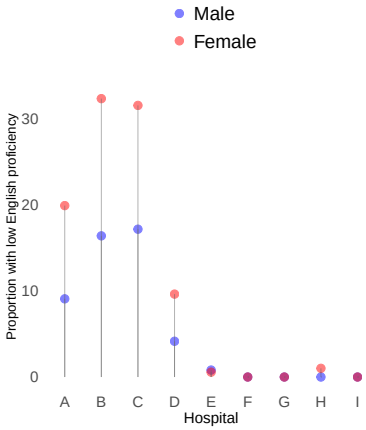
Body Mass Index (BMI) — Primary knees

	n	Missing		**Mean**	StdDev	Min	Max
Male	1882	67	3.7%	**31.8**	5.78	18.6	53
Female	3147	127	4.2%	**33.8**	7.01	17	59.6
Persons	**5029**	**194**	**4.0%**	**33**	**6.65**	**17**	**59.6**

Body Mass Index (BMI) — Revision knees

	n	Missing		**Mean**	StdDev	Min	Max
Male	67	4	6.3%	**31.9**	5.26	20	46.2
Female	97	3	3.2%	**33.7**	6.81	21.3	52.1
Persons	**164**	**7**	**4.5%**	**33**	**6.28**	**20**	**52.1**

5.1.3 *English Proficiency*



ENGLISH PROFICIENCY — PRIMARY & REVISION KNEES

	n	Missing		High		Low	
Male	1949	84	4.3%	1705	87.5%	160	8.2%
Female	3244	143	4.4%	2499	77.0%	602	18.6%
Persons	5193	227	4.4%	4204	81.0%	762	14.7%

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	1949	155	8%	31	1.6%	619	32%	799	41%	345	18%
Female	3244	220	6.8%	138	4.3%	1079	33%	1313	40%	494	15%
Persons	5193	375	7.2%	169	3.3%	1698	33%	2112	41%	839	16%

POST-SCHOOL EDUCATION — PRIMARY & REVISION KNEES

	n	Missing		None		Cert/Diploma		Bachelor		Postgrad	
Male	1949	193	9.9%	957	49%	664	34%	64	3.28%	71	3.6%
Female	3244	314	9.7%	2244	69%	377	12%	94	2.9%	215	6.6%
Persons	5193	507	9.8%	3201	62%	1041	20%	158	3%	286	5.5%

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	1882	502	27%	494	26%	679	36%	1053	56%
Female	3147	1142	36%	913	29%	1149	37%	1986	63%
Persons	**5029**	**1644**	**33%**	**1407**	**28%**	**1828**	**36%**	**3039**	**60%**

	n	Diabetes		Gastrointestinal disease		Respiratory disease		Renal disease	
Male	1882	421	22%	324	17%	277	15%	108	6%
Female	3147	729	23%	784	25%	531	17%	174	6%
Persons	**5029**	**1150**	**23%**	**1108**	**22%**	**808**	**16%**	**282**	**6%**

	n	Hepatic disease		Neurological disease		Anxiety/ depression	
Male	1882	37	2%	76	4%	207	11%
Female	3147	85	3%	168	5%	670	21%
Persons	**5029**	**122**	**2%**	**244**	**5%**	**877**	**17%**

	n	No comorbs		1 comorb		2 comorbs		$\geq$ 3 comorbs	
Male	1882	10	14%	12	20%	14	25%	24	40%
Female	3147	11	10%	8	16%	13	23%	37	51%
Persons	**5029**	**21**	**12%**	**20**	**17%**	**27**	**24%**	**61**	**47%**

PRE-OPERATIVE COMORBIDITIES — REVISION KNEES

	n	Low back pain		Other lower limb arthritis		Heart disease		Hypertension	
Male	67	19	28%	15	22%	24	36%	41	61%
Female	97	40	41%	31	32%	40	41%	61	63%
Persons	**164**	**59**	**36%**	**46**	**28%**	**64**	**39%**	**102**	**62%**

	n	Diabetes		Gastrointestinal disease		Respiratory disease		Renal disease	
Male	67	15	22%	19	28%	7	10%	4	6%
Female	97	23	24%	25	26%	16	16%	7	7%
Persons	**164**	**38**	**23%**	**44**	**27%**	**23**	**14%**	**11**	**7%**

	n	Hepatic disease		Neurological disease		Anxiety/ depression	
Male	67	0	0%	3	4%	5	7%
Female	97	3	3%	9	9%	25	26%
Persons	**164**	**3**	**2%**	**12**	**7%**	**30**	**18%**

	n	No comorbs		1 comorb		2 comorbs		$\geq$ 3 comorbs	
Male	67	10	15%	12	21%	14	27%	24	37%
Female	97	11	7%	8	14%	13	22%	37	57%
Persons	**164**	**21**	**10%**	**20**	**17%**	**27**	**24%**	**61**	**49%**

5.2.2 *ASA Physical Status Classification*

ASA — Primary knees

	n	Missing		ASA 1		ASA 2	
Males	1882	293	16%	86	5%	945	50%
Females	3147	510	16%	105	3%	1541	49%
Persons	5029	803	16%	191	4%	2486	49%

	n	ASA 3		ASA 4		ASA 5	
Males	1882	540	29%	17	0.9%	1	0.05%
Females	3147	968	31%	23	0.7%	0	0%
Persons	5029	1508	30%	40	0.8%	1	0.02%

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

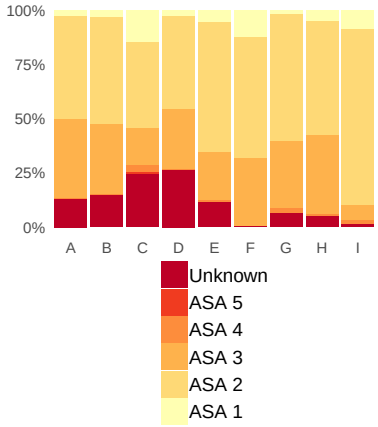
1. a normal healthy person
2. a person with mild systemic disease
3. a person with severe systemic disease
4. a person with severe systemic disease that is a constant threat to life
5. a moribund person who is not expected to survive

ASA — Revision knees

	n	Missing		ASA 1		ASA 2	
Males	67	17	25%	2	3%	24	36%
Females	97	10	10%	0	0%	47	48%
Persons	164	27	16%	2	1%	71	43%

	n	ASA 3		ASA 4		ASA 5	
Males	67	24	36%	0	0%	0	0%
Females	97	39	40%	1	1%	0	0%
Persons	164	63	38%	1	0.6%	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	5029	1	0.02%	2233	44%	2453	49%	342	7%
Revision	164	1	0.6%	64	39%	99	60%	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	1882	1828	97%	5	0.3%	0	0%
Female	3147	3035	96%	31	1%	0	0%
Persons	5029	4863	97%	36	0.7%	0	0%

	n	Oth arth		ON/AVN		Tumour	
Male	1882	1	0.05%	4	0.2%	0	0%
Female	3147	2	0.06%	6	0.2%	0	0%
Persons	5029	3	0.06%	10	0.2%	0	0%

	n	Other		Missing	
Male	1882	16	0.9%	28	1%
Female	3147	18	0.6%	55	2%
Persons	5029	34	0.7%	83	2%

OA
: osteoarthritis

RA
: rheumatoid arthritis

DDH
: developmental dysplasia of the hips

Oth arth
: other inflammatory arthritis

ON/AVN
: osteonecrosis/avascular necrosis

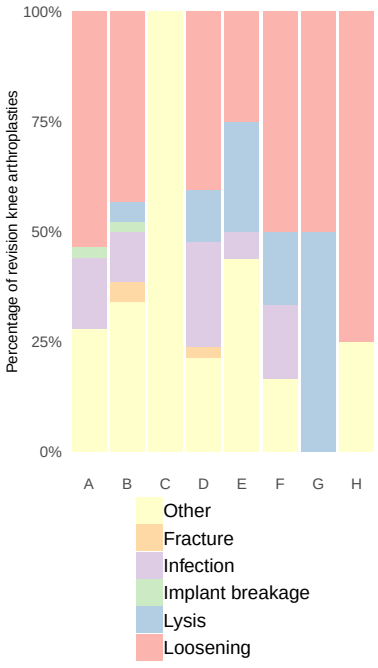
Reason for Surgery — Revision knees

	n	Loosening		Lysis		Dislocation	
Male	67	21	31%	7	10%	0	0%
Female	97	49	51%	6	6%	0	0%
Persons	164	70	43%	13	8%	0	0%

	n	Implant break		Infection		Fracture	
Male	67	1	1%	14	21%	0	0%
Female	97	1	1%	10	10%	3	3%
Persons	164	2	1%	24	15%	3	2%

	n	Other		Missing	
Male	67	21	31%	3	4%
Female	97	25	26%	3	3%
Persons	164	46	28%	6	4%

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.

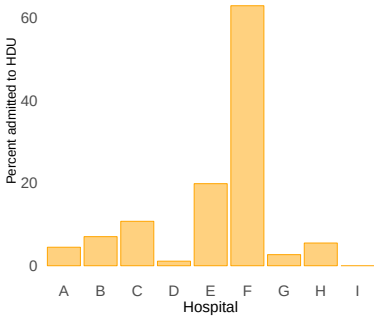
Complications are required to have been documented in the medical record. They include delirium, surgical site infection (SSI), deep venous thrombosis (DVT), pulmonary embolus (PE), respiratory infection, cardiovascular events, dislocation, fracture, nerve injury, bladder infection or retention, wound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

5.3.1 High Care Bed Utilisation

HIGH CARE BED UTILISATION — PRIMARY KNEES

	n	Missing		High Care Bed		Unplanned*	
Male	1882	2	0.1%	175	9%	137	78%
Female	3147	1	0.03%	220	7%	136	62%
Persons	5029	3	0.06%	395	8%	273	69%

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	67	0	0%	5	7%	3	60%
Female	97	0	0%	6	6%	5	83%
Persons	164	0	0%	11	7%	8	73%

* 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	1882	12	0.6%	66	4%	2.2
Female	3147	23	0.7%	182	6%	1.9
Persons	5029	35	0.7%	248	5%	2

	n	Autologous †		Donor †		Missing source	
Male	1882	3	5%	50	76%	11	17%
Female	3147	4	2%	134	74%	35	19%
Persons	5029	7	3%	184	74%	46	19%

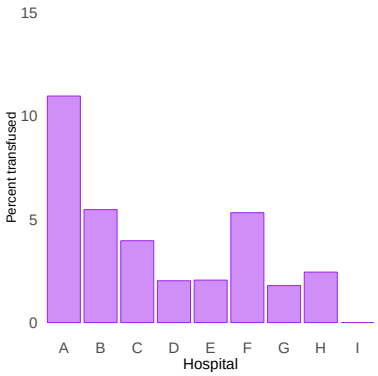
Blood Transfusion — Revision knees

	n	Missing		Transfused		Mean units
Male	67	1	1%	10	15%	2.3
Female	97	1	1%	12	12%	1.6
Persons	164	2	1%	22	13%	1.9

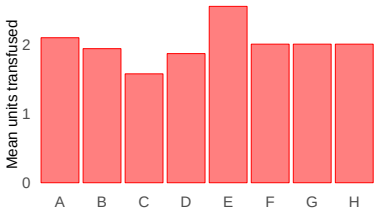
	n	Autologous †		Donor †		Missing source	
Male	67	0	0%	7	70%	1	10%
Female	97	1	8%	9	75%	1	8%
Persons	164	1	5%	16	73%	2	9%

* 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	1882	296	(16%)	1564	(83%)	15	(0.8%)
Females	3147	383	(12%)	2726	(87%)	32	(1%)
Persons	5029	679	(14%)	4290	(85%)	47	(0.9%)

COMPLICATIONS (DETAILS) DURING ADMISSION — PRIMARY KNEES

Complications	Males		Females		Persons	
Drug reaction	1	0.053%	1	0.032%	2	0.04%
Delirium	25	1.3%	20	0.64%	45	0.89%
SSI requiring oral antibiotics	1	0.053%	0	0%	1	0.02%
SSI requiring IV antibiotics	0	0%	5	0.16%	5	0.099%
SSI requ surg $\bar{c}$ prosth removal	0	0%	0	0%	0	0%
SSI requ surg $\bar{s}$ prosth removal	0	0%	0	0%	0	0%
Deep vein thrombosis	8	0.43%	14	0.44%	22	0.44%
Pulmonary embolus	7	0.37%	20	0.64%	27	0.54%
Fat emboli	0	0%	1	0.032%	1	0.02%
Respiratory infection	9	0.48%	24	0.76%	33	0.66%
CVS	33	1.8%	59	1.9%	92	1.8%
Dislocation	0	0%	0	0%	0	0%
Fracture	3	0.16%	12	0.38%	15	0.3%
Nerve injury	2	0.11%	4	0.13%	6	0.12%
Urinary tract infection	21	1.1%	18	0.57%	39	0.78%
Urinary retention	61	3.2%	24	0.76%	85	1.7%
Wound dehiscence	19	1%	18	0.57%	37	0.74%
Reoperation during index adm	2	0.11%	2	0.064%	4	0.08%
Pressure area	1	0.053%	3	0.095%	4	0.08%
Fall	7	0.37%	9	0.29%	16	0.32%
Hypotension	11	0.58%	25	0.79%	36	0.72%
Cellulitis	5	0.27%	9	0.29%	14	0.28%
Death	0	0%	1	0.032%	1	0.02%
Other	79	4.2%	123	3.9%	202	4%

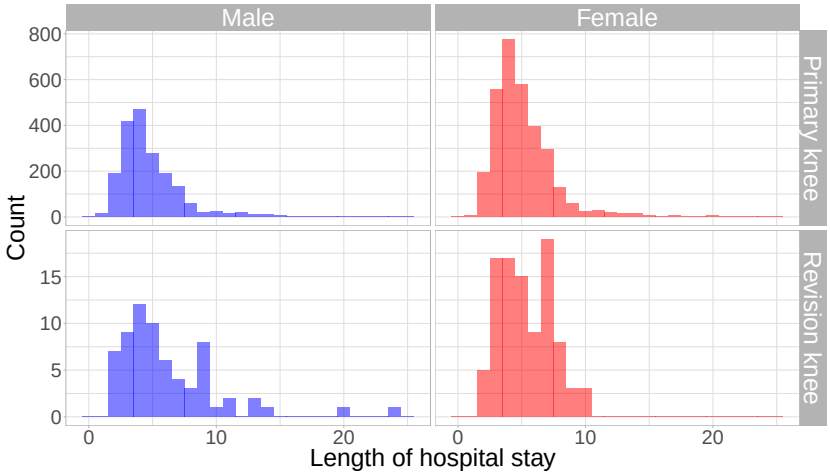
Complications (any) during Admission — Revision knees

	n	1 or more		None		Unk/NS	
Males	67	7	(10%)	59	(88%)	1	(1%)
Females	97	11	(11%)	85	(88%)	1	(1%)
Persons	164	18	(11%)	144	(88%)	2	(1%)

Complications (details) during Admission — Revision knees

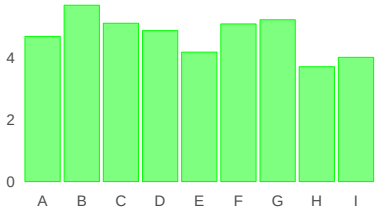
Complications	Males		Females		Persons	
Drug reaction	0	0%	0	0%	0	0%
Delirium	0	0%	0	0%	0	0%
SSI requiring oral antibiotics	0	0%	0	0%	0	0%
SSI requiring IV antibiotics	0	0%	0	0%	0	0%
SSI requ surg c̄ prosth removal	0	0%	0	0%	0	0%
SSI requ surg s̄ prosth removal	0	0%	0	0%	0	0%
Deep vein thrombosis	0	0%	1	1%	1	0.61%
Pulmonary embolus	0	0%	0	0%	0	0%
Fat emboli	0	0%	0	0%	0	0%
Respiratory infection	0	0%	1	1%	1	0.61%
CVS	1	1.5%	0	0%	1	0.61%
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%	1	0.61%
Urinary retention	1	1.5%	1	1%	2	1.2%
Wound dehiscence	1	1.5%	0	0%	1	0.61%
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	1.5%	0	0%	1	0.61%
Cellulitis	0	0%	0	0%	0	0%
Death	0	0%	0	0%	0	0%
Other	3	4.5%	5	5.2%	8	4.9%

5.3.4 *Length of Stay in Hospital*



The plot at left excludes 10 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	1882	37%	3	0.2%	4.9	4	6	10
Female	3147	63%	9	0.3%	5.1	5	6	9
Persons	5029	100%	12	0.2%	5	4	6	9.2

Length of Stay in Hospital — Revision knees

	n		Missing		Mean	Median	75th %ile	95th %ile
Male	67	41%	0	0%	6.2	5	8	13
Female	97	59%	0	0%	6.3	5	7	9
Persons	164	100%	0	0%	6.3	5	7	10

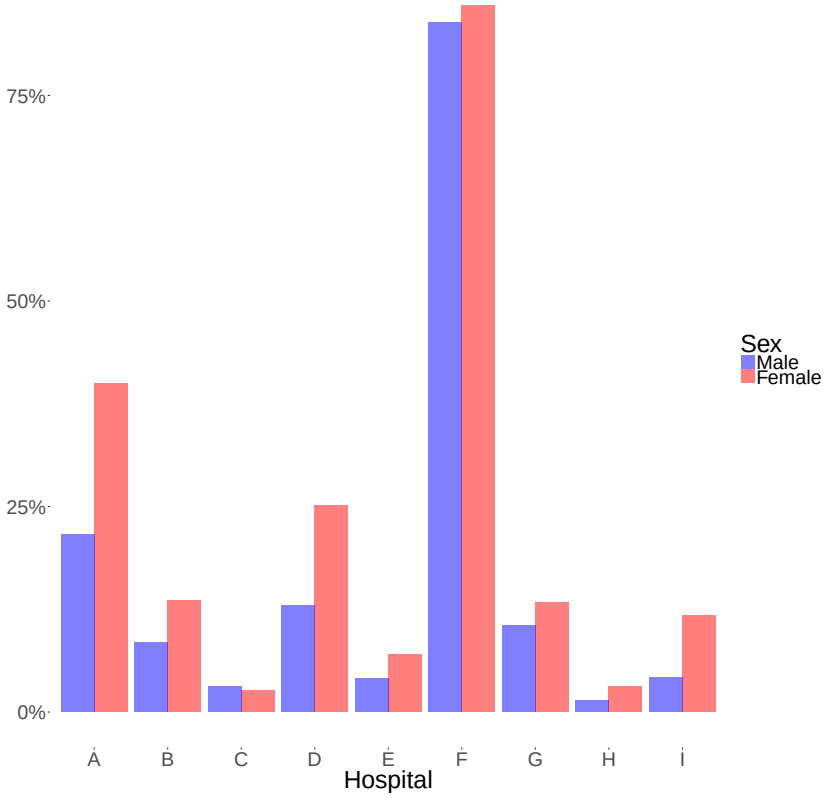
5.3.5 *Discharge Destination*

DISCHARGE DESTINATION — PRIMARY KNEES

	n	Unk/NS		Usual residence		Inpatient rehab		Other	
Male	1882	20	1%	1608	85%	246	13%	8	0.4%
Female	3147	34	1%	2447	78%	649	21%	17	0.5%
Persons	5029	54	1%	4055	81%	895	18%	25	0.5%

DISCHARGE DESTINATION — REVISION KNEES

	n	Unk/NS		Usual residence		Inpatient rehab		Other	
Male	67	2	3%	54	81%	11	16%	0	0%
Female	97	0	0%	71	73%	26	27%	0	0%
Persons	164	2	1%	125	76%	37	23%	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.

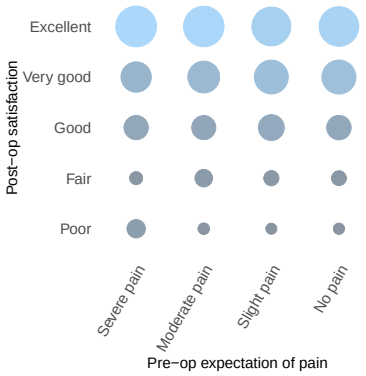
For success, the question asked is "overall, how are the problems now with your hip/knee on which you had surgery, compared to before your operation?" This question also allows the person to choose one of five options: much better; a little better; about the same; a little worse; and much worse.

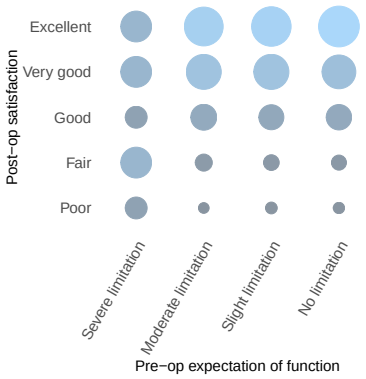
In addition, ACORN asks participants whether they have been re-admitted to hospital since discharge, had another operation on the joint that was replaced six months earlier, and whether they have experienced any other problem not requiring re-admission or re-operation. By asking this additional question 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.

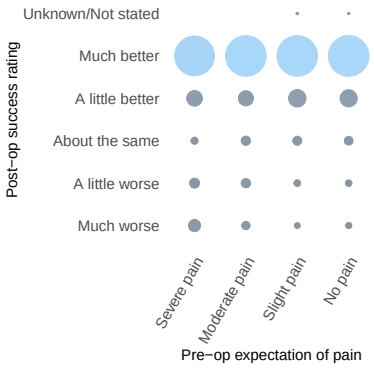
The EQ-VAS records a person's self-rated health on a 20 cm vertical scale with 0 at the bottom representing "worst health imaginable" and 100 at the top representing "best health imaginable". Prior to surgery, the surveys are completed by patients on paper. After surgery, the surveys are completed over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

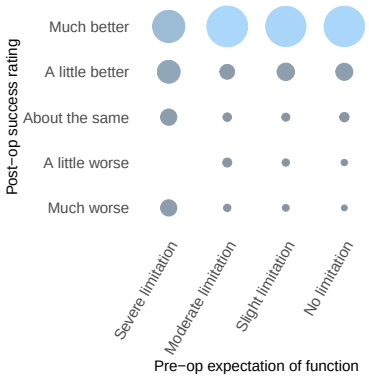
The EQ-5D-5L is a descriptive system of five dimensions of a person's general health. The dimensions are Mobility, Self-care, Usual Activities, Pain or Discomfort, and Anxiety or Depression. Each dimension has five levels: no problems, slight problems, moderate problems, severe problems, or extreme problems. 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	1882	315	17%	975	52%	470	25%	100	5%	22	1%
Female	3147	578	18%	1495	48%	880	28%	171	5%	23	0.7%
Persons	5029	893	18%	2470	49%	1350	27%	271	5%	45	0.9%

EXPECTATION OF PAIN — REVISION KNEES

	n	Unknown/ Not stated		No pain		Slight pain		Moderate pain		Severe pain	
Male	67	13	19%	27	40%	18	27%	8	12%	1	1%
Female	97	20	21%	37	38%	33	34%	6	6%	1	1%
Persons	164	33	20%	64	39%	51	31%	14	9%	2	1%

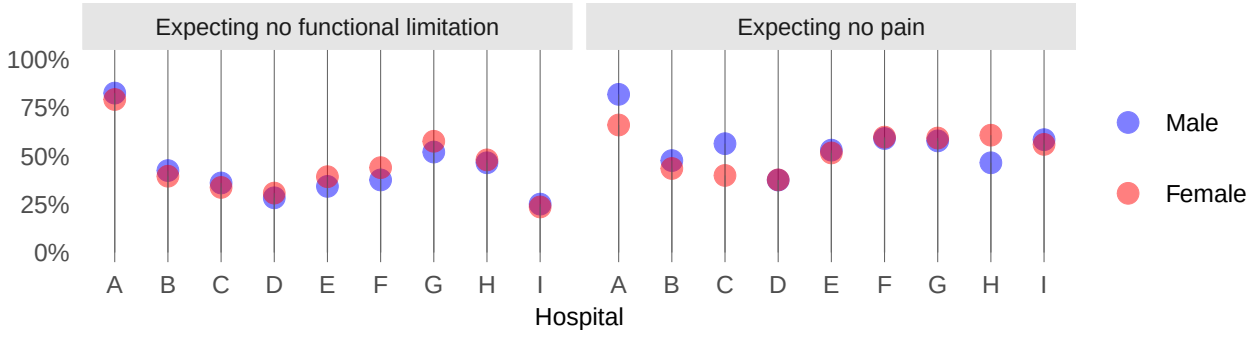
5.4.2 *Pre-op Expectation of Function at 6 months post-op*

EXPECTATION OF FUNCTION — PRIMARY KNEES

	n	Unknown/ Not stated		No limitation		Slight limitation		Moderate limitation		Severe limitation	
Male	1882	319	17%	827	44%	649	34%	83	4%	4	0.2%
Female	3147	578	18%	1390	44%	999	32%	175	6%	5	0.2%
Persons	5029	897	18%	2217	44%	1648	33%	258	5%	9	0.2%

EXPECTATION OF FUNCTION — REVISION KNEES

	n	Unknown/ Not stated		No limitation		Slight limitation		Moderate limitation		Severe limitation	
Male	67	13	19%	28	42%	20	30%	6	9%	0	0%
Female	97	19	20%	38	39%	38	39%	1	1%	1	1%
Persons	164	32	20%	66	40%	58	35%	7	4%	1	0.6%



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	1879	129	7%	64	3%	109	6%	269	14%	533	28%	775	41%
Female	3143	229	7%	96	3%	187	6%	523	17%	947	30%	1161	37%
Persons	5022	358	7%	160	3%	296	6%	792	16%	1480	29%	1936	39%

SATISFACTION AT 6 MONTHS POST-OP — REVISION KNEES

	n	Unk/NS		Poor		Fair		Good		Very good		Excellent	
Male	67	8	12%	5	7%	8	12%	17	25%	13	19%	16	24%
Female	97	3	3%	7	7%	8	8%	23	24%	25	26%	31	32%
Persons	164	11	7%	12	7%	16	10%	40	24%	38	23%	47	29%

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	1879	128	7%	34	2%	41	2%	63	3%	243	13%	1370	73%
Female	3143	229	7%	53	2%	58	2%	109	3%	416	13%	2278	72%
Persons	5022	357	7%	87	2%	99	2%	172	3%	659	13%	3648	73%

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	67	9	13%	2	3%	6	9%	6	9%	13	19%	31	46%
Female	97	3	3%	3	3%	3	3%	7	7%	20	21%	61	63%
Persons	164	12	7%	5	3%	9	5%	13	8%	33	20%	92	56%

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	1879	503	27%	378	20%	204	11%	156	8%	638	34%
Female	3143	882	28%	623	20%	331	11%	243	8%	1064	34%
Persons	5022	1385	28%	1001	20%	535	11%	399	8%	1702	34%

Post-Discharge Complications (any) — Revision knees

	n	None		1		2		3 or more		Number unknown	
Male	67	14	21%	16	24%	4	6%	8	12%	25	37%
Female	97	23	24%	27	28%	16	16%	8	8%	23	24%
Persons	164	37	23%	43	26%	20	12%	16	10%	48	29%

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

	Primary knees (*n*=5022)		Revision knees (*n*=164)	
SSI requiring oral antibiotics	204	4.1%	6	3.7%
SSI requiring IV antibiotics	6	0.12%	0	0%
DVT index leg	75	1.5%	1	0.61%
DVT other leg	2	0.04%	0	0%
DVT both legs	0	0%	1	0.61%
Pulmonary embolus	7	0.14%	1	0.61%
Dislocation	3	0.06%	0	0%
Joint stiffness	737	15%	29	18%
Bladder infection or retention	5	0.1%	2	1.2%
Fracture	3	0.06%	1	0.61%
Unexpected pain	429	8.5%	25	15%
Cardiac	7	0.14%	0	0%
Stroke	0	0%	0	0%
Leg length discrepancy	74	1.5%	4	2.4%
Joint or lower limb swelling	684	14%	24	15%
Paraesthesia or numbness	678	14%	19	12%
Cellulitis	26	0.52%	0	0%
Neuropathy	44	0.88%	0	0%
Muscle weakness	66	1.3%	3	1.8%
Respiratory infection	5	0.1%	0	0%
Other	241	4.8%	14	8.5%

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

	Primary knees (*n*=5023)		Revision knees (*n*=164)	
SSI requiring oral antibiotics	204	4.1%	6	3.7%
SSI requiring IV antibiotics	11	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	95	1.9%	2	1.2%
Pulmonary embolus	33	0.66%	1	0.61%
Fat emboli	1	0.02%	0	0%
Drug reaction	2	0.04%	0	0%
Delirium	45	0.9%	0	0%
Hypotension	36	0.72%	1	0.61%
CVS	99	2%	1	0.61%
Respiratory infection	38	0.76%	1	0.61%
Urinary tract infection or retention	124	2.5%	5	3%
Wound dehiscence	37	0.74%	1	0.61%
Pressure area	4	0.08%	0	0%
Fall	16	0.32%	0	0%
Cellulitis	39	0.78%	0	0%
Death	17	0.34%	0	0%
Dislocation	3	0.06%	0	0%
Fracture	18	0.36%	1	0.61%
Joint stiffness	737	15%	29	18%
Unexpected pain	429	8.5%	25	15%
Leg length discrepancy	74	1.5%	4	2.4%
Joint or lower limb swelling	684	14%	24	15%
Nerve injury†	714	14%	19	12%
Muscle weakness	66	1.3%	3	1.8%
Re-operation	108	2.2%	7	4.3%
Other	429	8.5%	22	13%

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	1879	111	6%	112	6%	144	8%	243	13%
Female	3143	212	7%	167	5%	217	7%	368	12%
Persons	5022	323	6%	279	6%	361	7%	611	12%

RE-ADMISSION — REVISION KNEES

	n	Missing		Re-admission due to arthroplasty		Re-admission for other reasons		Total re-admissions	
Male	67	8	12%	5	7%	5	7%	8	12%
Female	97	1	1%	12	12%	11	11%	22	23%
Persons	164	9	5%	17	10%	16	10%	30	18%

REASON FOR RE-ADMISSION — PRIMARY & REVISION KNEES

	Primary (*n*=609)		Revision (*n*=30)	
Reasons related to arthroplasty				
DVT	22	4%	1	3%
Pulmonary embolus	7	1%	1	3%
MUA	83	14%	1	3%
Dislocation	0	0%	0	0%
Surgical site infection	92	15%	5	17%
Wound dehiscence	4	0.7%	0	0%
Index joint revision	0	0%	1	3%
Other	69	11%	8	27%
Reasons unrelated to arthroplasty				
Cardiac	23	4%	1	3%
Renal/urinary tract	35	6%	4	13%
Cancer	9	1%	2	7%
Other	290	48%	9	30%

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

Re-operation — Primary knees

	n	Re-operation due to arthroplasty	
Male	1879	43	2%
Female	3143	61	2%
Persons	5022	104	2%

Re-operation — Revision knees

	n	Re-operation due to arthroplasty	
Male	67	3	4%
Female	97	4	4%
Persons	164	7	4%

Reason for Re-operation — Primary knees

	Males (*n*=43)		Females (*n*=61)		Persons (*n*=104)	
SSI requiring surgery with no prosthesis removal	10	23%	13	21%	23	22%
SSI requiring surgery with prosthesis removal	1	2%	6	10%	7	7%
Dislocation	0	0%	0	0%	0	0%
Joint stiffness	27	63%	34	56%	61	59%
Periprosthetic fracture	0	0%	1	2%	1	1%
Implant fracture	0	0%	1	2%	1	1%
Bleeding	0	0%	0	0%	0	0%
Other	5	12%	6	10%	11	11%
Unknown/NS	0	0%	0	0%	0	0%

Reason for Re-operation — Revision knees

	Males (*n*=3)		Females (*n*=4)		Persons (*n*=7)	
SSI requiring surgery with no prosthesis removal	1	33%	0	0%	1	14%
SSI requiring surgery with prosthesis removal	1	33%	2	50%	3	43%
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%	1	25%	1	14%
Bleeding	0	0%	0	0%	0	0%
Other	1	33%	1	25%	2	29%
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	1879	92	5%	0	0%	12	0.6%
Female	3143	186	6%	1	0.03%	5	0.2%
Persons	5022	278	6%	1	0.02%	17	0.3%

POST-DISCHARGE DEATH — REVISION KNEES

	n	Unknown/ not stated		Died in hospital		Total deaths at 6 mths post-op	
Male	67	10	15%	0	0%	0	0%
Female	97	4	4%	0	0%	0	0%
Persons	164	14	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.

5.4.9 *EuroQoL EQ-5D Measures*

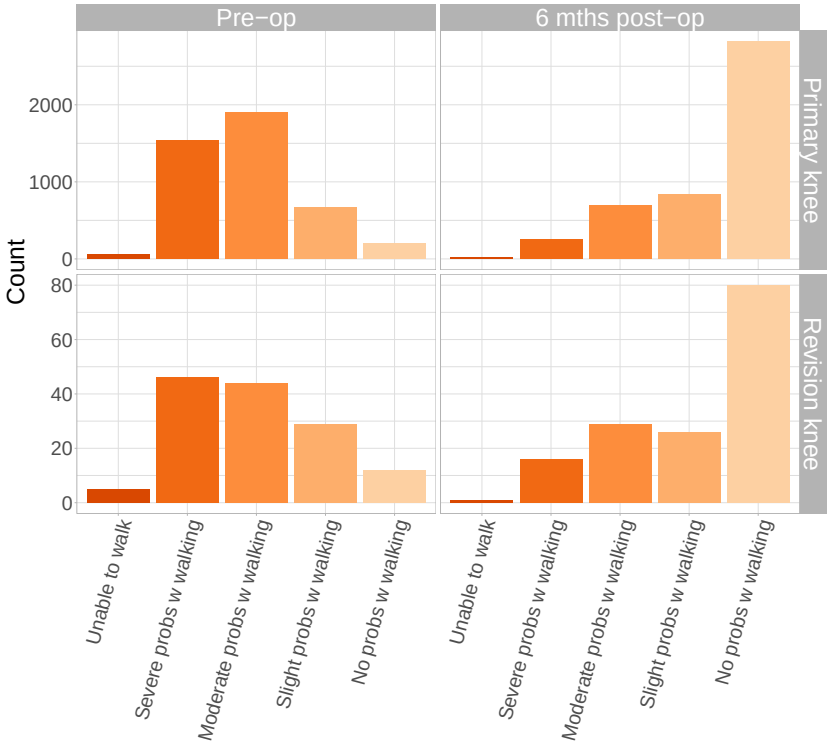


Figure 5.1: Knee Arthroplasties: Distribution of EQ-5D Mobility, pre-op versus post-op

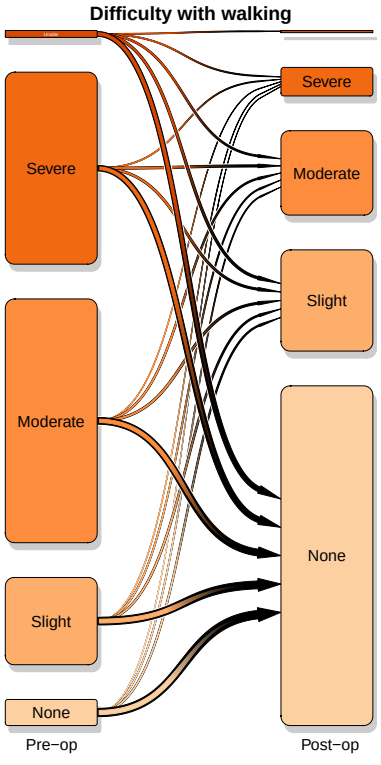
EQ-5D Mobility — Primary knees

	Pre-op		Post-op	
Unable to walk	58	1%	16	0.3%
Severe problems with walking	1543	31%	248	5%
Moderate problems with walking	1903	38%	697	14%
Slight problems with walking	666	13%	841	17%
No problems with walking	196	4%	2823	57%
Unknown/Not stated	600	12%	341	7%

EQ-5D Mobility — Revision knees

	Pre-op		Post-op	
Unable to walk	5	3%	1	0.6%
Severe problems with walking	46	28%	16	10%
Moderate problems with walking	44	27%	29	18%
Slight problems with walking	29	18%	26	16%
No problems with walking	12	7%	80	49%
Unknown/Not stated	27	17%	11	7%

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.



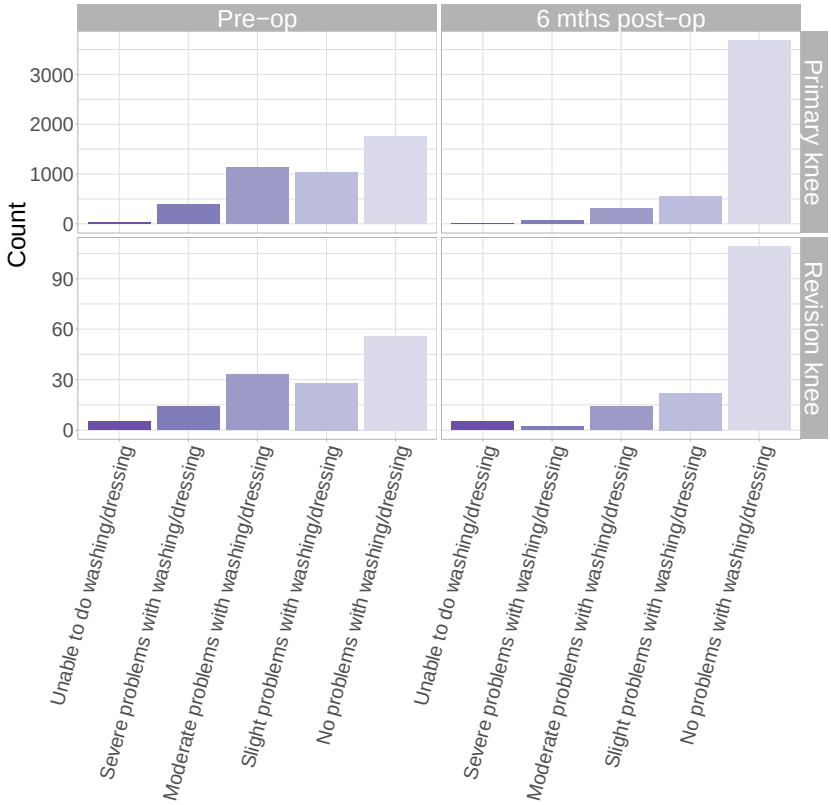


Figure 5.2: Knee Arthroplasties: Distribution of EQ-5D Personal Care, pre-op versus post-op

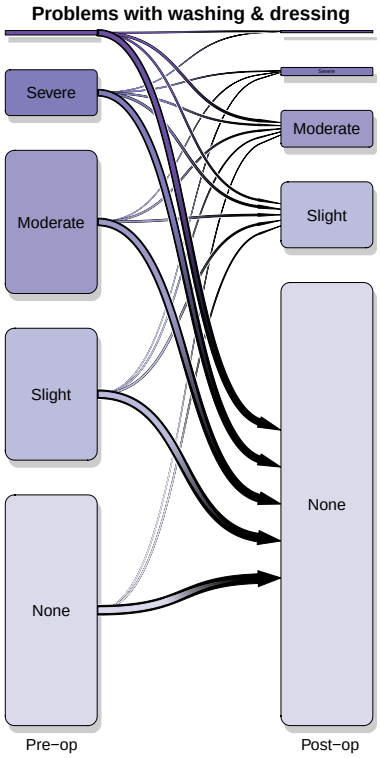
EQ-5D Personal Care — Primary knees

	Pre-op		Post-op	
Unable to do washing/dressing	39	0.8%	18	0.4%
Severe problems washing/dressing	393	8%	69	1%
Mod. problems washing/dressing	1133	23%	304	6%
Slight problems washing/dressing	1038	21%	547	11%
No problems washing/dressing	1764	36%	3684	74%
Unknown/Not stated	599	12%	344	7%

EQ-5D Personal Care — Revision knees

	Pre-op		Post-op	
Unable to do washing/dressing	5	3%	5	3%
Severe problems washing/dressing	14	9%	2	1%
Mod. problems washing/dressing	33	20%	14	9%
Slight problems washing/dressing	28	17%	22	13%
No problems washing/dressing	56	34%	109	67%
Unknown/Not stated	27	17%	11	7%

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.



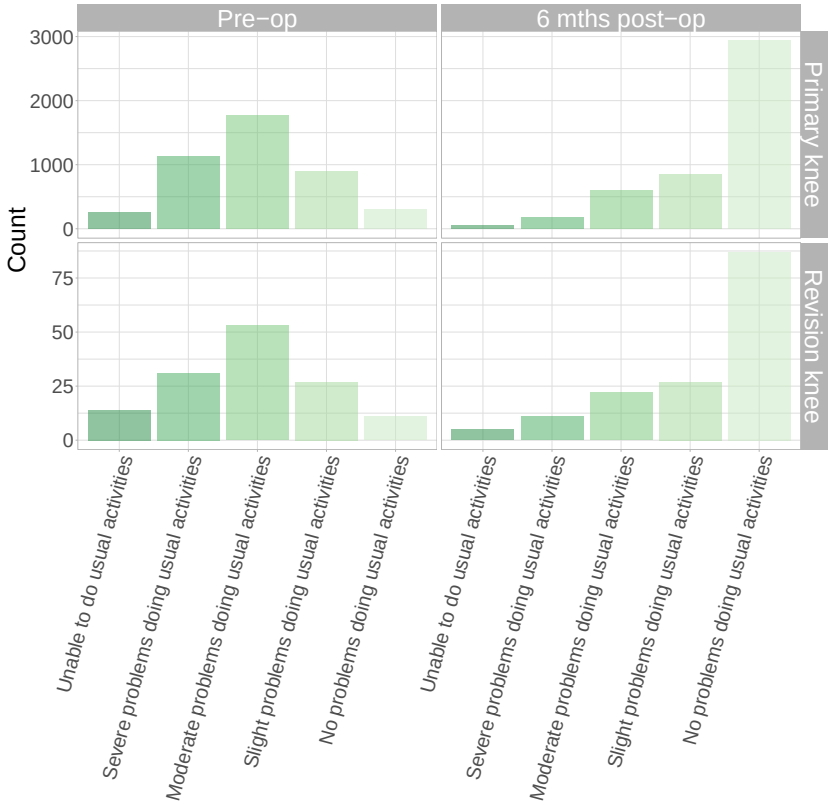


Figure 5.3: Knee Arthroplasties: Distribution of EQ-5D Usual Activities, pre-op versus post-op

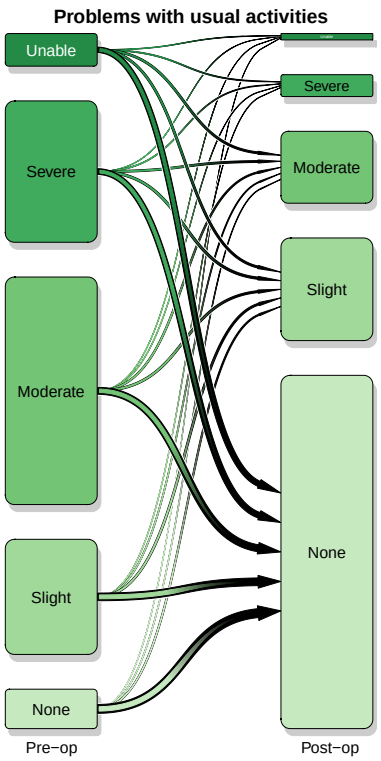
EQ-5D Usual Activites — Primary knees

	Pre-op		Post-op	
Unable to do usual activities	264	5%	57	1%
Severe problems c̄ usual activities	1137	23%	183	4%
Mod. problems c̄ usual activities	1769	36%	602	12%
Slight problems c̄ usual activities	892	18%	844	17%
No problems c̄ usual activities	304	6%	2937	59%
Unknown/Not stated	600	12%	343	7%

EQ-5D Usual Activites — Revision knees

	Pre-op		Post-op	
Unable to do usual activities	14	9%	5	3%
Severe problems c̄ usual activities	31	19%	11	7%
Mod. problems c̄ usual activities	53	33%	22	13%
Slight problems c̄ usual activities	27	17%	27	17%
No problems c̄ usual activities	11	7%	87	53%
Unknown/Not stated	27	17%	11	7%

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.



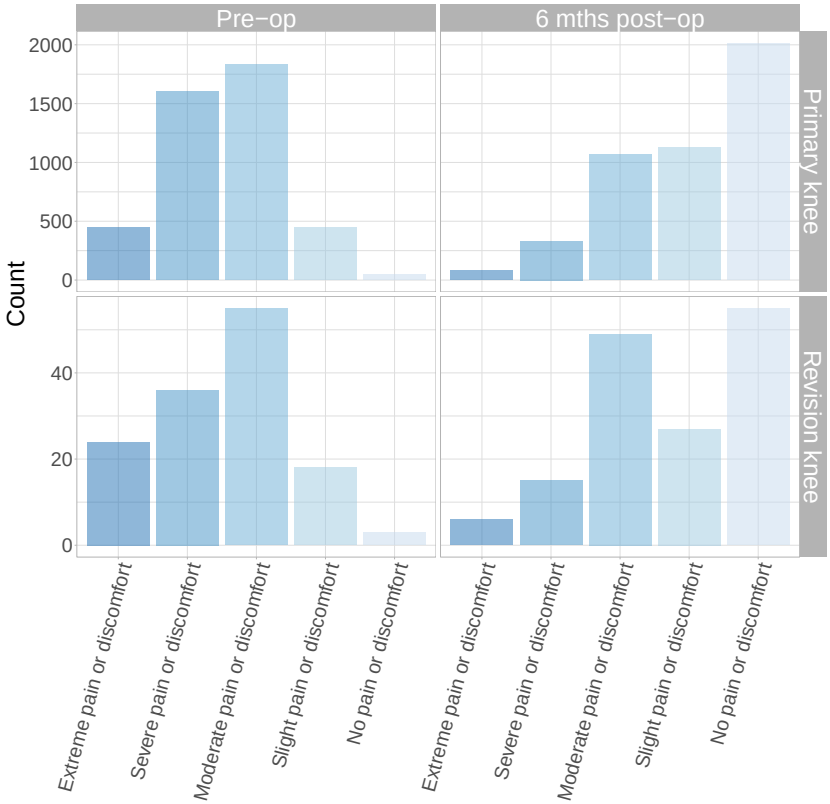


Figure 5.4: Knee Arthroplasties: Distribution of EQ-5D Discomfort, pre-op versus post-op

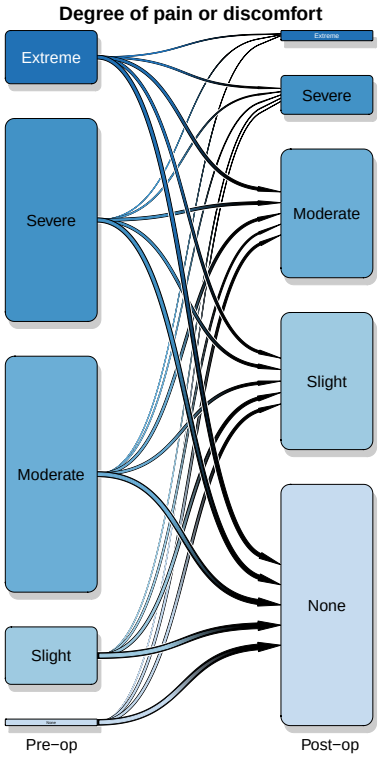
EQ-5D Discomfort — Primary knees

	Pre-op		Post-op	
Extreme pain or discomfort	444	9%	83	2%
Severe pain or discomfort	1601	32%	332	7%
Moderate pain or discomfort	1829	37%	1067	21%
Slight pain or discomfort	445	9%	1127	23%
No pain or discomfort	49	1%	2015	41%
Unknown/not stated	598	12%	342	7%

EQ-5D Discomfort — Revision knees

	Pre-op		Post-op	
Extreme pain or discomfort	24	15%	6	4%
Severe pain or discomfort	36	22%	15	9%
Moderate pain or discomfort	55	34%	49	30%
Slight pain or discomfort	18	11%	27	17%
No pain or discomfort	3	2%	55	34%
Unknown/not stated	27	17%	11	7%

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.



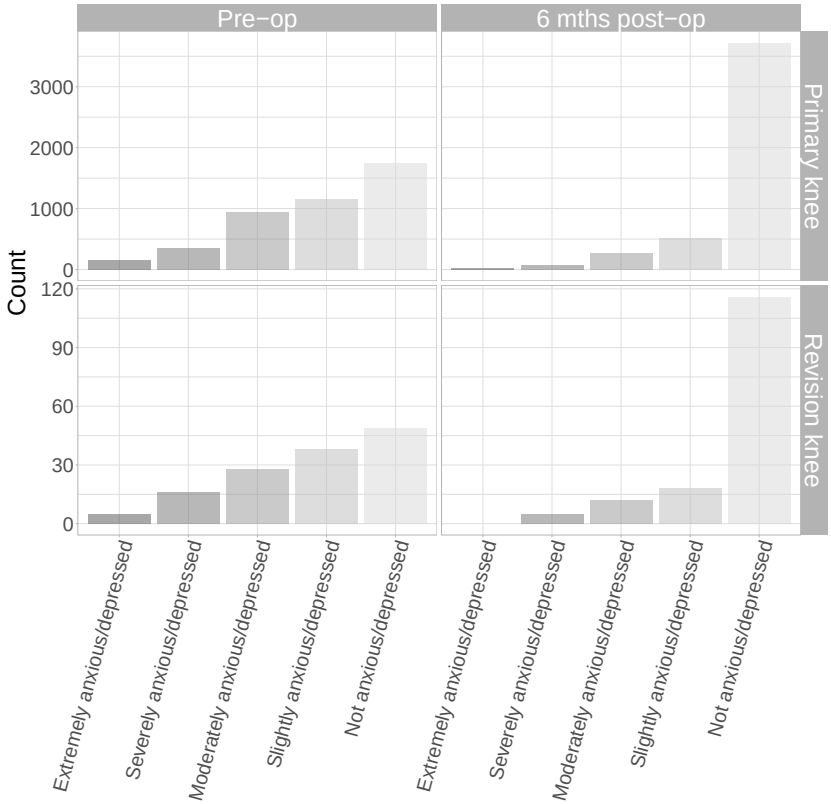


Figure 5.5: Knee Arthroplasties: Distribution of EQ-5D Anxiety/Depression, pre-op versus post-op

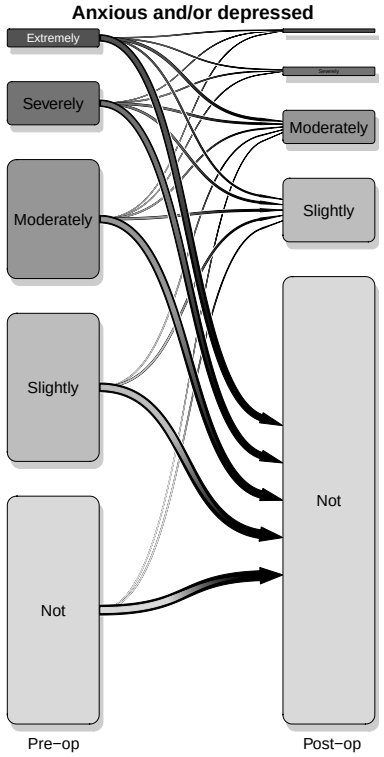
EQ-5D Anxiety/Depression — Primary knees

	Pre-op		Post-op	
Extremely anxious/depressed	156	3%	28	0.6%
Severely anxious/depressed	359	7%	75	2%
Moderately anxious/depressed	946	19%	270	5%
Slightly anxious/depressed	1151	23%	521	10%
Not anxious/depressed	1748	35%	3725	75%
Unknown/not stated	603	12%	344	7%

EQ-5D Anxiety/Depression — Revision knees

	Pre-op		Post-op	
Extremely anxious/depressed	5	3%	0	0%
Severely anxious/depressed	16	10%	5	3%
Moderately anxious/depressed	28	17%	12	7%
Slightly anxious/depressed	38	23%	18	11%
Not anxious/depressed	49	30%	116	71%
Unknown/not stated	27	17%	12	7%

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)*

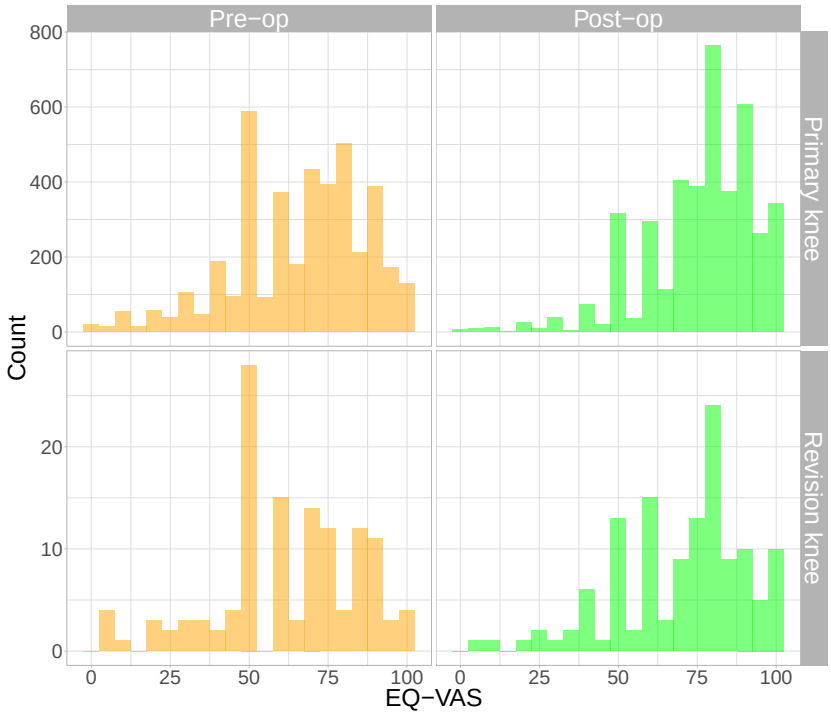


Figure 5.6: Knee Arthroplasties: Distribution of EQ-VAS, pre-op versus post-op

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	2551	63.8	25.0	65	95.0
		Post-op	2551	75.5	50.0	80	100.0
Primary knee	Females	Pre-op	1549	69.3	32.0	75	95.0
		Post-op	1549	77.7	50.0	80	100.0
Primary knee	Persons	Pre-op	4100	65.9	29.9	70	95.0
		Post-op	4100	76.3	50.0	80	100.0
Revision knee	Males	Pre-op	80	61.4	24.8	60	90.2
		Post-op	80	69.1	29.8	75	100.0
Revision knee	Females	Pre-op	48	64.0	12.9	70	96.5
		Post-op	48	72.0	50.0	75	93.2
Revision knee	Persons	Pre-op	128	62.4	20.0	60	93.2
		Post-op	128	70.2	35.0	75	100.0

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

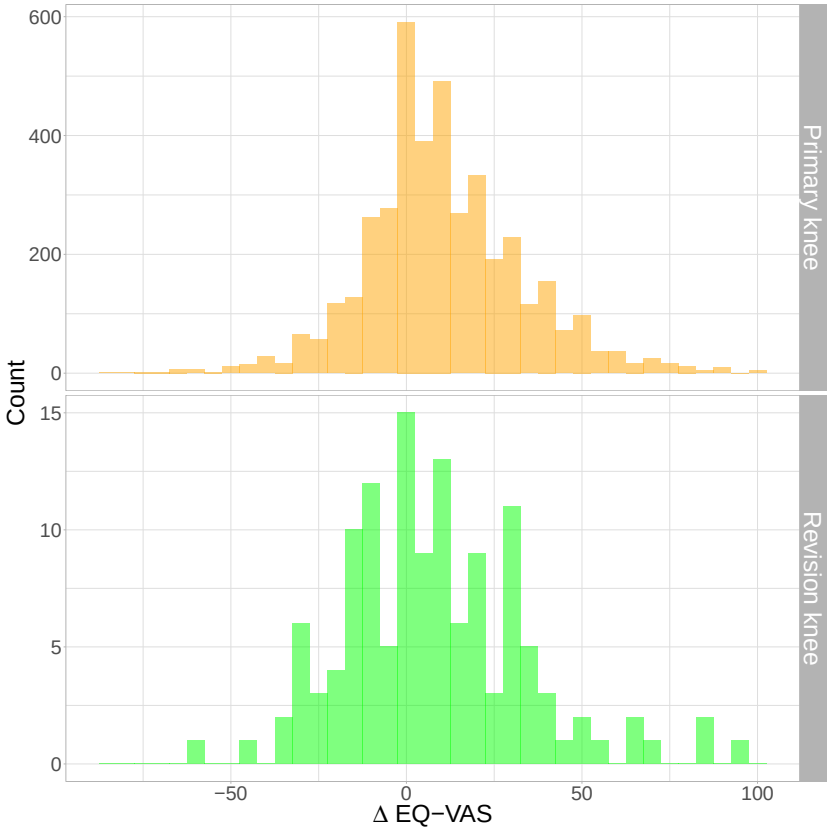


Figure 5.7: Knee Arthroplasties: Change in EQ-VAS, pre-op to post-op

5.4.11 *Oxford Knee Scores*

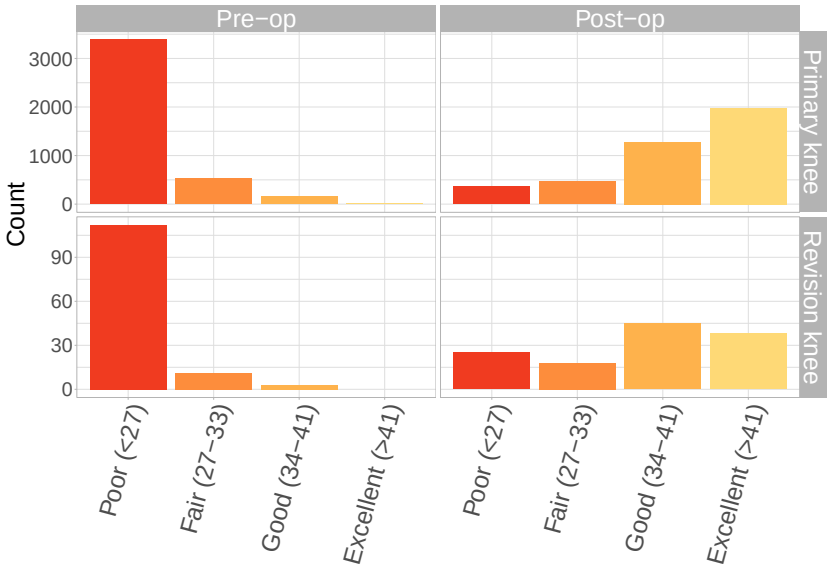


Figure 5.8: Distribution of grouped total Oxford Knee Scores, pre-op to post-op

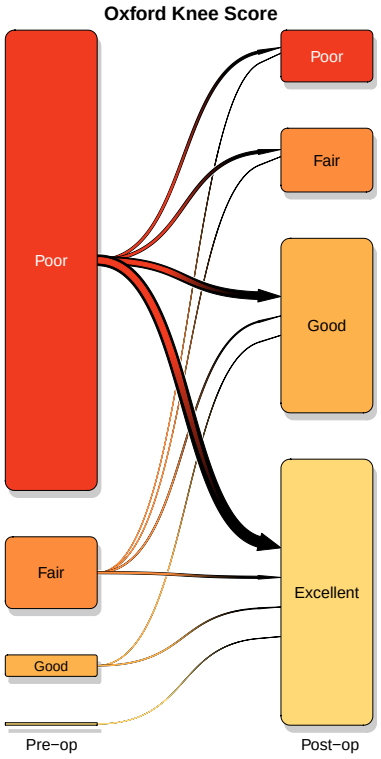
PARTITIONED TOTAL OXFORD KNEE SCORES, PRE-OP AND POST-OP — PRIMARY KNEES

Total Oxford score	Pre-op		Post-op	
Poor (<27)	3383	83%	368	9%
Fair (27-33)	534	13%	466	11%
Good (34-41)	160	4%	1280	31%
Excellent (>41)	19	0.5%	1982	48%

PARTITIONED TOTAL OXFORD KNEE SCORES, PRE-OP AND POST-OP — REVISION KNEES

Total Oxford score	Pre-op		Post-op	
Poor (<27)	112	89%	25	20%
Fair (27-33)	11	9%	18	14%
Good (34-41)	3	2%	45	36%
Excellent (>41)	0	0%	38	30%

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.



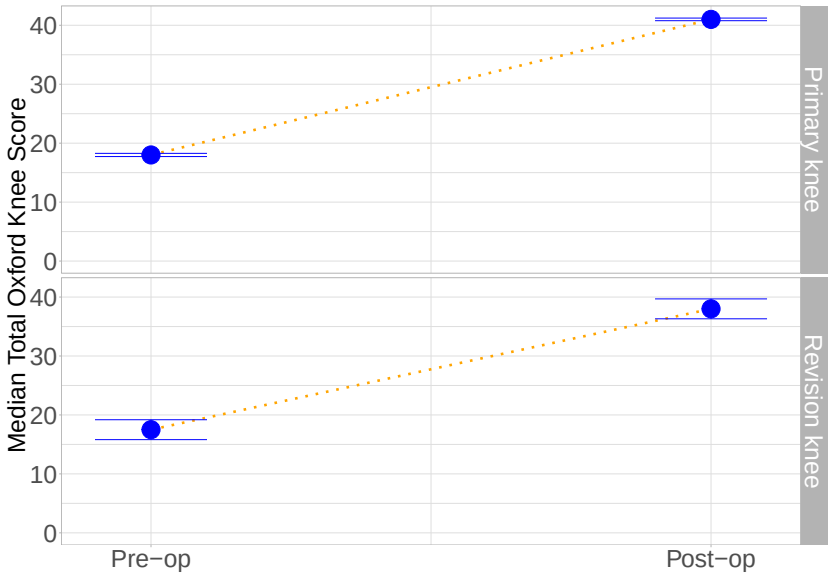


Figure 5.9: Domino plot of median Pre-op and Post-op Oxford Knee Scores

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	2546	17.4	6.0	17.0	31.0	12
		Post-op	2546	38.1	21.0	41.0	47.0	9
	Females	Pre-op	1550	20.8	8.0	21.0	35.0	11
		Post-op	1550	39.4	22.0	42.0	48.0	7
	Persons	Pre-op	4096	18.7	6.0	18.0	33.0	11
		Post-op	4096	38.6	21.0	41.0	47.0	9
Revision knee	Males	Pre-op	77	16.3	4.0	15.0	31.4	12
		Post-op	77	34.6	12.8	38.0	45.0	12
	Females	Pre-op	49	18.1	5.2	20.0	27.0	12
		Post-op	49	35.0	18.4	37.0	44.6	12
	Persons	Pre-op	126	17.0	4.0	17.5	29.8	12
		Post-op	126	34.8	13.8	38.0	45.0	12

* "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.

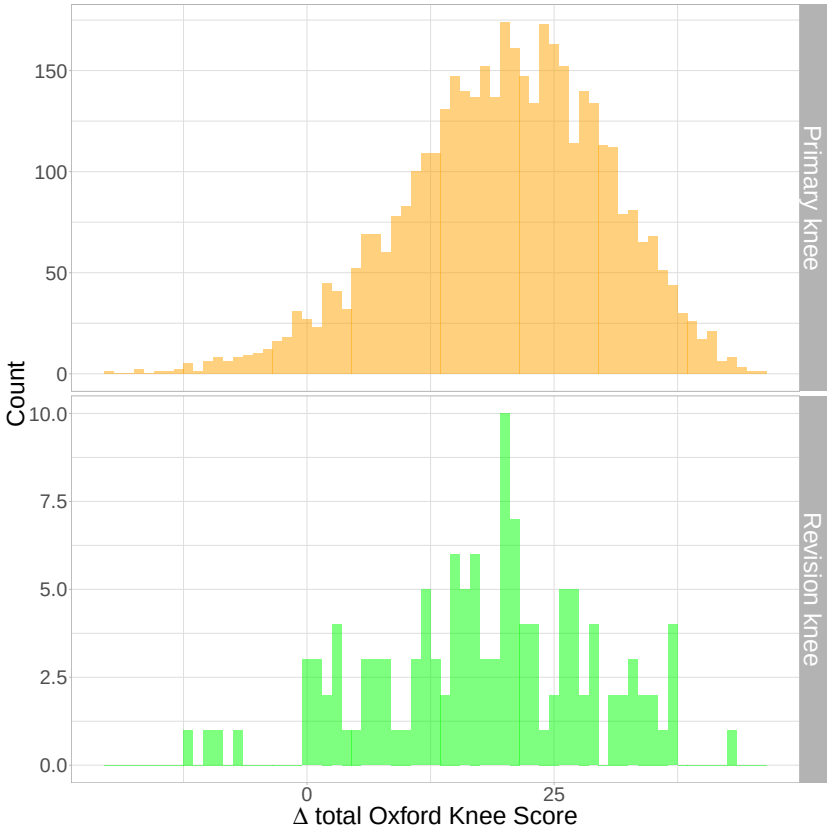


Figure 5.10: Change in total Oxford knee scores, pre-op to post-op

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	2546	20.7	3.0	21	36.0
1		Females	1550	18.6	0.0	19	35.0
5		Persons	4096	19.9	2.0	20	36.0
4	Revision knee	Males	77	18.4	0.8	20	35.0
3		Females	49	16.9	0.4	17	34.6
6		Persons	126	17.8	0.2	19	35.0

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