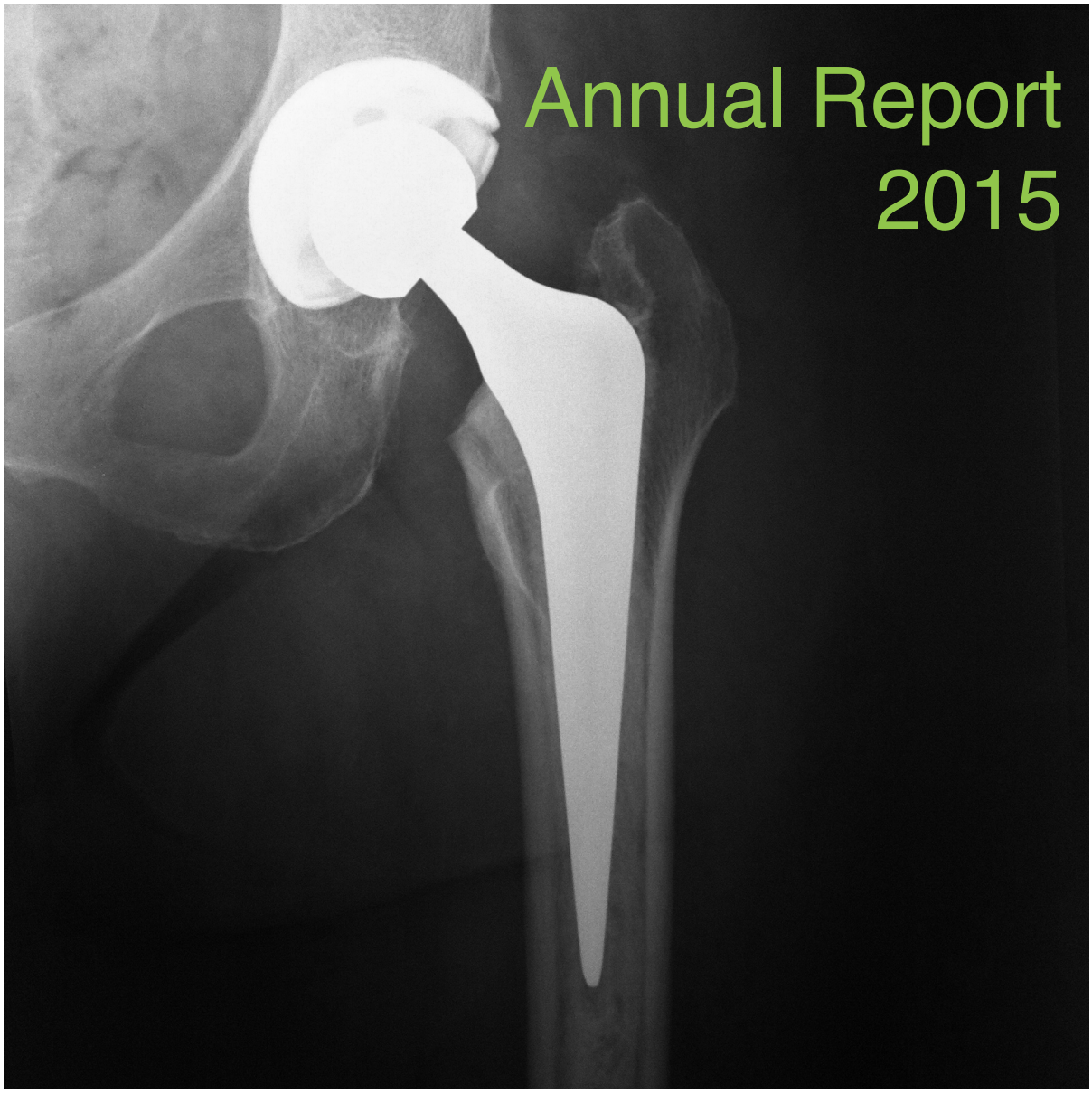
ACORN

Arthroplasty Clinical Outcomes Registry



Annual Report 2015

Ingham Institute

Applied Medical Research

WHITLAM

Orthopaedic Research Centre

ACORN

Arthroplasty Clinical Outcomes Registry National
2015 Annual Report

1st January 2013 to 31st December 2015

THIS REPORT has been prepared on behalf of the ACORN Steering Committee.

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

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 and Gursharan Singh for participant follow-up and administrative support.

Hospital	Co-ordinator	Role
Canterbury Hospital	Jaroslava Janotka	Nurse Unit Manager, Ambulatory Care Outpatients Department
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	Juliette Proctor	Nurse Unit Manager, Orthopaedics and Surgery
Bowral Hospital	Loretta Andersen	Head, Physiotherapy
Southern Highlands Private Hospital	Melissa Hennessy	Practice Manager, Orthopaedics and Surgery

PRODUCTION

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

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 seven institutions. Although ACORN now recruits from more sites, the report is restricted to reporting on sites with outcome data for the 2013 to 2015 calendar years. The report includes data on 4123 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

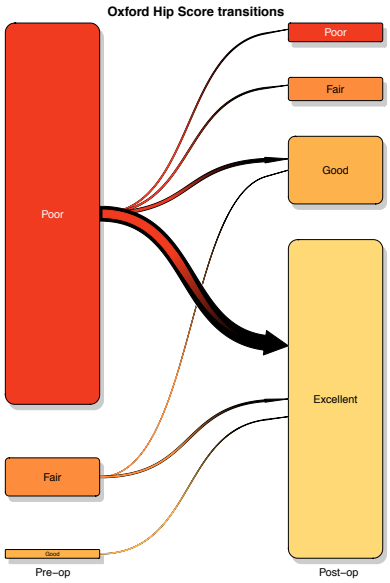
2015 saw ACORN complete its third successful year of operation following commencement in December 2012. There has been continuation of the initial high level of activity within ACORN during 2015 and into 2016. Achievements for ACORN during its third year included:

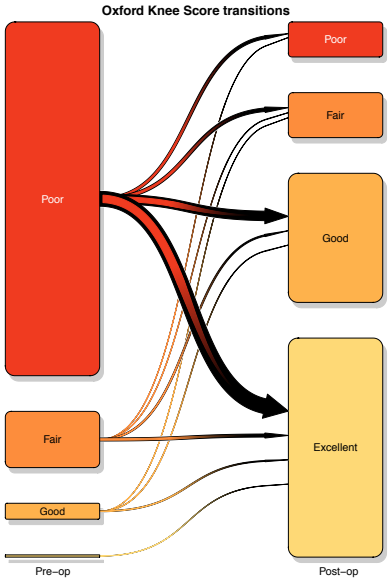
- Recruitment of additional participating sites (from six sites to ten sites)
- Obtaining a greater number of annual records held by the registry
- Maintaining a high level of data recording quality
- Publication of the second Annual Report
- Publication of data quality audit
- Facilitating a funding stream to enable continuation and expansion
- Attaining an improved rate of follow-up of patients
- Continuing to promote ACORN, particularly at state and national level conferences.

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. In 2015, 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 in itself provide a complete picture of the effectiveness of arthroplasty with respect to relief of pain, functional improvement, and improvements in quality of life for the recipient.

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

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

This third Annual Report maintains the template established in the first and second 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 solid foundation for the development of ACORN. In addition, the work of the Australian Commission of Safety and Quality in Health Care in developing standards[3] provided guidance towards the development of systematic collection of outcome data after hip and knee arthroplasty. A Steering Committee with defined terms of reference[4] was established to oversee the development, implementation, and growth of ACORN. The committee members include arthroplasty surgeons, senior nursing managers, allied health clinicians, and researchers, with processes developed for consultation with consumer organisations and health service executives where required.

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

[4] Appendix 1 of the ACORN annual report.

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

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

Health District, South Eastern Sydney Local Health District, Fairfield Hospital, Liverpool Hospital Orthopaedic Department, 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.

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

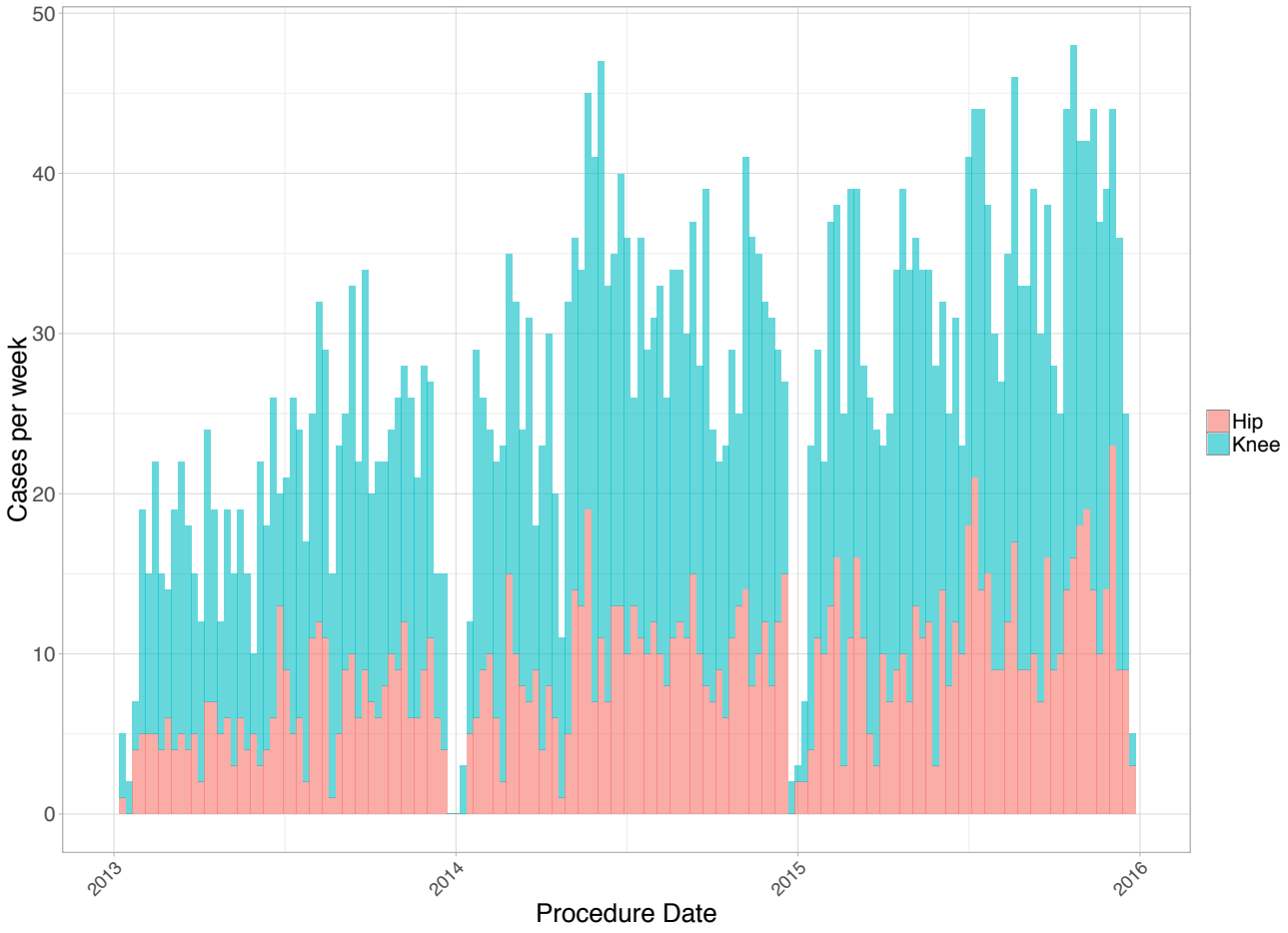
Re-admission, Re-operation, Complications

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.

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 2015

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

Year	Qtr	*n*	*n* lost	% lost	Attempts	Lost attempts	% <5m	% 5-7m	% 8m	% >8m
2013	1	173	27	15.7	1.9	4.0	0.0	76.5	3.6	3.6
2013	2	231	38	16.5	2.0	4.4	0.0	65.4	13.9	1.3
2013	3	331	56	16.9	1.8	3.0	0.0	44.8	29.1	7.3
2013	4	269	14	5.2	2.6	4.4	0.0	90.7	3.0	0.0
2014	1	286	25	8.8	2.2	1.7	2.5	84.9	1.8	0.7
2014	2	427	42	9.9	2.0	3.2	0.2	54.0	29.0	5.0
2014	3	422	22	5.2	1.9	3.2	0.5	38.8	43.6	4.0
2014	4	348	16	4.6	2.1	6.4	0.6	87.6	4.3	2.3
2015	1	350	18	5.2	2.1	3.4	20.1	65.6	1.1	0.6
2015	2	408	6	1.5	2.2	8.0	2.9	91.4	0.0	0.2
2015	3	480	10	2.1	2.7	5.2	0.4	61.6	26.5	2.1
2015	4	437	9	2.1	2.7	5.4	0.0	92.6	3.9	0.5

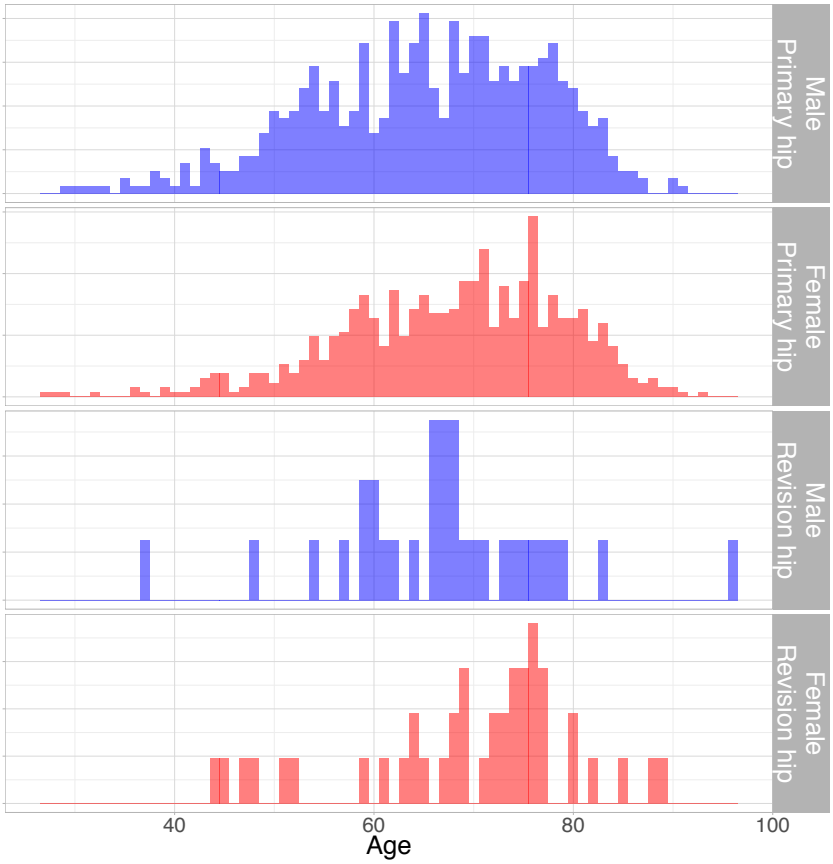
4
Hip Arthroplasty

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 2015, primary total hip arthroplasty surgery accounted for 94% of hip arthroplasty procedures reported by participating hospitals. The average age of all people having a hip procedure was 66.8 years. The most common reason for primary surgery was osteoarthritis. Hip arthroplasty surgery was more common in women (53.5%).

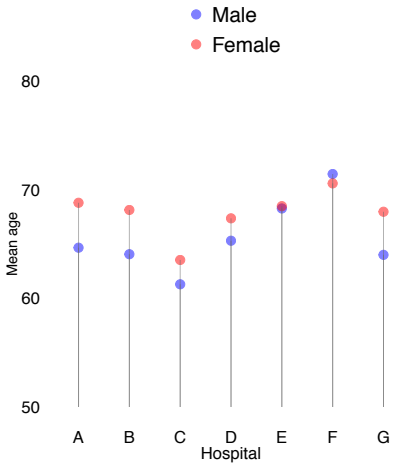
4.1 Demographic Profile

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.



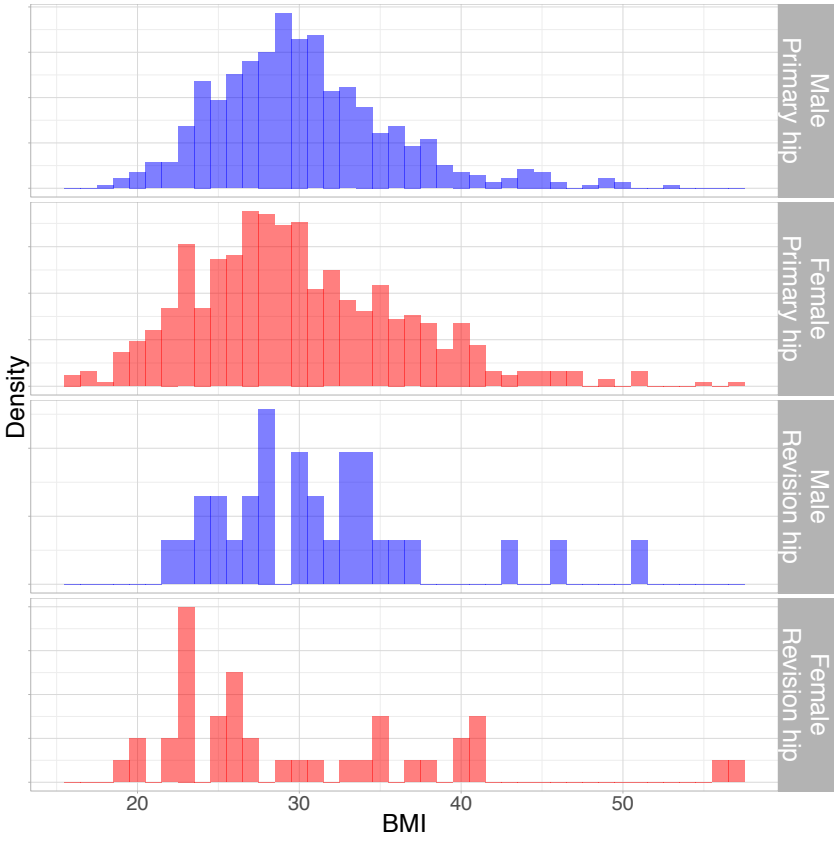
AGE OF PATIENTS — PRIMARY HIPS

	n	%	**Mean**	StdDev	Min	Max	<55	55-64	65-74	75-84	≥ 85
Male	586	46.7	**65.3**	11.71	29.4	90.9	21%	25%	30%	23%	1.7%
Female	669	53.3	**68.0**	11.08	27.4	93.3	12%	25%	33%	27%	3%
Persons	**1255**	**100.0**	**66.7**	**11.46**	**27.4**	**93.3**	**16%**	**25%**	**31%**	**25%**	**2.4%**

AGE OF PATIENTS — REVISION HIPS

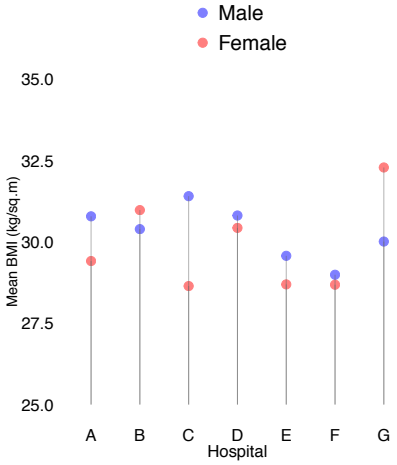
	n	%	**Mean**	StdDev	Min	Max	<55	55-64	65-74	75-84	≥ 85
Male	32	43.2	**67.0**	10.72	36.5	95.9	9.4%	25%	47%	16%	3.1%
Female	42	56.8	**69.5**	11.11	44.3	88.7	14%	12%	40%	26%	7.1%
Persons	**74**	**100.0**	**68.4**	**10.94**	**36.5**	**95.9**	**12%**	**18%**	**43%**	**22%**	**5.4%**

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	586	28	5.0%	**30.4**	5.61	18	53
Female	669	46	7.4%	**30.1**	6.67	16	56.9
Persons	**1255**	**74**	**6.3%**	**30.2**	**6.19**	**16**	**56.9**

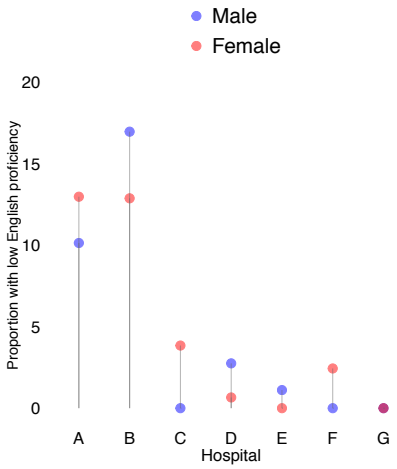
Body Mass Index (BMI) — Revision hips

	n	Missing		**Mean**	StdDev	Min	Max
Male	32	1	3.2%	**31.3**	6.55	21.8	51.3
Female	42	2	5.0%	**30.1**	9.06	19.5	56.7
Persons	**74**	**3**	**4.2%**	**30.6**	**8.03**	**19.5**	**56.7**

4.1.3 *English Proficiency*

ENGLISH PROFICIENCY — PRIMARY & REVISION HIPS

	n	Missing		High		Low	
Male	618	24	3.9%	540	87.4%	54	8.7%
Female	711	45	6.3%	614	86.4%	52	7.3%
Persons	1329	69	5.2%	1154	86.8%	106	8.0%



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	618	48	7.8%	8	1.3%	146	24%	288	47%	128	21%
Female	711	57	8%	13	1.8%	181	25%	314	44%	146	21%
Persons	1329	105	7.9%	21	1.6%	327	25%	602	45%	274	21%

POST-SCHOOL EDUCATION — PRIMARY & REVISION HIPS

	n	Missing		None		Cert/Diploma		Bachelor		Postgrad	
Male	618	64	10%	289	47%	201	33%	32	5.18%	32	5.2%
Female	711	86	12%	435	61%	99	14%	34	4.8%	57	8%
Persons	1329	150	11%	724	54%	300	23%	66	5%	89	6.7%

4.2 Patient Medical & Surgical Characteristics

4.2.1 Comorbidities

PRE-OPERATIVE COMORBIDITIES — PRIMARY HIPS

	n	Low back pain		Lower limb arthritis		Heart disease		Hypertension	
Male	586	185	32%	146	25%	170	29%	272	46%
Female	669	254	38%	187	28%	160	24%	339	51%
Persons	1255	439	35%	333	27%	330	26%	611	49%

	n	Diabetes		Gastrointestinal disease		Respiratory disease		Renal disease	
Male	586	90	15%	94	16%	77	13%	35	6%
Female	669	104	16%	135	20%	115	17%	34	5%
Persons	1255	194	15%	229	18%	192	15%	69	5%

	n	Hepatic disease		Neurological disease		Anxiety/ depression	
Male	586	16	3%	34	6%	72	12%
Female	669	20	3%	41	6%	141	21%
Persons	1255	36	3%	75	6%	213	17%

	n	No comorbs		1 comorb		2 comorbs		$\geq$ 3 comorbs	
Male	586	104	18%	133	23%	144	25%	205	35%
Female	669	95	14%	131	20%	164	25%	279	42%
Persons	1255	199	16%	264	21%	308	25%	484	39%

PRE-OPERATIVE COMORBIDITIES — REVISION HIPS

	n	Low back pain		Lower limb arthritis		Heart disease		Hypertension	
Male	32	9	28%	9	28%	11	34%	14	44%
Female	42	18	43%	9	21%	18	43%	19	45%
Persons	74	27	36%	18	24%	29	39%	33	45%

	n	Diabetes		Gastrointestinal disease		Respiratory disease		Renal disease	
Male	32	2	6%	5	16%	8	25%	3	9%
Female	42	5	12%	12	29%	6	14%	4	10%
Persons	74	7	9%	17	23%	14	19%	7	9%

	n	Hepatic disease		Neurological disease		Anxiety/ depression	
Male	32	0	0%	3	9%	3	9%
Female	42	0	0%	4	10%	10	24%
Persons	74	0	0%	7	9%	13	18%

	n	No comorbs		1 comorb		2 comorbs		$\geq$ 3 comorbs	
Male	32	4	12%	9	28%	7	22%	12	38%
Female	42	8	19%	5	12%	5	12%	24	57%
Persons	74	12	16%	14	19%	12	16%	36	49%

4.2.2 *ASA Physical Status Classification*

ASA — Primary hips

	n	Missing		ASA 1		ASA 2	
Males	586	122	21%	36	6%	273	47%
Females	669	148	22%	35	5%	293	44%
Persons	1255	270	22%	71	6%	566	45%

	n	ASA 3		ASA 4		ASA 5	
Males	586	153	26%	2	0.3%	0	0%
Females	669	189	28%	4	0.6%	0	0%
Persons	1255	342	27%	6	0.5%	0	0%

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

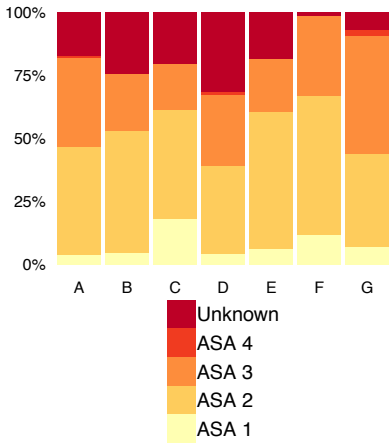
1. a normal healthy person
2. a person with mild systemic disease
3. a person with severe systemic disease
4. a person with severe systemic disease that is a constant threat to life
5. a moribund person who is not expected to survive

ASA — Revision hips

	n	Missing		ASA 1		ASA 2	
Males	32	11	34%	2	6%	9	28%
Females	42	15	36%	0	0%	12	29%
Persons	74	26	35%	2	3%	21	28%

	n	ASA 3		ASA 4		ASA 5	
Males	32	10	31%	0	0%	0	0%
Females	42	15	36%	0	0%	0	0%
Persons	74	25	34%	0	0%	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	1255	0	0%	541	43%	695	55%	19	2%
Revision	74	0	0%	32	43%	42	57%	0	0%

4.2.4 *Principal Reason for Surgery*

Reason for Surgery — Primary hips

	n	OA		RA		DDH	
Male	586	532	91%	2	0.3%	3	0.5%
Female	669	606	91%	6	0.9%	9	1%
Persons	1255	1138	91%	8	0.6%	12	1%

	n	Oth arth		ON/AVN		Tumour	
Male	586	1	0.2%	34	6%	0	0%
Female	669	4	0.6%	20	3%	0	0%
Persons	1255	5	0.4%	54	4%	0	0%

	n	Other		Missing	
Male	586	6	1%	8	1%
Female	669	10	1%	14	2%
Persons	1255	16	1%	22	2%

OA
: osteoarthritis

RA
: rheumatoid arthritis

DDH
: developmental dysplasia of the hips

Oth arth
: other inflammatory arthritis

ON/AVN
: osteonecrosis/avascular necrosis

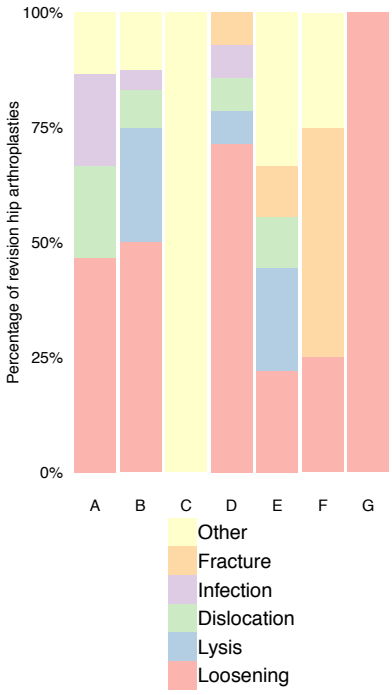
Reason for Surgery — Revision hips

	n	Loosening		Lysis		Dislocation	
Male	32	15	47%	2	6%	3	9%
Female	42	18	43%	7	17%	4	10%
Persons	74	33	45%	9	12%	7	9%

	n	Implant break		Infection		Fracture	
Male	32	0	0%	4	12%	2	6%
Female	42	1	2%	1	2%	2	5%
Persons	74	1	1%	5	7%	4	5%

	n	Other		Missing	
Male	32	5	16%	1	3%
Female	42	5	12%	4	10%
Persons	74	10	14%	5	7%

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

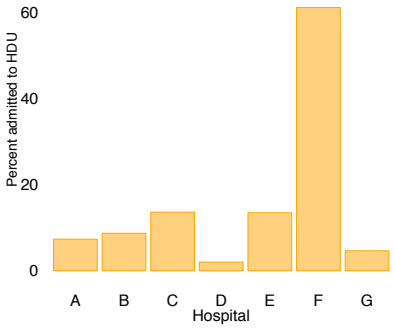
	n	Missing		High Care Bed		Unplanned †	
Male	586	0	0%	69	12%	53	77%
Female	669	0	0%	65	10%	46	71%
Persons	1255	0	0%	134	11%	99	74%

HIGH CARE BED UTILISATION — REVISION HIPS

	n	Missing		High Care Bed		Unplanned †	
Male	32	0	0%	6	19%	4	67%
Female	42	0	0%	8	19%	6	75%
Persons	74	0	0%	14	19%	10	71%

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

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.



4.3.2 *Peri-operative Blood Transfusion*

Blood Transfusion — Primary hips

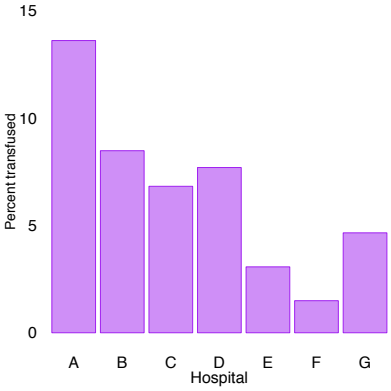
	n	Missing		Transfused		Mean units
Male	586	2	0.3%	31	5%	2.1
Female	669	4	0.6%	73	11%	2.2
Persons	1255	6	0.5%	104	8%	2.2

Blood Transfusion — Revision hips

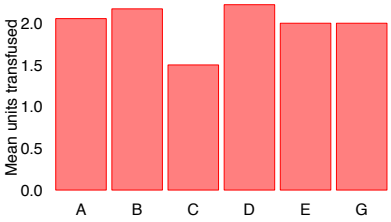
	n	Missing		Transfused		Mean units
Male	32	0	0%	7	22%	2
Female	42	0	0%	10	24%	2.4
Persons	74	0	0%	17	23%	2.2

† 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 recieving 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	586	75	(13%)	504	(86%)	7	(1%)
Females	669	81	(12%)	580	(87%)	7	(1%)
Persons	1255	156	(12%)	1084	(86%)	14	(1%)

COMPLICATIONS (DETAILS) DURING ADMISSION — PRIMARY HIPS

Complications	Males		Females		Persons	
Drug reaction	0	0%	0	0%	0	0%
Delirium	10	1.7%	4	0.6%	14	1.1%
SSI requiring oral antibiotics	0	0%	0	0%	0	0%
SSI requiring IV antibiotics	1	0.17%	0	0%	1	0.08%
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	1	0.17%	2	0.3%	3	0.24%
Pulmonary embolus	1	0.17%	2	0.3%	3	0.24%
Fat emboli	0	0%	0	0%	0	0%
Respiratory infection	4	0.68%	5	0.75%	9	0.72%
CVS	12	2%	13	1.9%	25	2%
Dislocation	0	0%	4	0.6%	4	0.32%
Fracture	6	1%	7	1%	13	1%
Nerve injury	0	0%	4	0.6%	4	0.32%
Urinary tract infection	7	1.2%	9	1.3%	16	1.3%
Urinary retention	9	1.5%	2	0.3%	11	0.88%
Wound dehiscence	3	0.51%	1	0.15%	4	0.32%
Reoperation during index adm	1	0.17%	2	0.3%	3	0.24%
Pressure area	0	0%	1	0.15%	1	0.08%
Fall	0	0%	1	0.15%	1	0.08%
Hypotension	7	1.2%	18	2.7%	25	2%
Cellulitis	0	0%	1	0.15%	1	0.08%
Death	1	0.17%	0	0%	1	0.08%
Other	15	2.6%	11	1.6%	26	2.1%

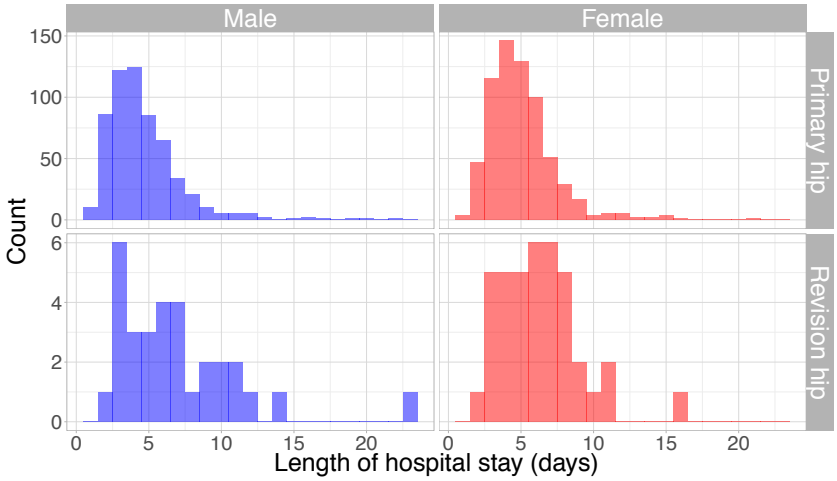
Complications (any) during Admission — Revision hips

	n	1 or more		None		Unk/NS	
Males	32	4	(12%)	28	(88%)	0	(0%)
Females	42	9	(21%)	32	(76%)	1	(2%)
Persons	74	13	(18%)	60	(81%)	1	(1%)

Complications (details) during Admission — Revision hips

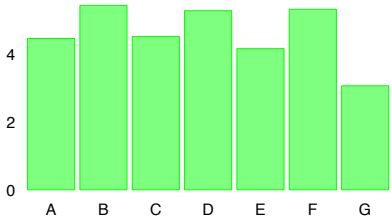
Complications	Males		Females		Persons	
Drug reaction	0	0%	0	0%	0	0%
Delirium	0	0%	0	0%	0	0%
SSI requiring oral antibiotics	0	0%	0	0%	0	0%
SSI requiring IV antibiotics	0	0%	0	0%	0	0%
SSI requ surg c̄ prosth removal	0	0%	0	0%	0	0%
SSI requ surg s̄ prosth removal	0	0%	0	0%	0	0%
Deep vein thrombosis	0	0%	0	0%	0	0%
Pulmonary embolus	0	0%	0	0%	0	0%
Fat emboli	0	0%	0	0%	0	0%
Respiratory infection	0	0%	0	0%	0	0%
CVS	1	3.1%	0	0%	1	1.4%
Dislocation	0	0%	0	0%	0	0%
Fracture	0	0%	1	2.4%	1	1.4%
Nerve injury	0	0%	1	2.4%	1	1.4%
Urinary tract infection	0	0%	1	2.4%	1	1.4%
Urinary retention	0	0%	1	2.4%	1	1.4%
Wound dehiscence	2	6.2%	0	0%	2	2.7%
Reoperation during index adm	0	0%	1	2.4%	1	1.4%
Pressure area	0	0%	0	0%	0	0%
Fall	0	0%	0	0%	0	0%
Hypotension	0	0%	1	2.4%	1	1.4%
Cellulitis	0	0%	0	0%	0	0%
Death	0	0%	0	0%	0	0%
Other	0	0%	3	7.1%	3	4.1%

4.3.4 *Length of Stay in Hospital*



The plot at left excludes 8 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	586	47%	4	0.7%	4.8	4	6	9
Female	669	53%	4	0.6%	5.2	5	6	9
Persons	1255	100%	8	0.6%	5	4	6	9

LENGTH OF STAY IN HOSPITAL — REVISION HIPS

	n		Missing		Mean	Median	75th %ile	95th %ile
Male	32	43%	0	0%	8.2	6	9.2	18
Female	42	57%	0	0%	8.9	6	8	39
Persons	74	100%	0	0%	8.6	6	8.8	29

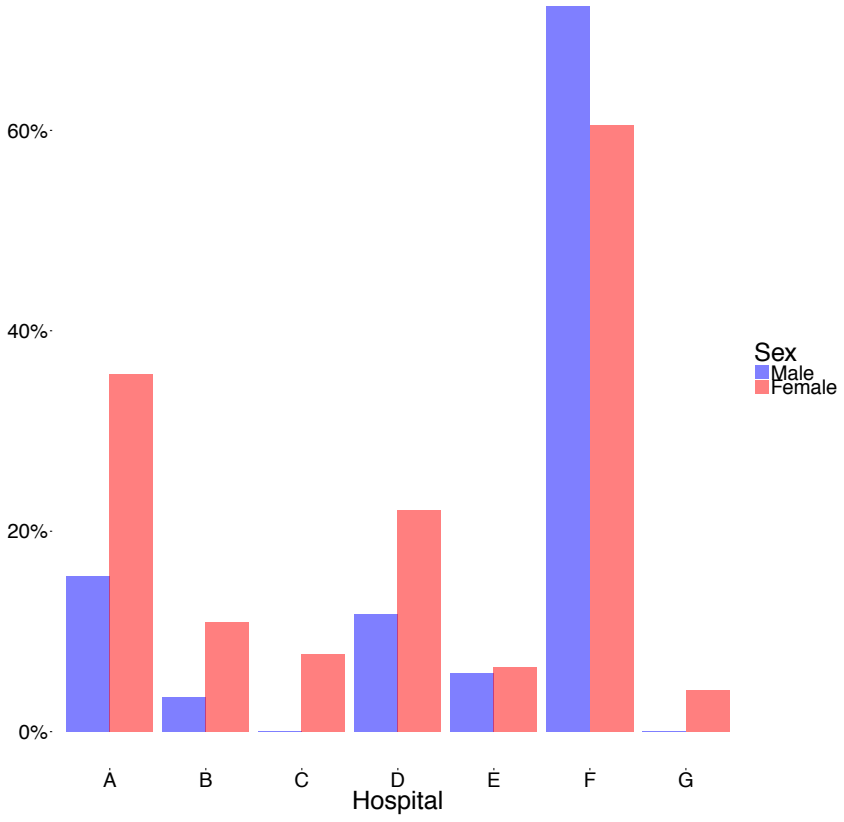
4.3.5 *Discharge Destination*

DISCHARGE DESTINATION — PRIMARY HIPS

	n	Unk/NS		Usual residence		Inpatient rehab		Other	
Male	586	6	1%	509	87%	65	11%	6	1%
Female	669	8	1%	520	78%	139	21%	2	0.3%
Persons	1255	14	1%	1029	82%	204	16%	8	0.6%

DISCHARGE DESTINATION — REVISION HIPS

	n	Unk/NS		Usual residence		Inpatient rehab		Other	
Male	32	2	6%	23	72%	6	19%	1	3%
Female	42	3	7%	22	52%	17	40%	0	0%
Persons	74	5	7%	45	61%	23	31%	1	1%



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.

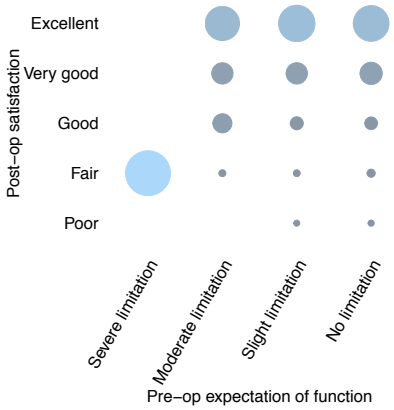
For success, the question asked is "overall, how are the problems now with your hip/knee on which you had surgery, compared to before your operation?" This question also allows the person to choose one of five options: much better; a little better; about the same; a little worse; and much worse.

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-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 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.

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	586	81	14%	373	64%	104	18%	26	4%	2	0.3%
Female	669	109	16%	386	58%	150	22%	24	4%	0	0%
Persons	1255	190	15%	759	60%	254	20%	50	4%	2	0.2%

EXPECTATION OF PAIN — REVISION HIPS

	n	Unknown/ Not stated		No pain		Slight pain		Moderate pain		Severe pain	
Male	32	8	25%	16	50%	6	19%	2	6%	0	0%
Female	42	13	31%	19	45%	7	17%	3	7%	0	0%
Persons	74	21	28%	35	47%	13	18%	5	7%	0	0%

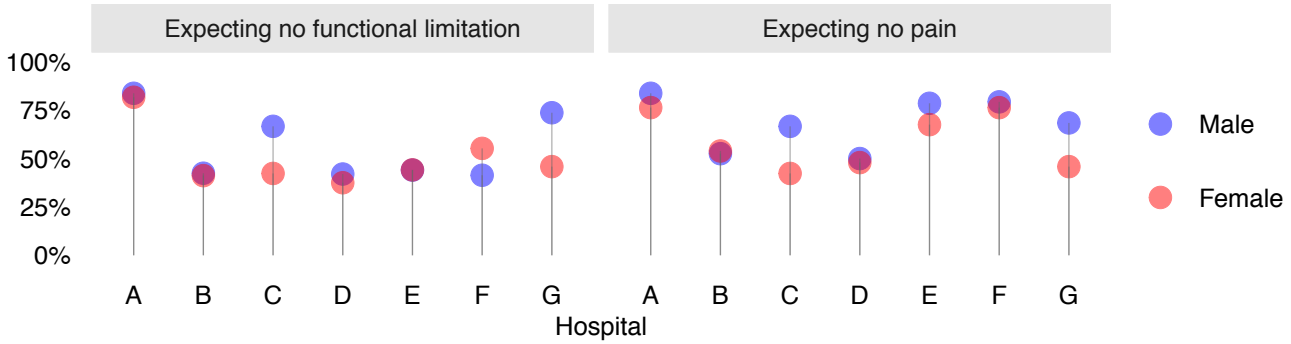
4.4.2 *Pre-op Expectation of Function at 6 months post-op*

EXPECTATION OF FUNCTION — PRIMARY HIPS

	n	Unknown/ Not stated		No limitation		Slight limitation		Moderate limitation		Severe limitation	
Male	586	83	14%	305	52%	175	30%	23	4%	0	0%
Female	669	109	16%	324	48%	208	31%	27	4%	1	0.1%
Persons	1255	192	15%	629	50%	383	31%	50	4%	1	0.08%

EXPECTATION OF FUNCTION — REVISION HIPS

	n	Unknown/ Not stated		No limitation		Slight limitation		Moderate limitation		Severe limitation	
Male	32	8	25%	11	34%	11	34%	2	6%	0	0%
Female	42	13	31%	15	36%	12	29%	2	5%	0	0%
Persons	74	21	28%	26	35%	23	31%	4	5%	0	0%



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

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	584	48	8%	5	0.9%	15	3%	44	8%	118	20%	354	61%
Female	669	34	5%	14	2%	21	3%	63	9%	152	23%	385	58%
Persons	1253	82	7%	19	2%	36	3%	107	9%	270	22%	739	59%

SATISFACTION AT 6 MONTHS POST-OP — REVISION HIPS

	n	Unk/NS		Poor		Fair		Good		Very good		Excellent	
Male	32	4	12%	1	3%	1	3%	3	9%	8	25%	15	47%
Female	41	3	7%	0	0%	1	2%	13	32%	11	27%	13	32%
Persons	73	7	10%	1	1%	2	3%	16	22%	19	26%	28	38%

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	584	49	8%	4	0.7%	3	0.5%	8	1%	32	5%	488	84%
Female	669	33	5%	5	0.7%	3	0.4%	17	3%	50	7%	561	84%
Persons	1253	82	7%	9	0.7%	6	0.5%	25	2%	82	7%	1049	84%

SUCCESS AT 6 MONTHS POST-OP — REVISION HIPS

	n	Unk/NS		much worse		a little worse		about the same		a little better		much better	
Male	32	4	12%	1	3%	1	3%	1	3%	4	12%	21	66%
Female	41	3	7%	1	2%	0	0%	5	12%	9	22%	23	56%
Persons	73	7	10%	2	3%	1	1%	6	8%	13	18%	44	60%

4.4.5 Complications in the 6 months post-op

POST-DISCHARGE COMPLICATIONS (ANY) — PRIMARY HIPS

	n	Missing		None		1		2		3 or more		Number unknown	
Male	584	45	8%	303	52%	66	11%	10	2%	3	0.5%	6	1%
Female	669	32	5%	351	52%	89	13%	23	3%	13	2%	3	0.4%
Persons	1253	77	6%	654	52%	155	12%	33	3%	27	2%	9	0.7%

POST-DISCHARGE COMPLICATIONS (ANY) — REVISION HIPS

	n	Missing		None		1		2		3 or more		Number unknown	
Male	32	4	12%	16	50%	6	19%	1	3%	0	0%	1	3%
Female	41	4	10%	16	39%	11	27%	1	2%	0	0%	0	0%
Persons	73	8	11%	32	44%	17	23%	2	3%	2	3%	1	1%

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

	Primary hips (*n*=1253)		Revision hips (*n*=73)	
SSI requiring oral antibiotics	17	1.4%	3	4.1%
SSI requiring IV antibiotics	2	0.16%	0	0%
DVT index leg	3	0.24%	0	0%
DVT other leg	0	0%	0	0%
DVT both legs	1	0.08%	0	0%
Pulmonary embolus	2	0.16%	0	0%
Dislocation	0	0%	0	0%
Joint stiffness	43	3.4%	3	4.1%
Bladder infection or retention	11	0.88%	0	0%
Fracture	5	0.4%	0	0%
Unexpected pain	53	4.2%	2	2.7%
Cardiac	0	0%	0	0%
Stroke	0	0%	0	0%
Leg length discrepancy	62	4.9%	4	5.5%
Joint or lower limb swelling	30	2.4%	4	5.5%
Paraesthesia or numbness	34	2.7%	2	2.7%
Cellulitis	6	0.48%	0	0%
Neuropathy	2	0.16%	1	1.4%
Muscle weakness	18	1.4%	3	4.1%
Respiratory infection	2	0.16%	0	0%
Other	13	1%	0	0%

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

	Primary hips (*n*=1254)		Revision hips (*n*=73)	
SSI requiring oral antibiotics	17	1.4%	3	4.1%
SSI requiring IV antibiotics	3	0.24%	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	7	0.56%	0	0%
Pulmonary embolus	5	0.4%	0	0%
Fat emboli	0	0%	0	0%
Drug reaction	0	0%	0	0%
Delirium	14	1.1%	0	0%
Hypotension	25	2%	0	0%
CVS	25	2%	1	1.4%
Respiratory infection	11	0.88%	0	0%
Urinary tract infection or retention	30	2.4%	2	2.7%
Wound dehiscence	4	0.32%	2	2.7%
Pressure area	1	0.08%	0	0%
Fall	1	0.08%	0	0%
Cellulitis	7	0.56%	0	0%
Death	6	0.48%	0	0%
Dislocation	4	0.32%	0	0%
Fracture	18	1.4%	1	1.4%
Joint stiffness	43	3.4%	3	4.1%
Unexpected pain	53	4.2%	2	2.7%
Leg length discrepancy	62	4.9%	4	5.5%
Joint or lower limb swelling	30	2.4%	4	5.5%
Nerve injury†	38	3%	3	4.1%
Muscle weakness	18	1.4%	3	4.1%
Re-operation	20	1.6%	6	8.2%
Other	38	3%	3	4.1%

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	582	43	7%	12	2%	50	9%	61	10%
Female	665	31	5%	26	4%	61	9%	83	12%
Persons	1247	74	6%	38	3%	111	9%	144	12%

RE-ADMISSION — REVISION HIPS

	n	Missing		Re-admission due to arthroplasty		Re-admission for other reasons		Total re-admissions	
Male	32	4	12%	4	12%	2	6%	6	19%
Female	41	3	7%	6	15%	5	12%	11	27%
Persons	73	7	10%	10	14%	7	10%	17	23%

REASONS FOR RE-ADMISSION — PRIMARY & REVISION HIPS

	Primary (*n*=144)		Revision (*n*=17)	
Reasons related to arthroplasty				
DVT	4	3%	0	0%
Pulmonary embolus	2	1%	0	0%
MUA	0	0%	0	0%
Dislocation	8	6%	5	29%
Surgical site infection	11	8%	4	24%
Wound dehiscence	1	0.7%	0	0%
Index joint revision	3	2%	0	0%
Other	7	5%	1	6%
Reasons unrelated to arthroplasty				
Cardiac	19	13%	0	0%
Renal/urinary tract	10	7%	1	6%
Cancer	3	2%	0	0%
Other	78	55%	6	35%

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

Re-operation — Primary hips

	n	Re-operation due to arthroplasty	
Male	584	4	0.7%
Female	669	14	2%
Persons	1253	18	1%

Re-operation — Revision hips

	n	Re-operation due to arthroplasty	
Male	32	1	3%
Female	41	4	10%
Persons	73	5	7%

Reason for Re-operation — Primary hips

	Males (*n*=4)		Females (*n*=14)		Persons (*n*=18)	
SSI requiring surgery with no prosthesis removal	1	25%	2	14%	3	17%
SSI requiring surgery with prosthesis removal	1	25%	1	7%	2	11%
Dislocation	1	25%	4	29%	5	28%
Joint stiffness	0	0%	0	0%	0	0%
Periprosthetic fracture	0	0%	2	14%	2	11%
Implant fracture	0	0%	1	7%	1	6%
Bleeding	1	25%	1	7%	2	11%
Other	0	0%	3	21%	3	17%
Unknown/NS	0	0%	0	0%	0	0%

Reason for Re-operation — Revision hips

	Males (*n*=1)		Females (*n*=4)		Persons (*n*=5)	
SSI requiring surgery with no prosthesis removal	0	0%	2	50%	2	40%
SSI requiring surgery with prosthesis removal	0	0%	0	0%	0	0%
Dislocation	1	100%	2	50%	3	60%
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	585	52	9%	1	0.2%	5	0.9%
Female	669	51	8%	0	0%	2	0.3%
Persons	1254	103	8%	1	0.08%	7	0.6%

POST-DISCHARGE DEATH — REVISION HIPS

	n	Unknown/ not stated		Died in hospital		Total deaths at 6 mths post-op	
Male	32	3	9%	0	0%	0	0%
Female	41	6	15%	0	0%	0	0%
Persons	73	9	12%	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*

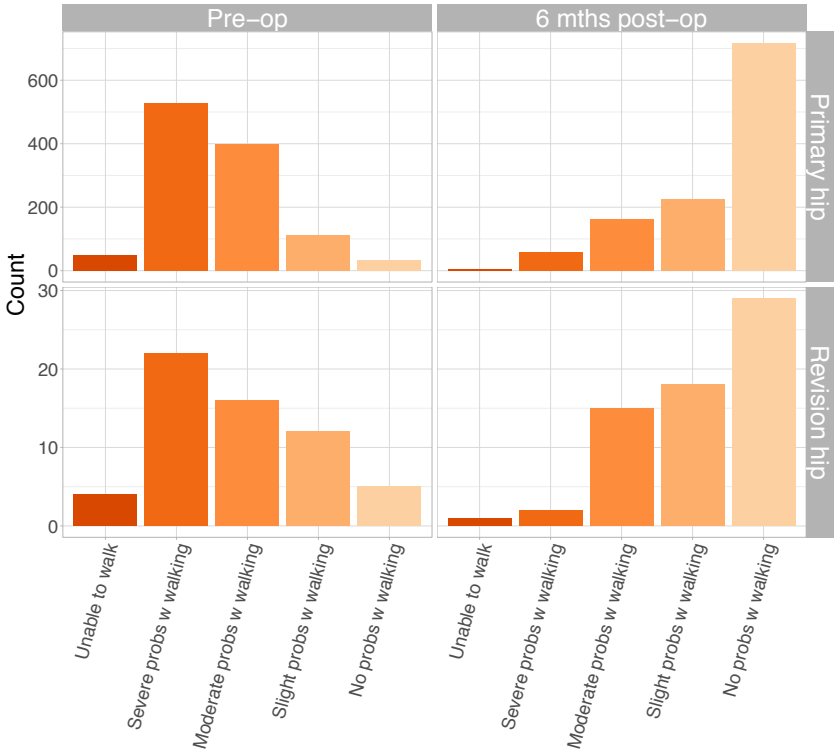


Figure 4.1: Hip Arthroplasties: Distribution of EQ-5D Mobility, pre-op versus post-op

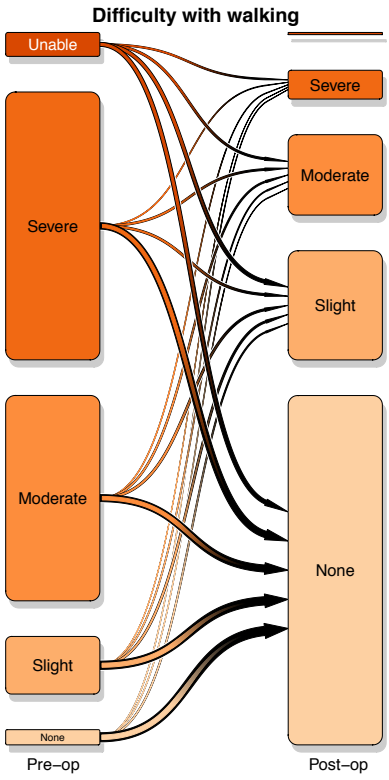
EQ-5D Mobility — Primary hips

	Pre-op		Post-op	
Unable to walk	48	4%	5	0.4%
Severe problems with walking	527	42%	59	5%
Moderate problems with walking	399	32%	161	13%
Slight problems with walking	113	9%	226	18%
No problems with walking	33	3%	717	57%
Unknown/Not stated	131	10%	83	7%

EQ-5D Mobility — Revision hips

	Pre-op		Post-op	
Unable to walk	4	6%	1	1%
Severe problems with walking	22	31%	2	3%
Moderate problems with walking	16	22%	15	21%
Slight problems with walking	12	17%	18	25%
No problems with walking	5	7%	29	40%
Unknown/Not stated	13	18%	7	10%

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.



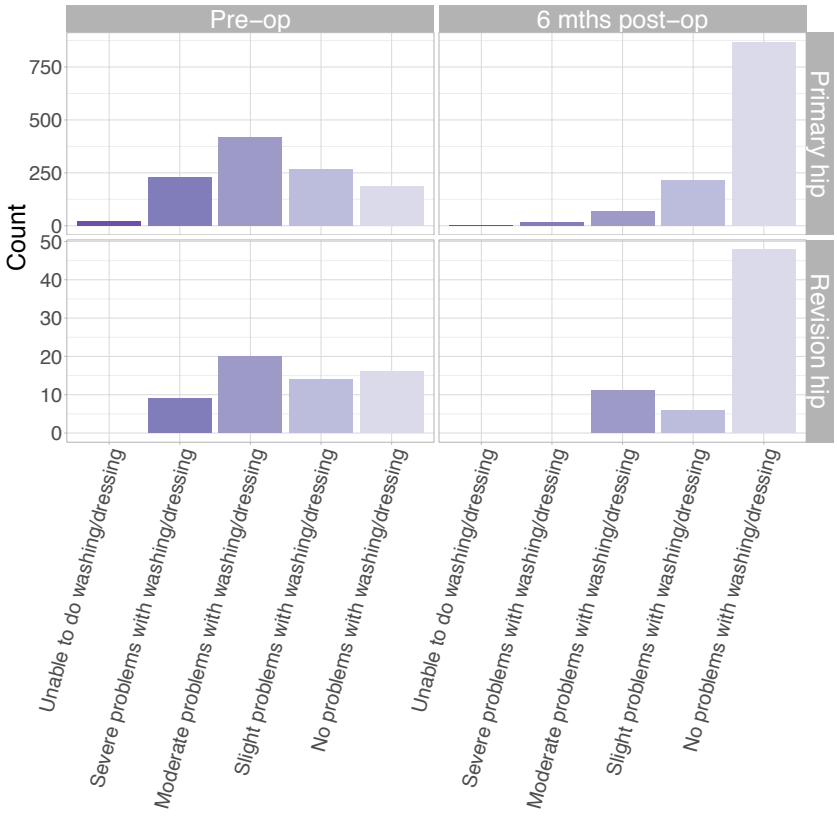


Figure 4.2: Hip Arthroplasties: Distribution of EQ-5D Personal Care, pre-op versus post-op

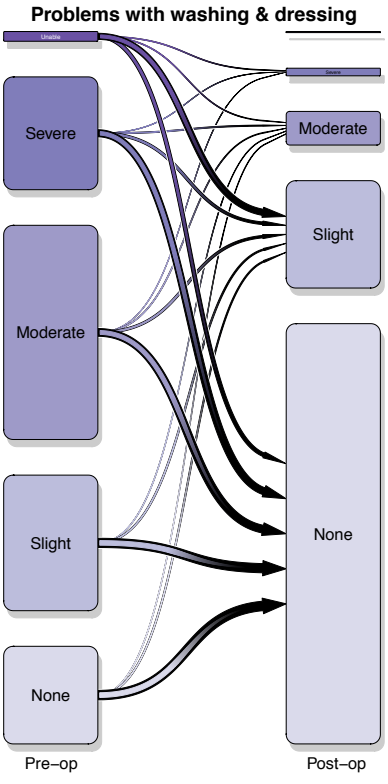
EQ-5D Personal Care — Primary hips

	Pre-op		Post-op	
Unable to do washing/dressing	20	2%	3	0.2%
Severe problems washing/dressing	228	18%	17	1%
Mod. problems washing/dressing	420	34%	67	5%
Slight problems washing/dressing	267	21%	213	17%
No problems washing/dressing	187	15%	869	69%
Unknown/Not stated	130	10%	83	7%

EQ-5D Personal Care — Revision hips

	Pre-op		Post-op	
Unable to do washing/dressing	0	0%	0	0%
Severe problems washing/dressing	9	12%	0	0%
Mod. problems washing/dressing	20	28%	11	15%
Slight problems washing/dressing	14	19%	6	8%
No problems washing/dressing	16	22%	48	67%
Unknown/Not stated	13	18%	7	10%

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.



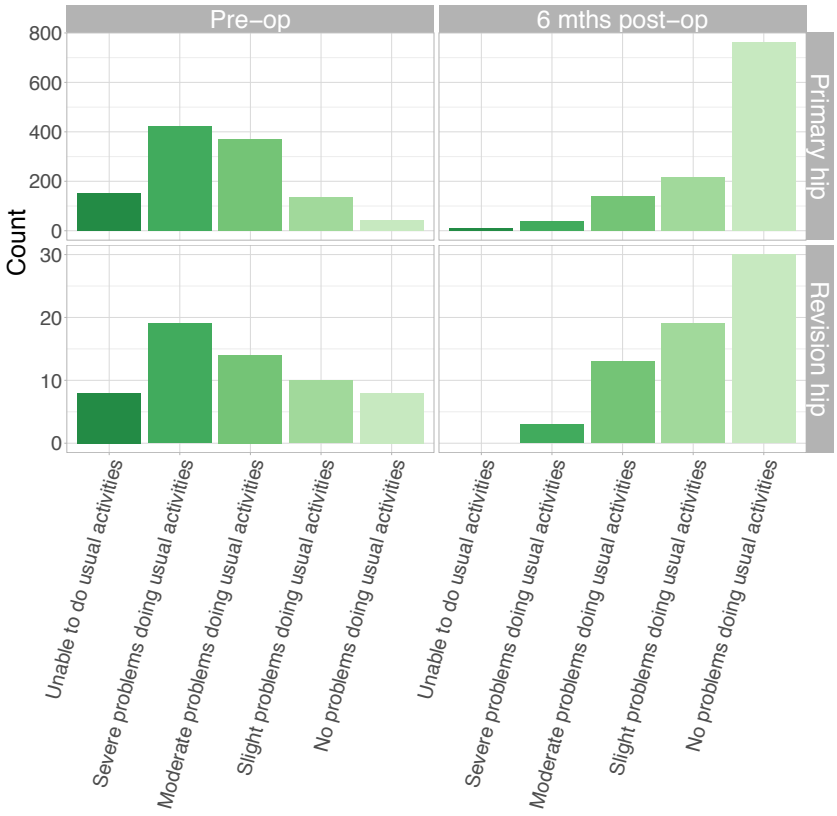


Figure 4.3: Hip Arthroplasties: Distribution of EQ-5D Usual Activities, pre-op versus post-op

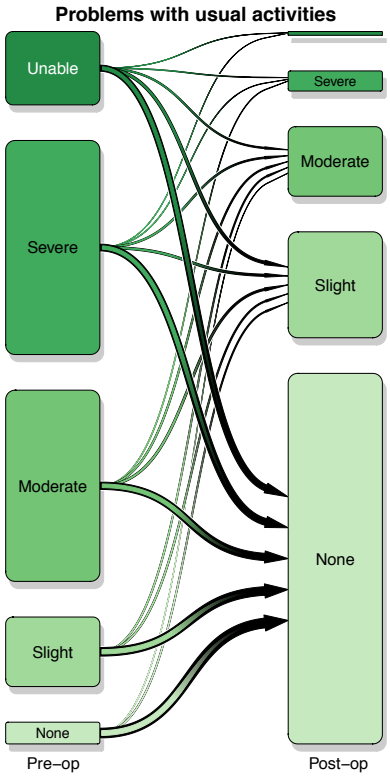
EQ-5D Usual Activites — Primary hips

	Pre-op		Post-op	
Unable to do usual activities	150	12%	9	0.7%
Severe problems c̄ usual activities	422	34%	40	3%
Mod. problems c̄ usual activities	369	29%	141	11%
Slight problems c̄ usual activities	137	11%	215	17%
No problems c̄ usual activities	42	3%	763	61%
Unknown/Not stated	132	11%	84	7%

EQ-5D Usual Activites — Revision hips

	Pre-op		Post-op	
Unable to do usual activities	8	11%	0	0%
Severe problems c̄ usual activities	19	26%	3	4%
Mod. problems c̄ usual activities	14	19%	13	18%
Slight problems c̄ usual activities	10	14%	19	26%
No problems c̄ usual activities	8	11%	30	42%
Unknown/Not stated	13	18%	7	10%

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.



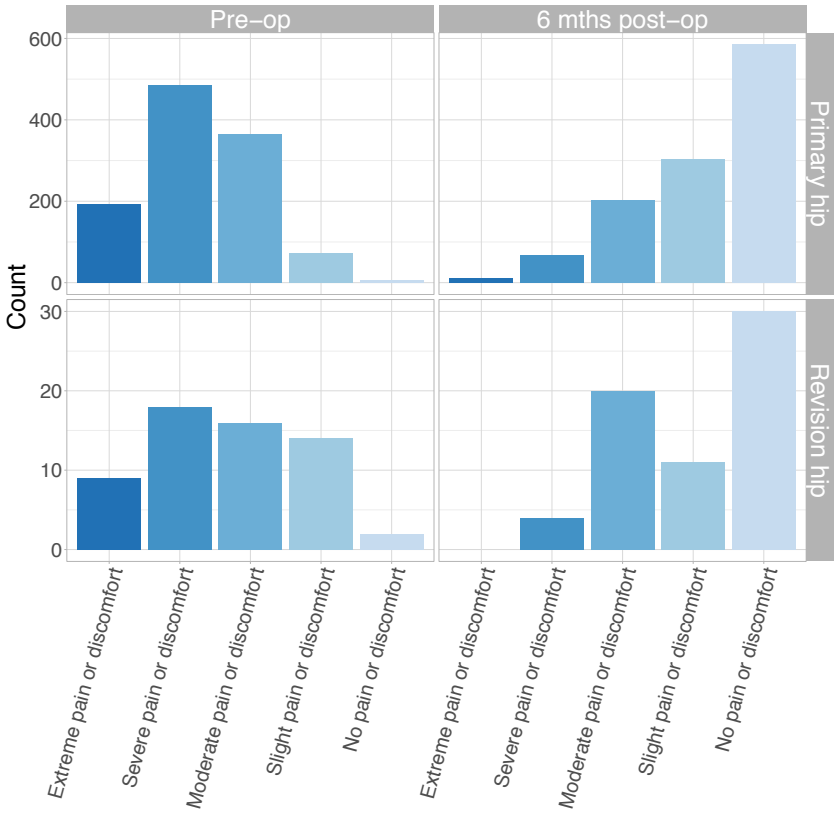


Figure 4.4: Hip Arthroplasties: Distribution of EQ-5D Discomfort, pre-op versus post-op

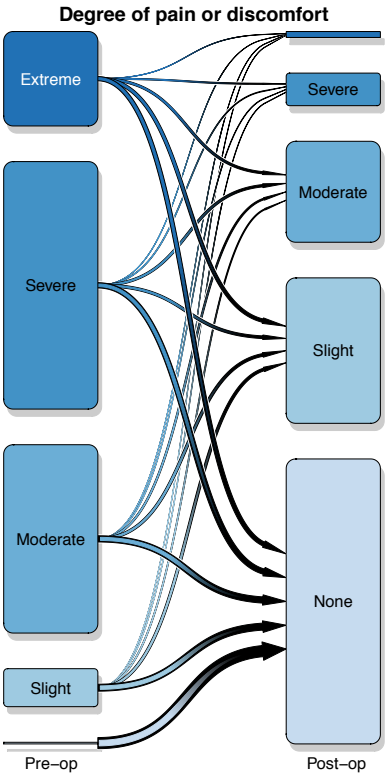
EQ-5D Discomfort — Primary hips

	Pre-op		Post-op	
Extreme pain or discomfort	192	15%	11	0.9%
Severe pain or discomfort	485	39%	67	5%
Moderate pain or discomfort	365	29%	202	16%
Slight pain or discomfort	73	6%	303	24%
No pain or discomfort	5	0.4%	585	47%
Unknown/not stated	131	10%	83	7%

EQ-5D Discomfort — Revision hips

	Pre-op		Post-op	
Extreme pain or discomfort	9	12%	0	0%
Severe pain or discomfort	18	25%	4	6%
Moderate pain or discomfort	16	22%	20	28%
Slight pain or discomfort	14	19%	11	15%
No pain or discomfort	2	3%	30	42%
Unknown/not stated	13	18%	7	10%

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.



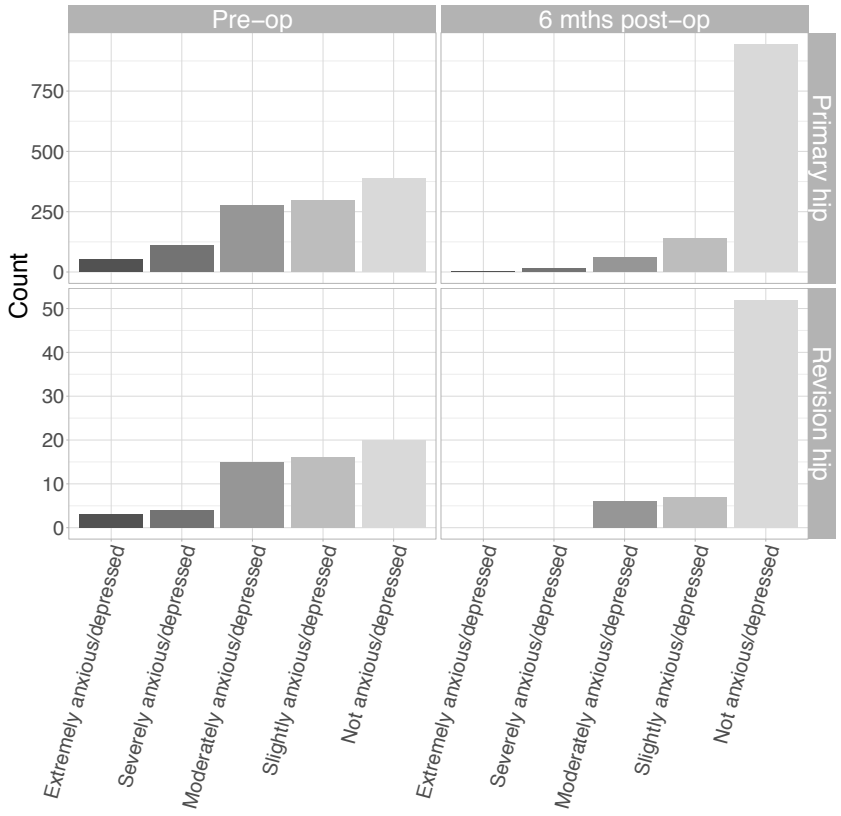


Figure 4.5: Hip Arthroplasties: Distribution of EQ-5D Anxiety/Depression, pre-op versus post-op

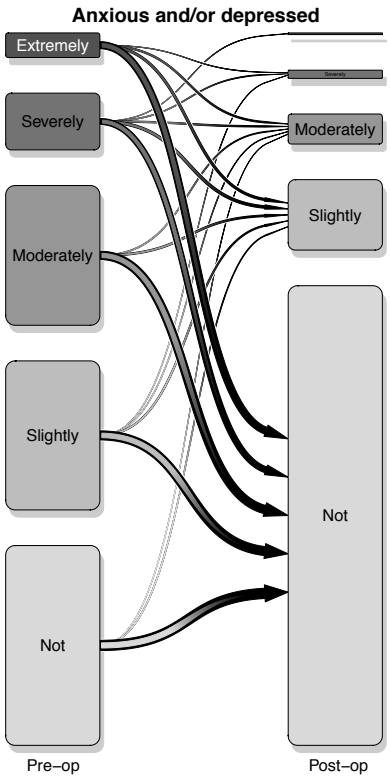
EQ-5D Anxiety/Depression — Primary hips

	Pre-op		Post-op	
Extremely anxious/depressed	52	4%	3	0.2%
Severely anxious/depressed	111	9%	16	1%
Moderately anxious/depressed	274	22%	60	5%
Slightly anxious/depressed	296	24%	137	11%
Not anxious/depressed	388	31%	945	76%
Unknown/not stated	130	10%	90	7%

EQ-5D Anxiety/Depression — Revision hips

	Pre-op		Post-op	
Extremely anxious/depressed	3	4%	0	0%
Severely anxious/depressed	4	6%	0	0%
Moderately anxious/depressed	15	21%	6	8%
Slightly anxious/depressed	16	22%	7	10%
Not anxious/depressed	20	28%	52	72%
Unknown/not stated	14	19%	7	10%

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)*

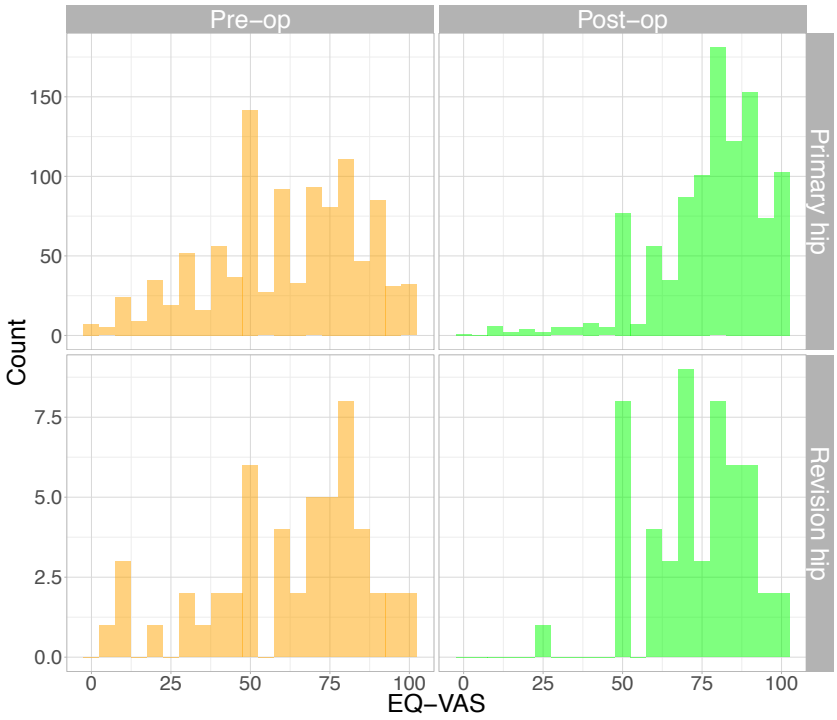


Figure 4.6: Hip Arthroplasties: Distribution of EQ-VAS, pre-op versus post-op

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

Procedure	Sex	Timing	$n^{\dagger}$	Mean	5th %ile	Median	95th %ile
Primary hip	Males	Pre-op	558	60.0	18.4	60.0	95.0
		Post-op	558	77.3	50.0	80.0	100.0
Primary hip	Females	Pre-op	476	62.3	20.0	69.0	95.0
		Post-op	476	78.6	50.0	80.0	99.2
Primary hip	Persons	Pre-op	1034	61.0	20.0	60.0	95.0
		Post-op	1034	77.9	50.0	80.0	100.0
Revision hip	Males	Pre-op	30	62.0	8.9	72.5	97.7
		Post-op	30	73.9	50.0	79.0	96.6
Revision hip	Females	Pre-op	22	63.8	35.2	70.0	85.0
		Post-op	22	71.6	50.0	70.0	90.0
Revision hip	Persons	Pre-op	52	62.8	10.0	70.0	95.0
		Post-op	52	72.9	50.0	75.0	95.0

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

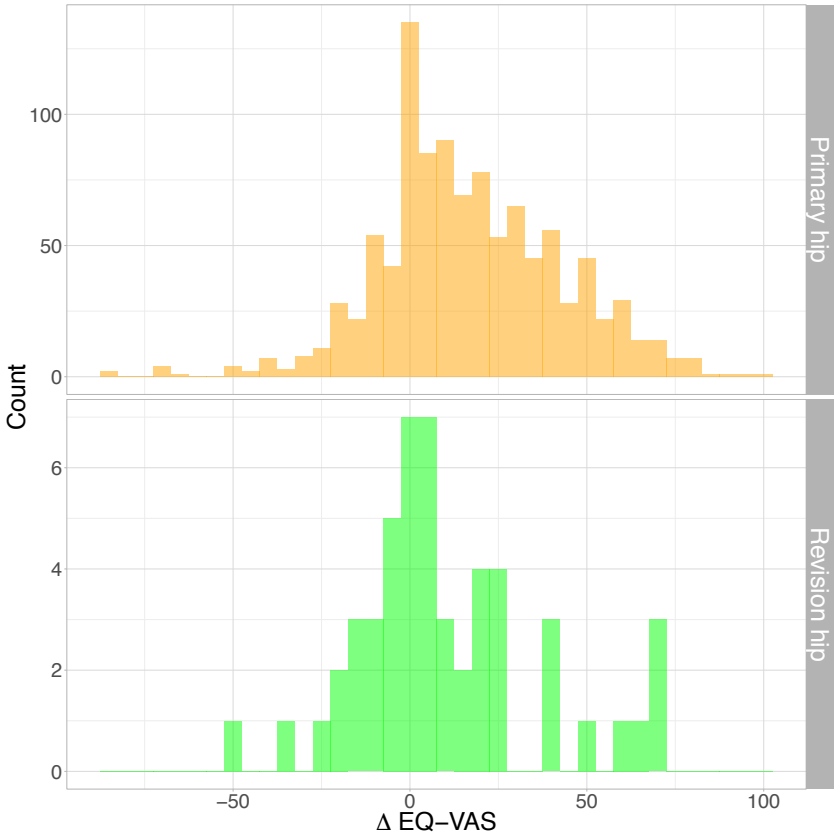


Figure 4.7: Hip Arthroplasties: Change in EQ-VAS, pre-op versus post-op

4.4.11 *Oxford Hip Scores*

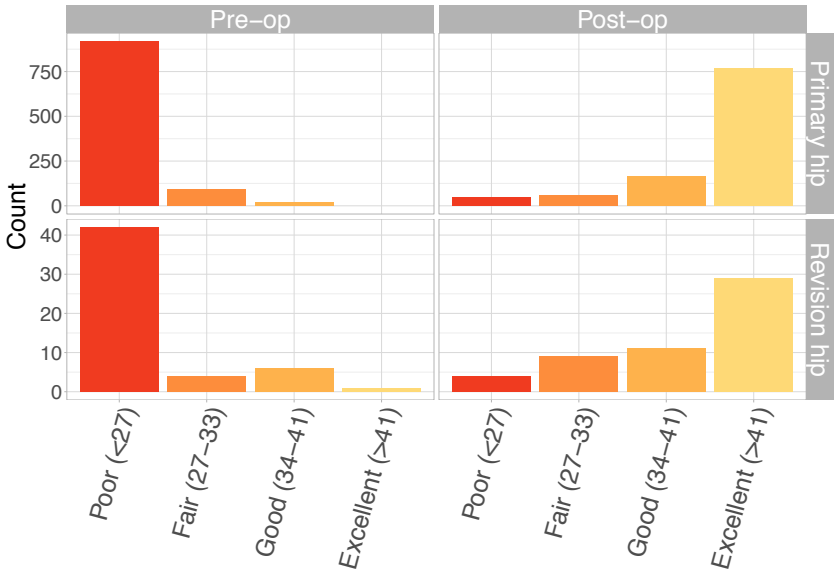


Figure 4.8: Hip Arthroplasties: Distribution of grouped total Oxford Hip Scores, pre-op to post-op

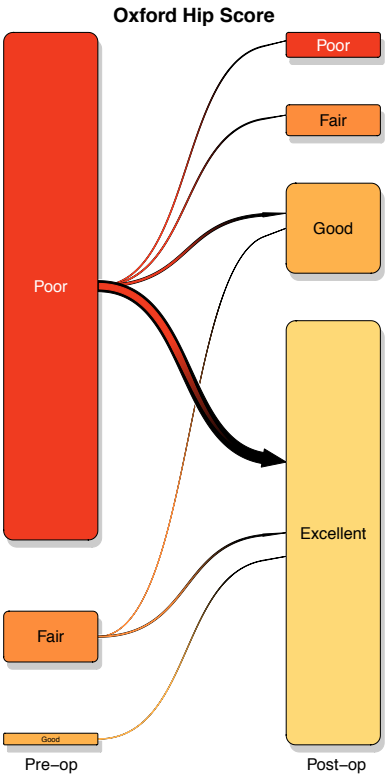
Partitioned total Oxford Hip Scores, pre-op and post-op — Primary hips

Total Oxford score	Pre-op		Post-op	
Poor (<27)	919	89%	45	4%
Fair (27-33)	92	9%	56	5%
Good (34-41)	21	2%	163	16%
Excellent (>41)	0	0%	768	74%

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

Total Oxford score	Pre-op		Post-op	
Poor (<27)	42	79%	4	8%
Fair (27-33)	4	8%	9	17%
Good (34-41)	6	11%	11	21%
Excellent (>41)	1	2%	29	55%

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



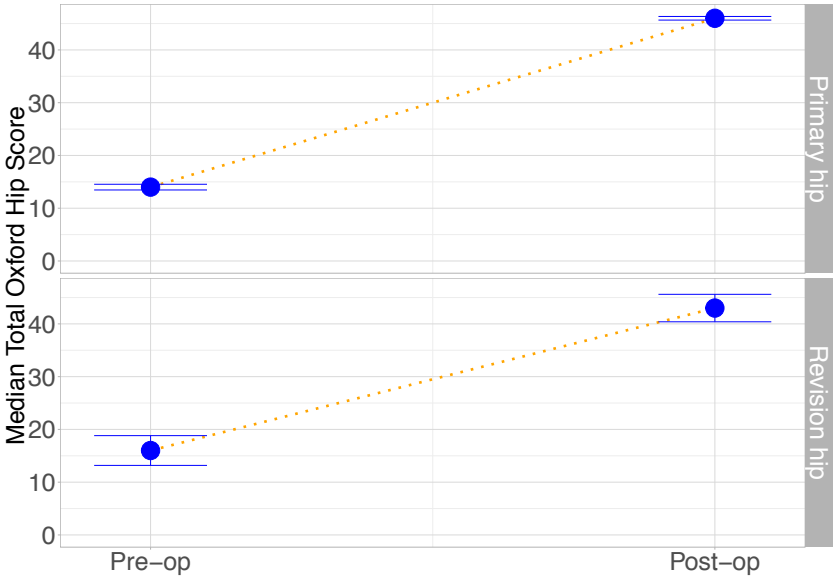


Figure 4.9: Domino plot of median Pre-op and Post-op Oxford Hip Scores

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

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

Procedure	Sex	Timing†	*n*‡	Mean	5th %ile	Median	95th %ile	IQR¶
Primary knee	Males	Pre-op	554	14.4	3.0	13	31.0	11.0
		Post-op	554	42.5	26.7	45	48.0	7.0
	Females	Pre-op	478	16.6	6.0	16	31.0	11.0
		Post-op	478	43.6	30.0	46	48.0	5.0
	Persons	Pre-op	1032	15.4	4.0	14	31.0	11.0
		Post-op	1032	43.0	27.6	46	48.0	7.0
Revision knee	Males	Pre-op	31	18.5	4.0	14	37.5	16.0
		Post-op	31	37.8	19.0	40	47.0	12.5
	Females	Pre-op	22	18.5	7.0	19	34.7	9.5
		Post-op	22	40.9	28.1	44	48.0	10.8
	Persons	Pre-op	53	18.5	4.6	16	37.4	13.0
		Post-op	53	39.1	19.6	43	48.0	12.0

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

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

¶ Inter-quartile range.

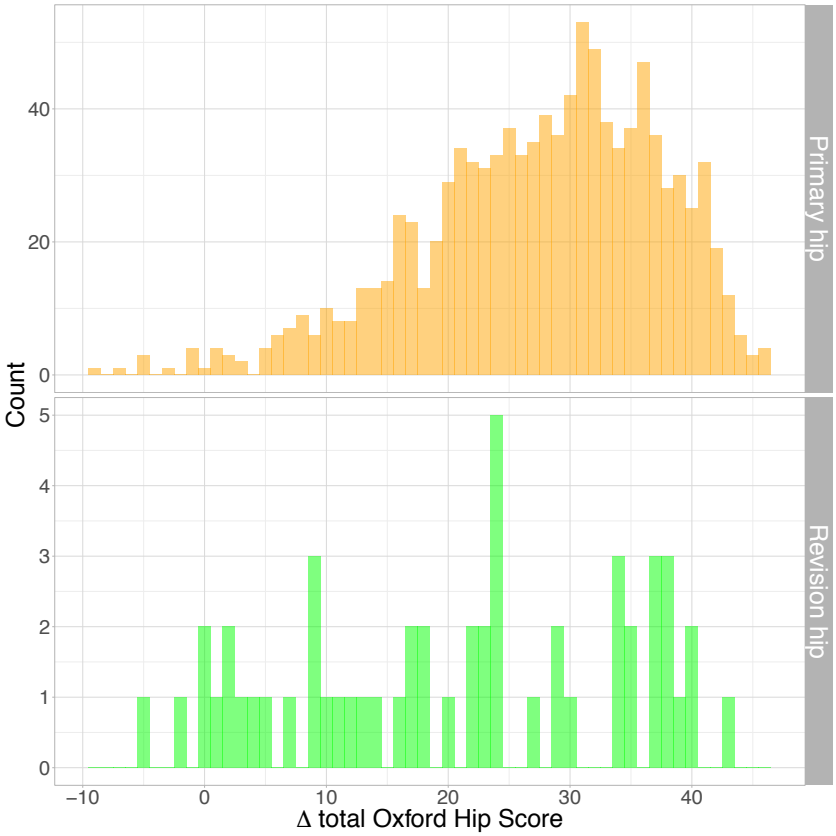


Figure 4.10: Change in total Oxford hip scores, pre-op to post-op

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

	Procedure	Sex	$n^{\dagger}$	Mean change	5th %ile	Median	95th %ile
2	Primary hip	Males	554	28.1	9.7	30.0	42.0
1		Females	478	27.0	9.9	28.0	41.0
5		Persons	1032	27.6	9.6	29.0	41.0
4	Revision hip	Males	31	19.4	0.5	18.0	38.5
3		Females	22	22.5	0.1	23.5	39.8
6		Persons	53	20.6	0.0	22.0	39.4

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

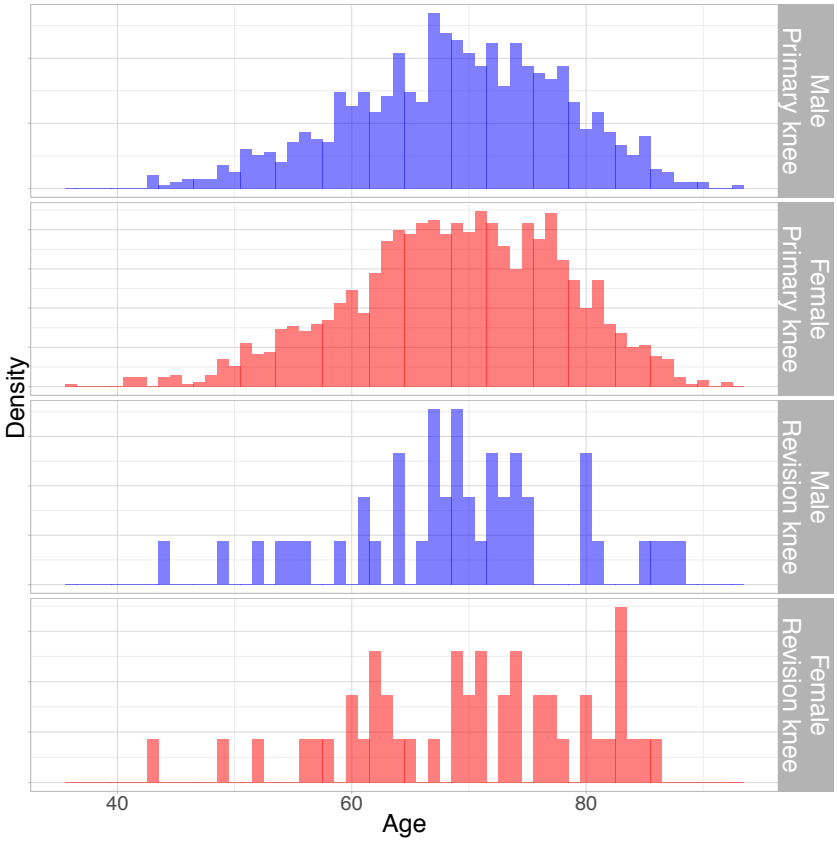
5
Knee Arthroplasty

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

Between January 2013 and December 2015, primary total knee arthroplasty surgery accounted for 97% of knee arthroplasty procedures. The average age of all people having a knee procedure was 68.9 years. The most common reason for primary surgery was osteoarthritis. Knee arthroplasty surgery was more common in women (62.9%).

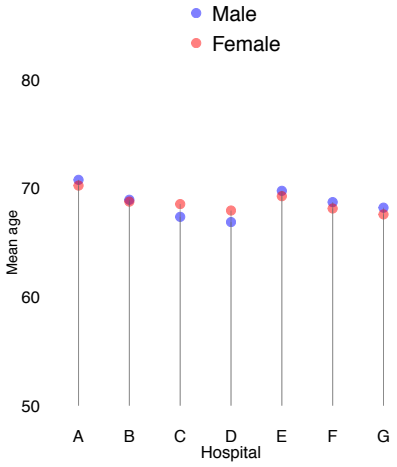
5.1 Demographic Profile

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.



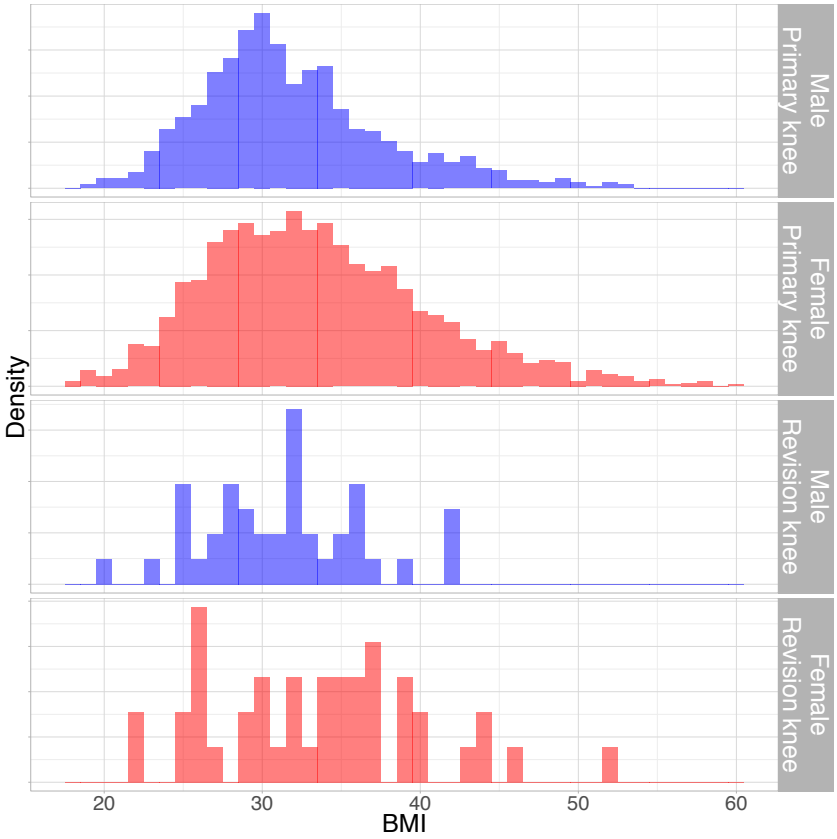
AGE OF PATIENTS — PRIMARY KNEES

	n	%	**Mean**	StdDev	Min	Max	<55	55-64	65-74	75-84	≥ 85
Male	988	36.7	**68.9**	9.11	42.6	92.7	7.7%	25%	40%	24%	2.8%
Female	1701	63.3	**68.9**	9.10	36.2	91.8	7.9%	25%	40%	25%	2.5%
Persons	**2689**	**100.0**	**68.9**	**9.10**	**36.2**	**92.7**	**7.8%**	**25%**	**40%**	**25%**	**2.6%**

AGE OF PATIENTS — REVISION KNEES

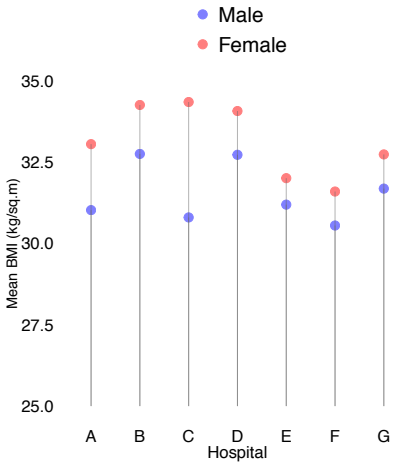
	n	%	**Mean**	StdDev	Min	Max	<55	55-64	65-74	75-84	≥ 85
Male	45	49.5	**68.9**	9.84	43.5	87.9	8.9%	20%	53%	11%	6.7%
Female	46	50.5	**70.1**	10.41	42.5	85.6	6.5%	28%	30%	30%	4.3%
Persons	**91**	**100.0**	**69.5**	**10.09**	**42.5**	**87.9**	**7.7%**	**24%**	**42%**	**21%**	**5.5%**

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	988	53	5.7%	**31.9**	5.86	18.6	53
Female	1701	100	6.2%	**33.6**	7.02	18.1	59.6
Persons	**2689**	**153**	**6.0%**	**33**	**6.66**	**18.1**	**59.6**

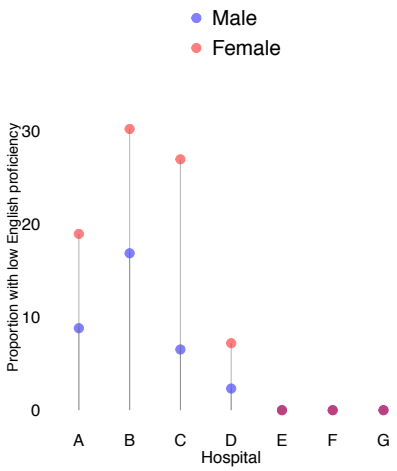
Body Mass Index (BMI) — Revision knees

	n	Missing		**Mean**	StdDev	Min	Max
Male	45	4	9.8%	**31.4**	5.04	20	42.1
Female	46	3	7.0%	**33.7**	6.72	21.6	52.1
Persons	**91**	**7**	**8.3%**	**32.6**	**6.04**	**20**	**52.1**

5.1.3 *English Proficiency*

ENGLISH PROFICIENCY — PRIMARY & REVISION KNEES

	n	Missing		High		Low	
Male	1033	51	4.9%	897	86.8%	85	8.2%
Female	1747	85	4.9%	1349	77.2%	313	17.9%
Persons	2780	136	4.9%	2246	80.8%	398	14.3%



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	1033	91	8.8%	11	1.1%	317	31%	414	40%	200	19%
Female	1747	150	8.6%	56	3.2%	565	32%	727	42%	249	14%
Persons	2780	241	8.7%	67	2.4%	882	32%	1141	41%	449	16%

POST-SCHOOL EDUCATION — PRIMARY & REVISION KNEES

	n	Missing		None		Cert/Diploma		Bachelor		Postgrad	
Male	1033	133	13%	468	45%	350	34%	41	3.97%	41	4%
Female	1747	233	13%	1154	66%	207	12%	45	2.6%	108	6.2%
Persons	2780	366	13%	1622	58%	557	20%	86	3.1%	149	5.4%

5.2 Patient Medical & Surgical Characteristics

5.2.1 Comorbidities

PRE-OPERATIVE COMORBIDITIES — PRIMARY KNEES

	n	Low back pain		Lower limb arthritis		Heart disease		Hypertension	
Male	988	226	23%	231	23%	332	34%	549	56%
Female	1701	541	32%	423	25%	525	31%	1061	62%
Persons	2689	767	29%	654	24%	857	32%	1610	60%

	n	Diabetes		Gastrointestinal disease		Respiratory disease		Renal disease	
Male	988	231	23%	169	17%	164	17%	62	6%
Female	1701	405	24%	449	26%	305	18%	84	5%
Persons	2689	636	24%	618	23%	469	17%	146	5%

	n	Hepatic disease		Neurological disease		Anxiety/ depression	
Male	988	22	2%	46	5%	109	11%
Female	1701	43	3%	101	6%	329	19%
Persons	2689	65	2%	147	5%	438	16%

	n	No comorbs		1 comorb		2 comorbs		$\geq$ 3 comorbs	
Male	988	4	14%	9	22%	7	26%	12	38%
Female	1701	8	11%	5	17%	5	26%	24	46%
Persons	2689	12	12%	14	19%	12	26%	36	43%

PRE-OPERATIVE COMORBIDITIES — REVISION KNEES

	n	Low back pain		Lower limb arthritis		Heart disease		Hypertension	
Male	45	15	33%	10	22%	15	33%	27	60%
Female	46	17	37%	11	24%	20	43%	27	59%
Persons	91	32	35%	21	23%	35	38%	54	59%

	n	Diabetes		Gastrointestinal disease		Respiratory disease		Renal disease	
Male	45	9	20%	11	24%	6	13%	2	4%
Female	46	12	26%	12	26%	8	17%	3	7%
Persons	91	21	23%	23	25%	14	15%	5	5%

	n	Hepatic disease		Neurological disease		Anxiety/ depression	
Male	45	0	0%	2	4%	1	2%
Female	46	1	2%	4	9%	10	22%
Persons	91	1	1%	6	7%	11	12%

	n	No comorbs		1 comorb		2 comorbs		$\geq$ 3 comorbs	
Male	45	4	18%	9	16%	7	31%	12	36%
Female	46	8	4%	5	24%	5	20%	24	52%
Persons	91	12	11%	14	20%	12	25%	36	44%

5.2.2 *ASA Physical Status Classification*

ASA — Primary knees

	n	Missing		ASA 1		ASA 2	
Males	988	232	23%	45	5%	448	45%
Females	1701	377	22%	67	4%	778	46%
Persons	2689	609	23%	112	4%	1226	46%

	n	ASA 3		ASA 4		ASA 5	
Males	988	252	26%	10	1%	1	0.1%
Females	1701	470	28%	9	0.5%	0	0%
Persons	2689	722	27%	19	0.7%	1	0.04%

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

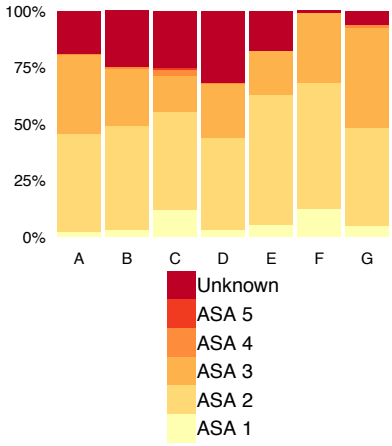
1. a normal healthy person
2. a person with mild systemic disease
3. a person with severe systemic disease
4. a person with severe systemic disease that is a constant threat to life
5. a moribund person who is not expected to survive

ASA — Revision knees

	n	Missing		ASA 1		ASA 2	
Males	45	12	27%	2	4%	18	40%
Females	46	8	17%	0	0%	23	50%
Persons	91	20	22%	2	2%	41	45%

	n	ASA 3		ASA 4		ASA 5	
Males	45	13	29%	0	0%	0	0%
Females	46	15	33%	0	0%	0	0%
Persons	91	28	31%	0	0%	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	2689	0	0%	1212	45%	1278	48%	199	7%
Revision	91	1	1%	35	38%	55	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 on 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	988	948	96%	1	0.1%	0	0%
Female	1701	1616	95%	18	1%	0	0%
Persons	2689	2564	95%	19	0.7%	0	0%

	n	Oth arth		ON/AVN		Tumour	
Male	988	1	0.1%	2	0.2%	0	0%
Female	1701	2	0.1%	4	0.2%	0	0%
Persons	2689	3	0.1%	6	0.2%	0	0%

	n	Other		Missing	
Male	988	12	1%	24	2%
Female	1701	10	0.6%	51	3%
Persons	2689	22	0.8%	75	3%

OA
: osteoarthritis

RA
: rheumatoid arthritis

DDH
: developmental dysplasia of the hips

Oth arth
: other inflammatory arthritis

ON/AVN
: osteonecrosis/avascular necrosis

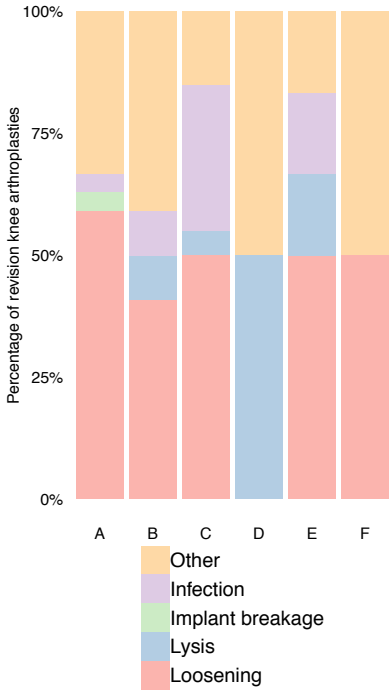
Reason for Surgery — Revision knees

	n	Loosening		Lysis		Dislocation	
Male	45	16	36%	5	11%	0	0%
Female	46	23	50%	3	7%	0	0%
Persons	91	39	43%	8	9%	0	0%

	n	Implant break		Infection		Fracture	
Male	45	1	2%	7	16%	0	0%
Female	46	0	0%	3	7%	0	0%
Persons	91	1	1%	10	11%	0	0%

	n	Other		Missing	
Male	45	13	29%	3	7%
Female	46	14	30%	3	7%
Persons	91	27	30%	6	7%

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

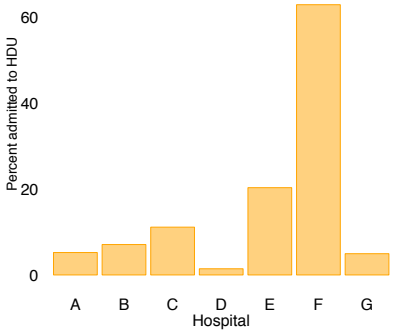
HIGH CARE BED UTILISATION — PRIMARY KNEES

	n	Missing		High Care Bed		Unplanned †	
Male	988	1	0.1%	111	11%	86	77%
Female	1701	1	0.06%	141	8%	95	67%
Persons	2689	2	0.07%	252	9%	181	72%

HIGH CARE BED UTILISATION — REVISION KNEES

	n	Missing		High Care Bed		Unplanned †	
Male	45	0	0%	4	9%	2	50%
Female	46	0	0%	2	4%	2	100%
Persons	91	0	0%	6	7%	4	67%

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.



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

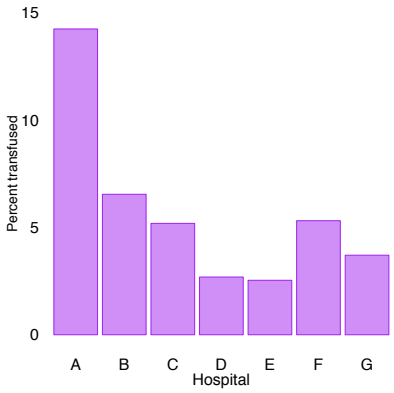
5.3.2 *Peri-operative Blood Transfusion*

Blood Transfusion — Primary knees

	n	Missing		Transfused		Mean units
Male	988	8	0.8%	48	5%	2.2
Female	1701	16	0.9%	135	8%	2
Persons	2689	24	0.9%	183	7%	2

	n	Autologous †		Donor †		Missing source	
Male	988	2	4%	38	79%	6	12%
Female	1701	4	3%	96	71%	25	19%
Persons	2689	6	3%	134	73%	31	17%

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.

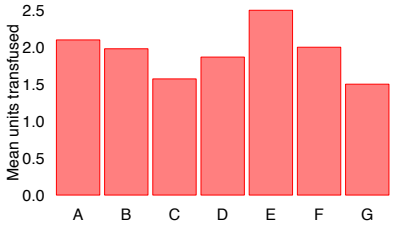


Blood Transfusion — Revision knees

	n	Missing		Transfused		Mean units
Male	45	1	2%	8	18%	2.2
Female	46	1	2%	5	11%	1.4
Persons	91	2	2%	13	14%	1.9

	n	Autologous †		Donor †		Missing source	
Male	45	0	0%	5	62%	1	12%
Female	46	0	0%	4	80%	0	0%
Persons	91	0	0%	9	69%	1	8%

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



† percentages are of patients who received transfusions.

5.3.3 Complications during Index Admission

COMPLICATIONS (ANY) DURING ADMISSION — PRIMARY KNEES

	n	1 or more		None		Unk/NS	
Males	988	179	(18%)	794	(80%)	9	(0.9%)
Females	1701	223	(13%)	1453	(85%)	22	(1%)
Persons	2689	402	(15%)	2247	(84%)	31	(1%)

COMPLICATIONS (DETAILS) DURING ADMISSION — PRIMARY KNEES

Complications	Males		Females		Persons	
Drug reaction	1	0.1%	1	0.059%	2	0.074%
Delirium	17	1.7%	9	0.53%	26	0.97%
SSI requiring oral antibiotics	0	0%	0	0%	0	0%
SSI requiring IV antibiotics	0	0%	4	0.24%	4	0.15%
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	4	0.4%	4	0.24%	8	0.3%
Pulmonary embolus	4	0.4%	12	0.71%	16	0.6%
Fat emboli	0	0%	1	0.059%	1	0.037%
Respiratory infection	4	0.4%	14	0.82%	18	0.67%
CVS	22	2.2%	40	2.4%	62	2.3%
Dislocation	0	0%	0	0%	0	0%
Fracture	3	0.3%	9	0.53%	12	0.45%
Nerve injury	1	0.1%	2	0.12%	3	0.11%
Urinary tract infection	19	1.9%	14	0.82%	33	1.2%
Urinary retention	24	2.4%	7	0.41%	31	1.2%
Wound dehiscence	16	1.6%	12	0.71%	28	1%
Reoperation during index adm	0	0%	2	0.12%	2	0.074%
Pressure area	1	0.1%	1	0.059%	2	0.074%
Fall	5	0.51%	7	0.41%	12	0.45%
Hypotension	9	0.91%	17	1%	26	0.97%
Cellulitis	5	0.51%	3	0.18%	8	0.3%
Death	0	0%	1	0.059%	1	0.037%
Other	38	3.8%	49	2.9%	87	3.2%

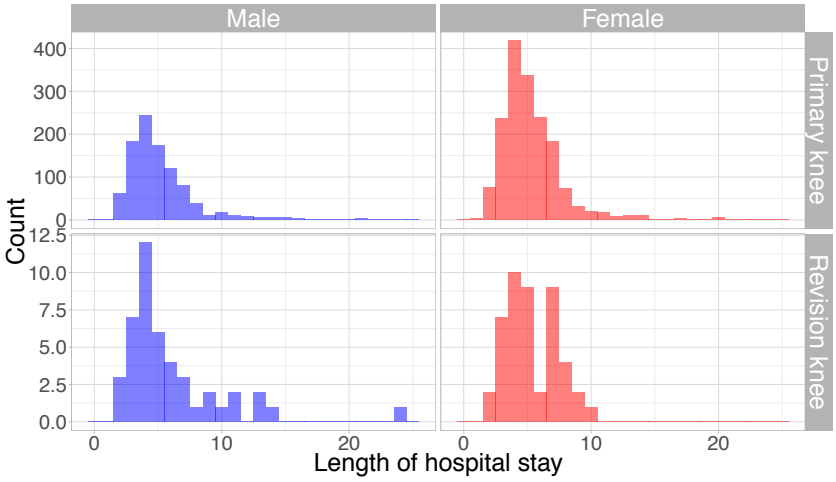
Complications (any) during Admission — Revision knees

	n	1 or more		None		Unk/NS	
Males	45	6	(13%)	38	(84%)	1	(2%)
Females	46	3	(7%)	42	(91%)	1	(2%)
Persons	91	9	(10%)	80	(88%)	2	(2%)

Complications (details) during Admission — Revision knees

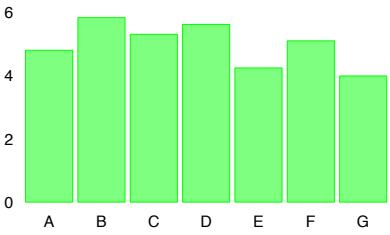
Complications	Males		Females		Persons	
Drug reaction	0	0%	0	0%	0	0%
Delirium	0	0%	0	0%	0	0%
SSI requiring oral antibiotics	0	0%	0	0%	0	0%
SSI requiring IV antibiotics	0	0%	0	0%	0	0%
SSI requ surg c̄ prosth removal	0	0%	0	0%	0	0%
SSI requ surg s̄ prosth removal	0	0%	0	0%	0	0%
Deep vein thrombosis	0	0%	0	0%	0	0%
Pulmonary embolus	0	0%	0	0%	0	0%
Fat emboli	0	0%	0	0%	0	0%
Respiratory infection	0	0%	0	0%	0	0%
CVS	1	2.2%	0	0%	1	1.1%
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	2.2%	1	1.1%
Urinary retention	0	0%	0	0%	0	0%
Wound dehiscence	1	2.2%	0	0%	1	1.1%
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	2.2%	0	0%	1	1.1%
Cellulitis	0	0%	0	0%	0	0%
Death	0	0%	0	0%	0	0%
Other	3	6.7%	1	2.2%	4	4.4%

5.3.4 *Length of Stay in Hospital*



The plot at left excludes 3 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	988	37%	3	0.3%	5.2	5	6	11
Female	1701	63%	9	0.5%	5.3	5	6	10
Persons	2689	100%	12	0.4%	5.3	5	6	10

LENGTH OF STAY IN HOSPITAL — REVISION KNEES

	n		Missing		Mean	Median	75th %ile	95th %ile
Male	45	49%	0	0%	6	5	7	13
Female	46	51%	0	0%	5.3	5	7	8.8
Persons	91	100%	0	0%	5.7	5	7	11

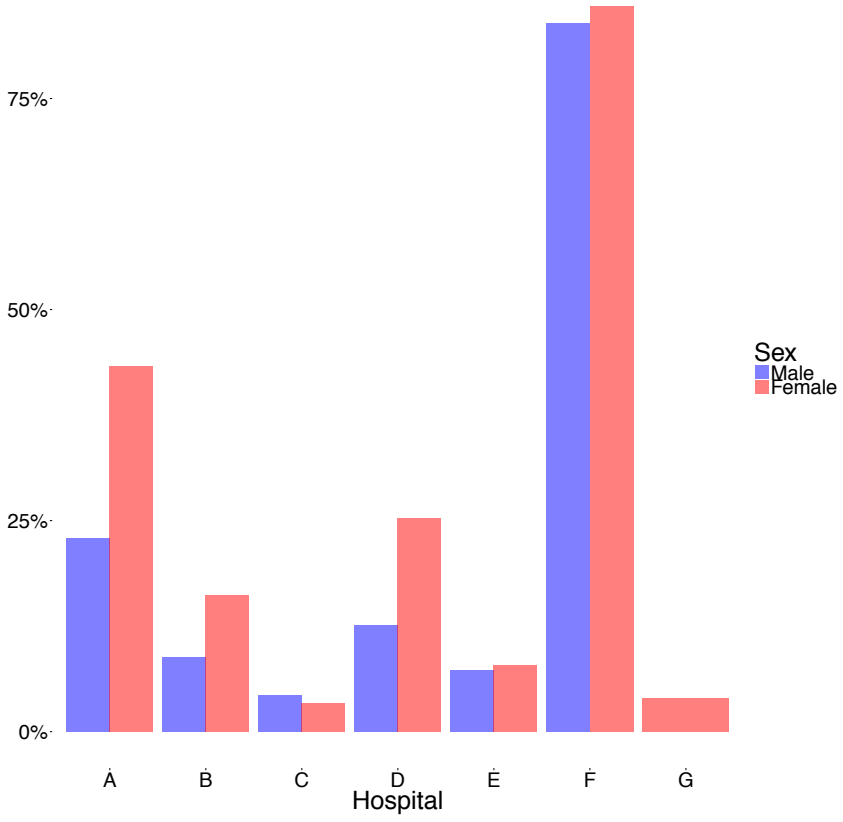
5.3.5 *Discharge Destination*

DISCHARGE DESTINATION — PRIMARY KNEES

	n	Unk/NS		Usual residence		Inpatient rehab		Other	
Male	988	14	1%	811	82%	160	16%	3	0.3%
Female	1701	26	2%	1252	74%	415	24%	8	0.5%
Persons	2689	40	1%	2063	77%	575	21%	11	0.4%

DISCHARGE DESTINATION — REVISION KNEES

	n	Unk/NS		Usual residence		Inpatient rehab		Other	
Male	45	2	4%	35	78%	8	18%	0	0%
Female	46	0	0%	34	74%	12	26%	0	0%
Persons	91	2	2%	69	76%	20	22%	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.

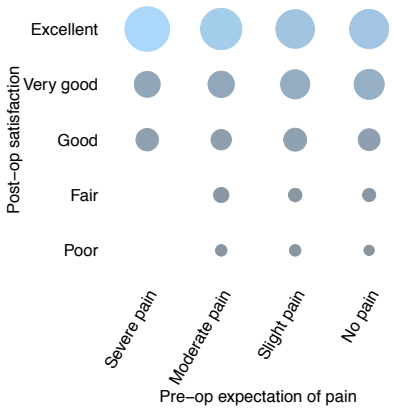
For success, the question asked is "overall, how are the problems now with your hip/knee on which you had surgery, compared to before your operation?" This question also allows the person to choose one of five options: much better; a little better; about the same; a little worse; and much worse.

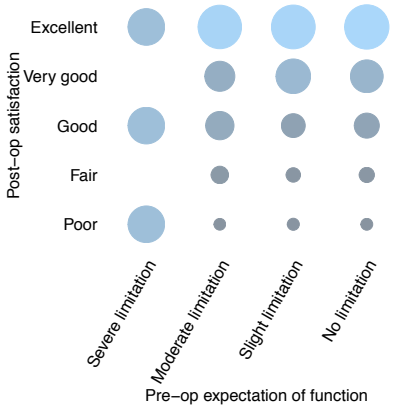
In addition, ACORN asks participants whether they have been re-admitted to hospital since discharge, had another operation on the joint that was replaced six months earlier, and whether they have experienced any other problem not requiring re-admission or re-operation. By asking this additional question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

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	988	169	17%	524	53%	236	24%	48	5%	11	1%
Female	1701	308	18%	828	49%	469	28%	87	5%	9	0.5%
Persons	2689	477	18%	1352	50%	705	26%	135	5%	20	0.7%

EXPECTATION OF PAIN — REVISION KNEES

	n	Unknown/ Not stated		No pain		Slight pain		Moderate pain		Severe pain	
Male	45	9	20%	18	40%	13	29%	5	11%	0	0%
Female	46	5	11%	19	41%	19	41%	3	7%	0	0%
Persons	91	14	15%	37	41%	32	35%	8	9%	0	0%

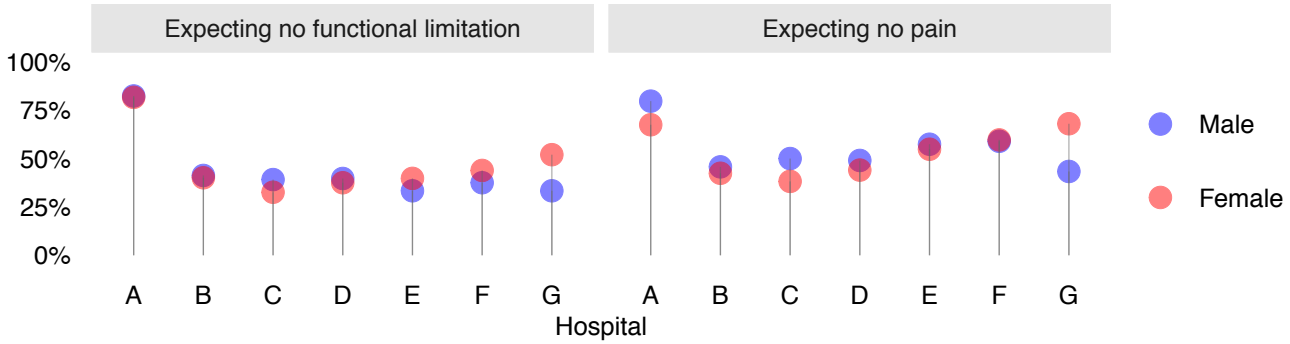
5.4.2 *Pre-op Expectation of Function at 6 months post-op*

EXPECTATION OF FUNCTION — PRIMARY KNEES

	n	Unknown/ Not stated		No limitation		Slight limitation		Moderate limitation		Severe limitation	
Male	988	170	17%	451	46%	321	32%	44	4%	2	0.2%
Female	1701	307	18%	790	46%	510	30%	93	5%	1	0.06%
Persons	2689	477	18%	1241	46%	831	31%	137	5%	3	0.1%

EXPECTATION OF FUNCTION — REVISION KNEES

	n	Unknown/ Not stated		No limitation		Slight limitation		Moderate limitation		Severe limitation	
Male	45	9	20%	18	40%	14	31%	4	9%	0	0%
Female	46	5	11%	18	39%	22	48%	1	2%	0	0%
Persons	91	14	15%	36	40%	36	40%	5	5%	0	0%



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

5.4.3 Satisfaction at 6 months post-op

SATISFACTION AT 6 MONTHS POST-OP — PRIMARY KNEES

	n	Unk/NS		Poor		Fair		Good		Very good		Excellent	
Male	985	79	8%	31	3%	47	5%	130	13%	251	25%	447	45%
Female	1697	155	9%	55	3%	89	5%	244	14%	447	26%	707	42%
Persons	2682	234	9%	86	3%	136	5%	374	14%	698	26%	1154	43%

SATISFACTION AT 6 MONTHS POST-OP — REVISION KNEES

	n	Unk/NS		Poor		Fair		Good		Very good		Excellent	
Male	45	6	13%	5	11%	2	4%	12	27%	9	20%	11	24%
Female	46	1	2%	3	7%	3	7%	8	17%	13	28%	18	39%
Persons	91	7	8%	8	9%	5	5%	20	22%	22	24%	29	32%

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	985	77	8%	16	2%	19	2%	32	3%	112	11%	729	74%
Female	1697	157	9%	33	2%	32	2%	57	3%	203	12%	1215	72%
Persons	2682	234	9%	49	2%	51	2%	89	3%	315	12%	1944	72%

SUCCESS AT 6 MONTHS POST-OP — REVISION KNEES

	n	Unk/NS		much worse		a little worse		about the same		a little better		much better	
Male	45	7	16%	2	4%	4	9%	3	7%	6	13%	23	51%
Female	46	2	4%	1	2%	0	0%	3	7%	7	15%	33	72%
Persons	91	9	10%	3	3%	4	4%	6	7%	13	14%	56	62%

5.4.5 Complications in the 6 months post-op

POST-DISCHARGE COMPLICATIONS (ANY) — PRIMARY KNEES

	n	Missing		None		1		2		3 or more		Number unknown	
Male	985	66	7%	500	51%	127	13%	44	4%	27	3%	9	0.9%
Female	1697	142	8%	879	52%	229	13%	90	5%	44	3%	21	1%
Persons	2682	208	8%	1379	51%	356	13%	134	5%	117	4%	30	1%

POST-DISCHARGE COMPLICATIONS (ANY) — REVISION KNEES

	n	Missing		None		1		2		3 or more		Number unknown	
Male	45	6	13%	14	31%	7	16%	2	4%	2	4%	2	4%
Female	46	1	2%	23	50%	7	15%	3	7%	2	4%	0	0%
Persons	91	7	8%	37	41%	14	15%	5	5%	6	7%	2	2%

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

	Primary hips (*n*=2682)		Revision hips (*n*=91)	
SSI requiring oral antibiotics	91	3.4%	3	3.3%
SSI requiring IV antibiotics	4	0.15%	0	0%
DVT index leg	41	1.5%	0	0%
DVT other leg	1	0.037%	0	0%
DVT both legs	0	0%	0	0%
Pulmonary embolus	3	0.11%	1	1.1%
Dislocation	2	0.075%	0	0%
Joint stiffness	222	8.3%	13	14%
Bladder infection or retention	4	0.15%	2	2.2%
Fracture	1	0.037%	0	0%
Unexpected pain	158	5.9%	10	11%
Cardiac	1	0.037%	0	0%
Stroke	0	0%	0	0%
Leg length discrepancy	32	1.2%	1	1.1%
Joint or lower limb swelling	199	7.4%	6	6.6%
Paraesthesia or numbness	198	7.4%	4	4.4%
Cellulitis	7	0.26%	0	0%
Neuropathy	13	0.48%	0	0%
Muscle weakness	38	1.4%	2	2.2%
Respiratory infection	1	0.037%	0	0%
Other	46	1.7%	3	3.3%

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

	Primary knees (*n*=2683)		Revision knees (*n*=91)	
SSI requiring oral antibiotics	91	3.4%	3	3.3%
SSI requiring IV antibiotics	8	0.3%	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	49	1.8%	0	0%
Pulmonary embolus	18	0.67%	1	1.1%
Fat emboli	1	0.037%	0	0%
Drug reaction	2	0.075%	0	0%
Delirium	26	0.97%	0	0%
Hypotension	26	0.97%	1	1.1%
CVS	63	2.3%	1	1.1%
Respiratory infection	19	0.71%	0	0%
Urinary tract infection or retention	63	2.3%	3	3.3%
Wound dehiscence	28	1%	1	1.1%
Pressure area	2	0.075%	0	0%
Fall	12	0.45%	0	0%
Cellulitis	15	0.56%	0	0%
Death	11	0.41%	0	0%
Dislocation	2	0.075%	0	0%
Fracture	13	0.48%	0	0%
Joint stiffness	222	8.3%	13	14%
Unexpected pain	158	5.9%	10	11%
Leg length discrepancy	32	1.2%	1	1.1%
Joint or lower limb swelling	199	7.4%	6	6.6%
Nerve injury†	211	7.9%	4	4.4%
Muscle weakness	38	1.4%	2	2.2%
Re-operation	51	1.9%	2	2.2%
Other	132	4.9%	7	7.7%

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

SSI Surgical Site Infection

CVS Cardiovascular system

† including paraesthesia & numbness

5.4.6 Re-admission in the 6 months post-op

RE-ADMISSION — PRIMARY KNEES

	n	Missing		Re-admission due to arthroplasty		Re-admission for other reasons		Total re-admissions	
Male	985	66	7%	60	6%	76	8%	129	13%
Female	1697	142	8%	86	5%	102	6%	180	11%
Persons	2682	208	8%	146	5%	178	7%	309	12%

RE-ADMISSION — REVISION KNEES

	n	Missing		Re-admission due to arthroplasty		Re-admission for other reasons		Total re-admissions	
Male	45	6	13%	4	9%	3	7%	6	13%
Female	46	1	2%	3	7%	3	7%	6	13%
Persons	91	7	8%	7	8%	6	7%	12	13%

REASON FOR RE-ADMISSION — PRIMARY & REVISION KNEES

	Primary (*n*=307)		Revision (*n*=12)	
Reasons related to arthroplasty				
DVT	11	4%	0	0%
Pulmonary embolus	3	1%	1	8%
MUA	42	14%	1	8%
Dislocation	0	0%	0	0%
Surgical site infection	63	21%	2	17%
Wound dehiscence	2	0.7%	0	0%
Index joint revision	0	0%	1	8%
Other	24	8%	2	17%
Reasons unrelated to arthroplasty				
Cardiac	9	3%	1	8%
Renal/urinary tract	16	5%	1	8%
Cancer	4	1%	1	8%
Other	147	48%	3	25%

5.4.7 Re-operation in the 6 months post-op

Re-operation — Primary knees

	n	Re-operation due to arthroplasty	
Male	985	20	2%
Female	1697	29	2%
Persons	2682	49	2%

Re-operation — Revision knees

	n	Re-operation due to arthroplasty	
Male	45	2	4%
Female	46	0	0%
Persons	91	2	2%

Reason for Re-operation — Primary knees

	Males (*n*=20)		Females (*n*=29)		Persons (*n*=49)	
SSI requiring surgery with no prosthesis removal	5	25%	7	24%	12	24%
SSI requiring surgery with prosthesis removal	1	5%	4	14%	5	10%
Dislocation	0	0%	0	0%	0	0%
Joint stiffness	12	60%	16	55%	28	57%
Periprosthetic fracture	0	0%	0	0%	0	0%
Implant fracture	0	0%	1	3%	1	2%
Bleeding	0	0%	0	0%	0	0%
Other	2	10%	1	3%	3	6%
Unknown/NS	0	0%	0	0%	0	0%

Reason for Re-operation — Revision knees

	Males (*n*=2)		Females (*n*=0)	Persons (*n*=2)	
SSI requiring surgery with no prosthesis removal	0	0%	0	0	0%
SSI requiring surgery with prosthesis removal	1	50%	0	1	50%
Dislocation	0	0%	0	0	0%
Joint stiffness	0	0%	0	0	0%
Periprosthetic fracture	0	0%	0	0	0%
Implant fracture	0	0%	0	0	0%
Bleeding	0	0%	0	0	0%
Other	1	50%	0	1	50%
Unknown/NS	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	985	93	9%	0	0%	7	0.7%
Female	1697	185	11%	1	0.06%	4	0.2%
Persons	2682	278	10%	1	0.04%	11	0.4%

POST-DISCHARGE DEATH — REVISION KNEES

	n	Unknown/ not stated		Died in hospital		Total deaths at 6 mths post-op	
Male	45	10	22%	0	0%	0	0%
Female	46	4	9%	0	0%	0	0%
Persons	91	14	15%	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*

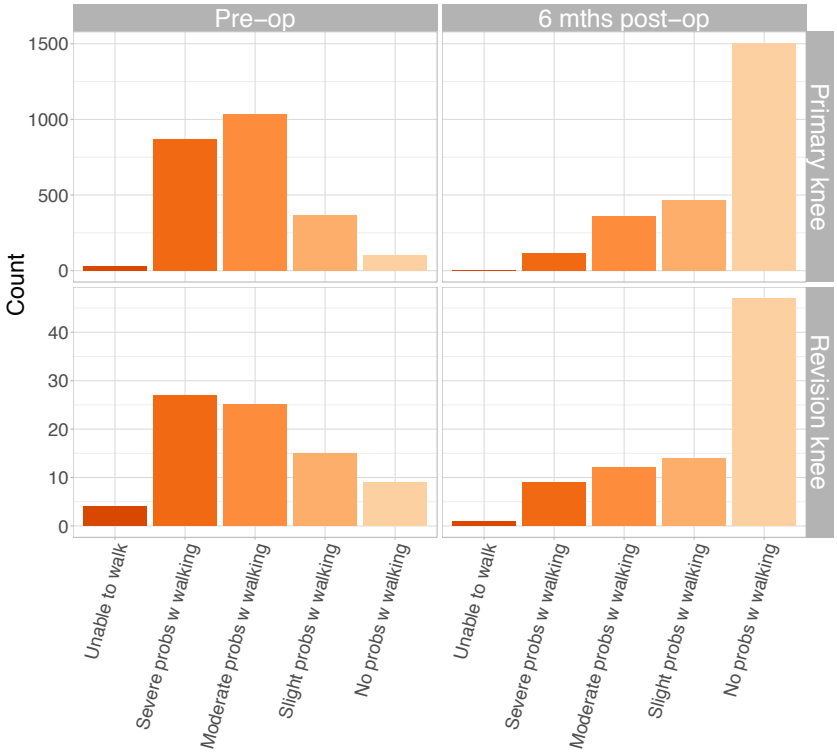


Figure 5.1: Knee Arthroplasties: Distribution of EQ-5D Mobility, pre-op versus post-op

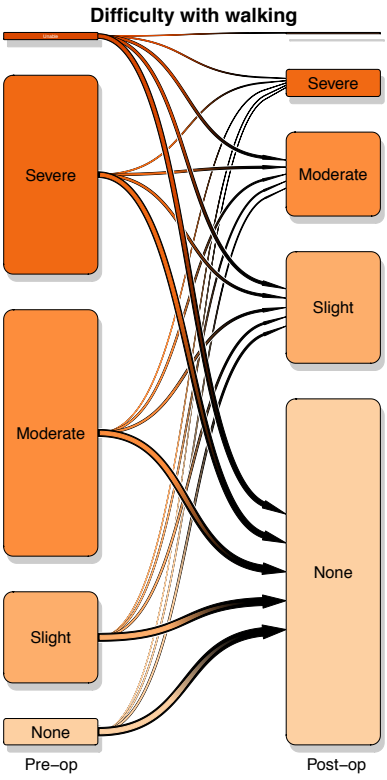
EQ-5D Mobility — Primary knees

	Pre-op		Post-op	
Unable to walk	33	1%	5	0.2%
Severe problems with walking	869	33%	118	4%
Moderate problems with walking	1037	39%	358	13%
Slight problems with walking	370	14%	469	18%
No problems with walking	104	4%	1504	56%
Unknown/Not stated	259	10%	218	8%

EQ-5D Mobility — Revision knees

	Pre-op		Post-op	
Unable to walk	4	4%	1	1%
Severe problems with walking	27	30%	9	10%
Moderate problems with walking	25	27%	12	13%
Slight problems with walking	15	16%	14	15%
No problems with walking	9	10%	47	52%
Unknown/Not stated	11	12%	8	9%

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.



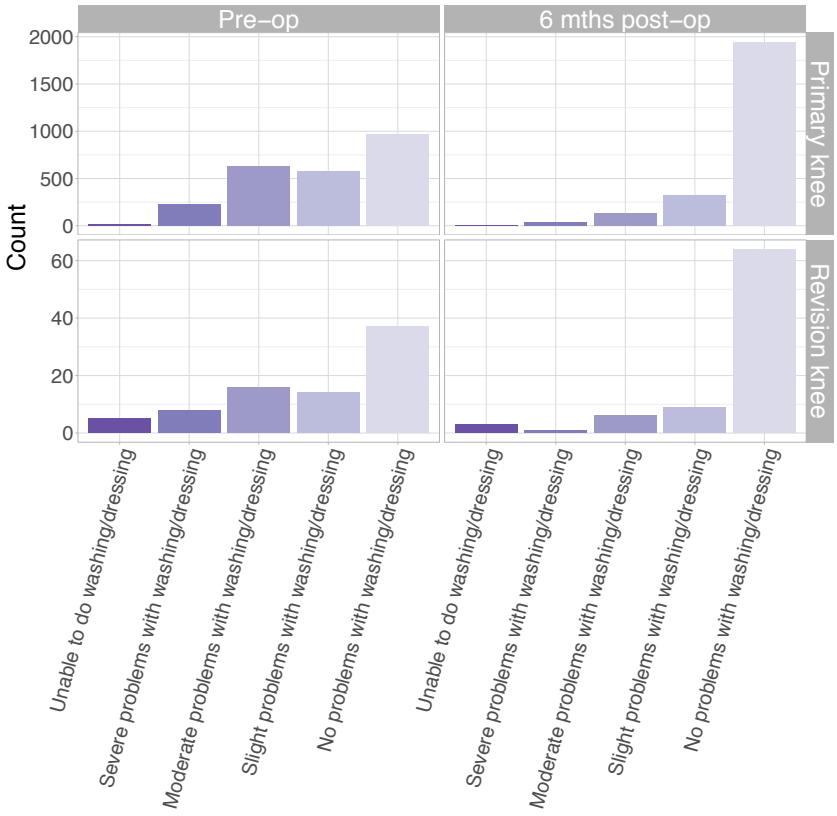


Figure 5.2: Knee Arthroplasties: Distribution of EQ-5D Personal Care, pre-op versus post-op

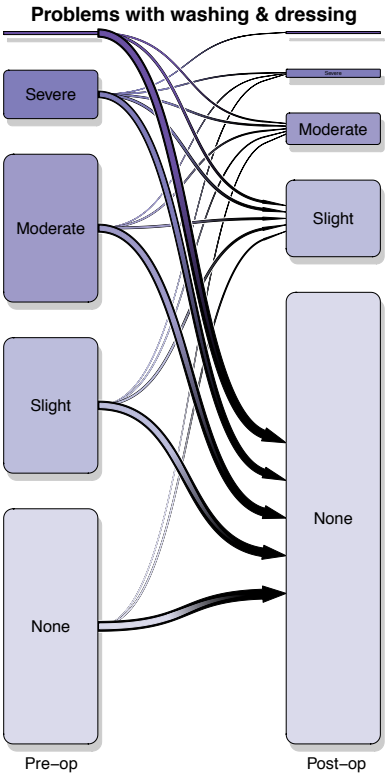
EQ-5D Personal Care — Primary knees

	Pre-op		Post-op	
Unable to do washing/dressing	18	0.7%	8	0.3%
Severe problems washing/dressing	228	9%	36	1%
Mod. problems washing/dressing	628	24%	135	5%
Slight problems washing/dressing	573	21%	327	12%
No problems washing/dressing	966	36%	1946	73%
Unknown/Not stated	259	10%	220	8%

EQ-5D Personal Care — Revision knees

	Pre-op		Post-op	
Unable to do washing/dressing	5	5%	3	3%
Severe problems washing/dressing	8	9%	1	1%
Mod. problems washing/dressing	16	18%	6	7%
Slight problems washing/dressing	14	15%	9	10%
No problems washing/dressing	37	41%	64	70%
Unknown/Not stated	11	12%	8	9%

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.



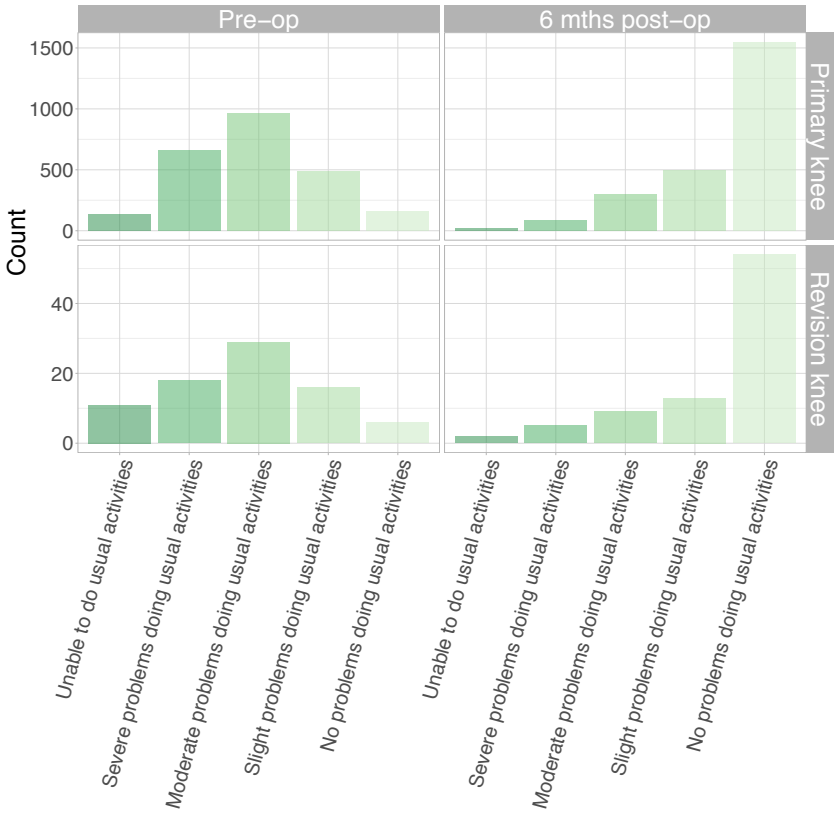


Figure 5.3: Knee Arthroplasties: Distribution of EQ-5D Usual Activities, pre-op versus post-op

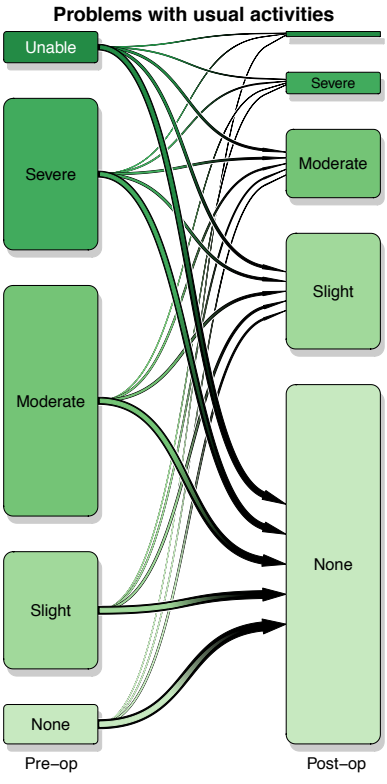
EQ-5D Usual Activites — Primary knees

	Pre-op		Post-op	
Unable to do usual activities	138	5%	24	0.9%
Severe problems c̄ usual activities	660	25%	90	3%
Mod. problems c̄ usual activities	966	36%	297	11%
Slight problems c̄ usual activities	487	18%	493	18%
No problems c̄ usual activities	163	6%	1548	58%
Unknown/Not stated	258	10%	220	8%

EQ-5D Usual Activites — Revision knees

	Pre-op		Post-op	
Unable to do usual activities	11	12%	2	2%
Severe problems c̄ usual activities	18	20%	5	5%
Mod. problems c̄ usual activities	29	32%	9	10%
Slight problems c̄ usual activities	16	18%	13	14%
No problems c̄ usual activities	6	7%	54	59%
Unknown/Not stated	11	12%	8	9%

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.



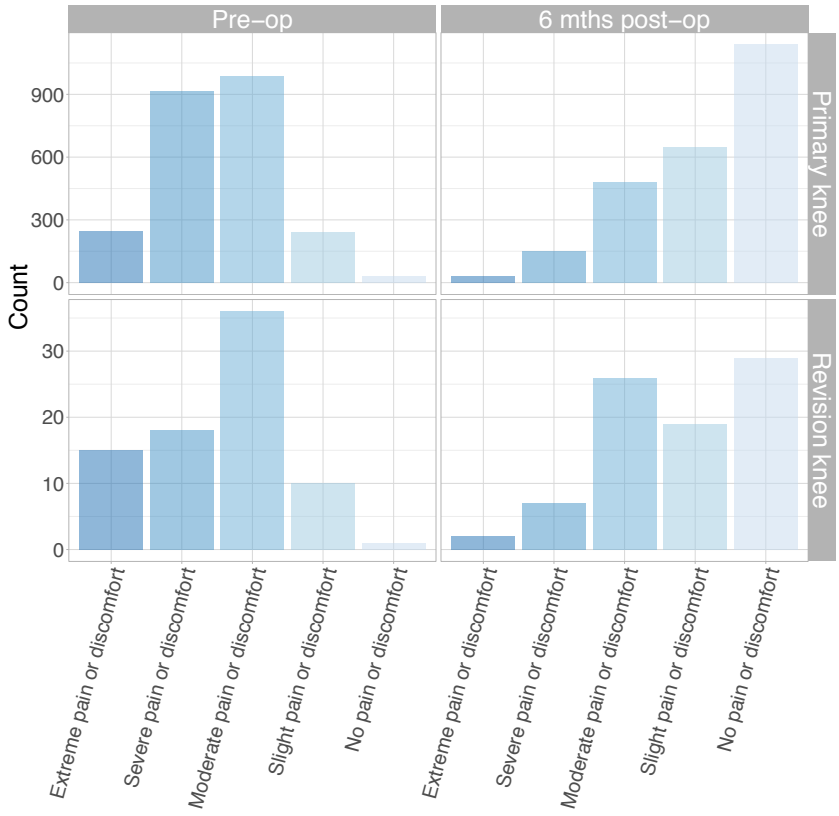


Figure 5.4: Knee Arthroplasties: Distribution of EQ-5D Discomfort, pre-op versus post-op

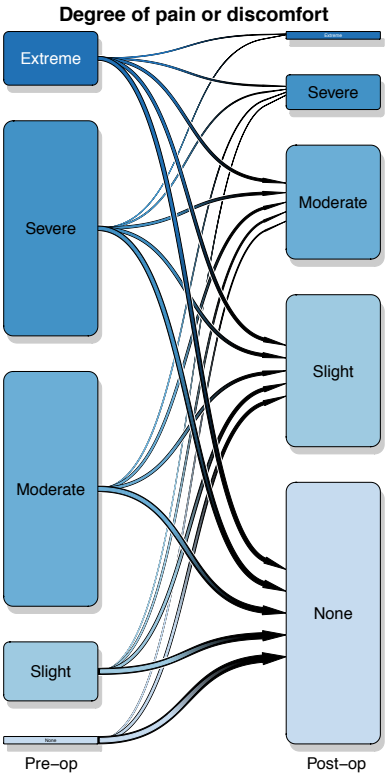
EQ-5D Discomfort — Primary knees

	Pre-op		Post-op	
Extreme pain or discomfort	246	9%	33	1%
Severe pain or discomfort	913	34%	152	6%
Moderate pain or discomfort	986	37%	481	18%
Slight pain or discomfort	241	9%	649	24%
No pain or discomfort	30	1%	1138	43%
Unknown/not stated	256	10%	219	8%

EQ-5D Discomfort — Revision knees

	Pre-op		Post-op	
Extreme pain or discomfort	15	16%	2	2%
Severe pain or discomfort	18	20%	7	8%
Moderate pain or discomfort	36	40%	26	29%
Slight pain or discomfort	10	11%	19	21%
No pain or discomfort	1	1%	29	32%
Unknown/not stated	11	12%	8	9%

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.



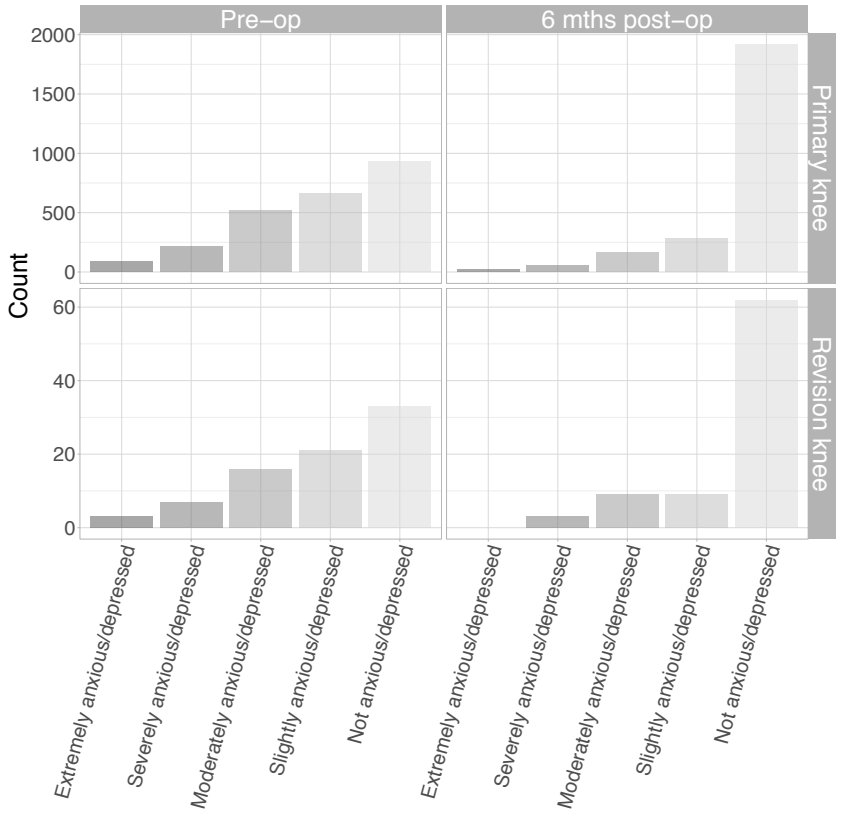


Figure 5.5: Knee Arthroplasties: Distribution of EQ-5D Anxiety/Depression, pre-op versus post-op

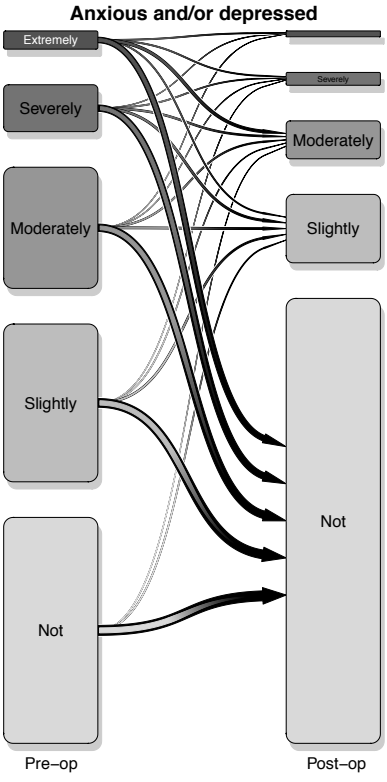
EQ-5D Anxiety/Depression — Primary knees

	Pre-op		Post-op	
Extremely anxious/depressed	89	3%	23	0.9%
Severely anxious/depressed	214	8%	59	2%
Moderately anxious/depressed	519	19%	166	6%
Slightly anxious/depressed	661	25%	281	11%
Not anxious/depressed	929	35%	1921	72%
Unknown/not stated	258	10%	220	8%

EQ-5D Anxiety/Depression — Revision knees

	Pre-op		Post-op	
Extremely anxious/depressed	3	3%	0	0%
Severely anxious/depressed	7	8%	3	3%
Moderately anxious/depressed	16	18%	9	10%
Slightly anxious/depressed	21	23%	9	10%
Not anxious/depressed	33	36%	62	68%
Unknown/not stated	11	12%	8	9%

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)*

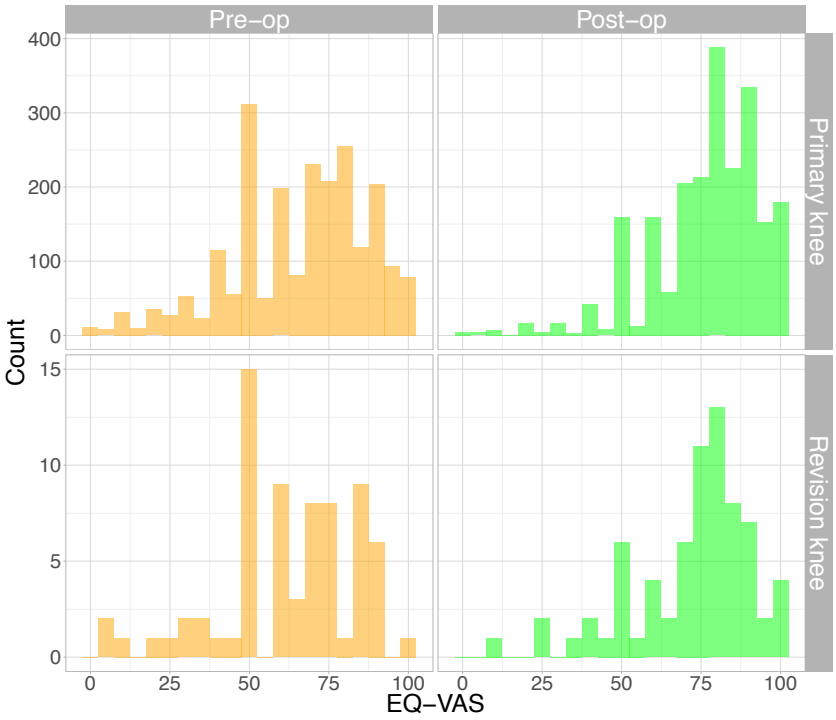


Figure 5.6: Knee Arthroplasties: Distribution of EQ-VAS, pre-op versus post-op

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

Procedure	Sex	Timing	$n^{\dagger}$	Mean	5^{th} %ile	Median	95^{th} %ile
Primary knee	Males	Pre-op	1380	63.3	20.0	65	95.0
		Post-op	1380	75.5	40.0	80	100.0
Primary knee	Females	Pre-op	822	69.3	30.0	75	95.0
		Post-op	822	78.4	50.0	80	100.0
Primary knee	Persons	Pre-op	2202	65.6	25.0	70	95.0
		Post-op	2202	76.6	50.0	80	100.0
Revision knee	Males	Pre-op	39	63.1	30.0	60	90.0
		Post-op	39	69.4	25.0	75	95.5
Revision knee	Females	Pre-op	32	60.8	7.2	65	90.0
		Post-op	32	75.8	50.0	80	94.0
Revision knee	Persons	Pre-op	71	62.1	22.5	65	90.0
		Post-op	71	72.2	37.5	75	97.0

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

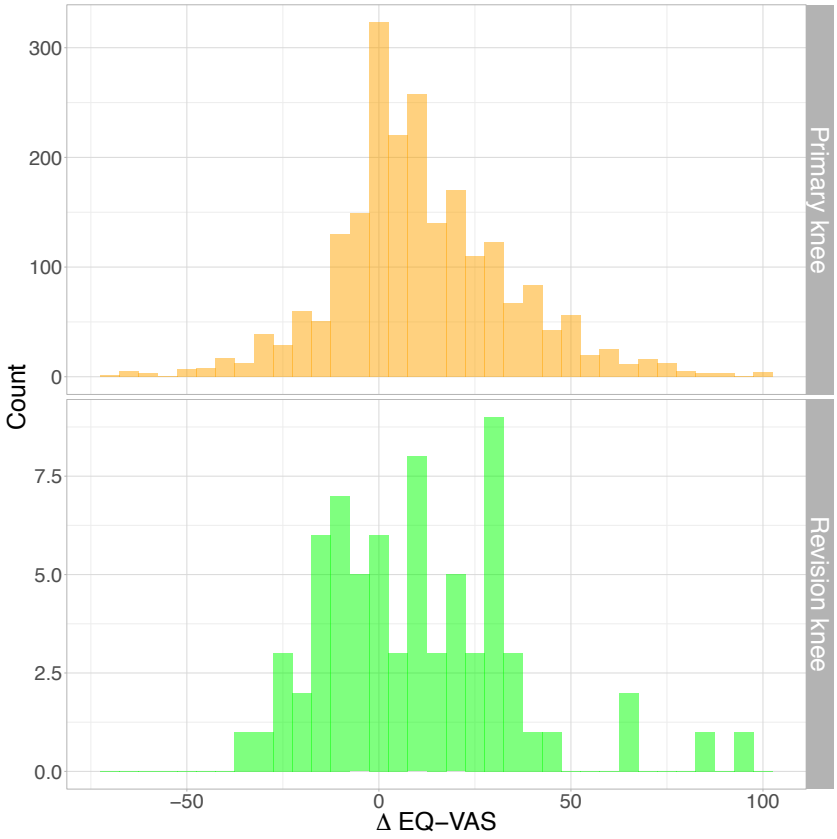


Figure 5.7: Knee Arthroplasties: Change in EQ-VAS, pre-op to post-op

5.4.11 *Oxford Knee Scores*

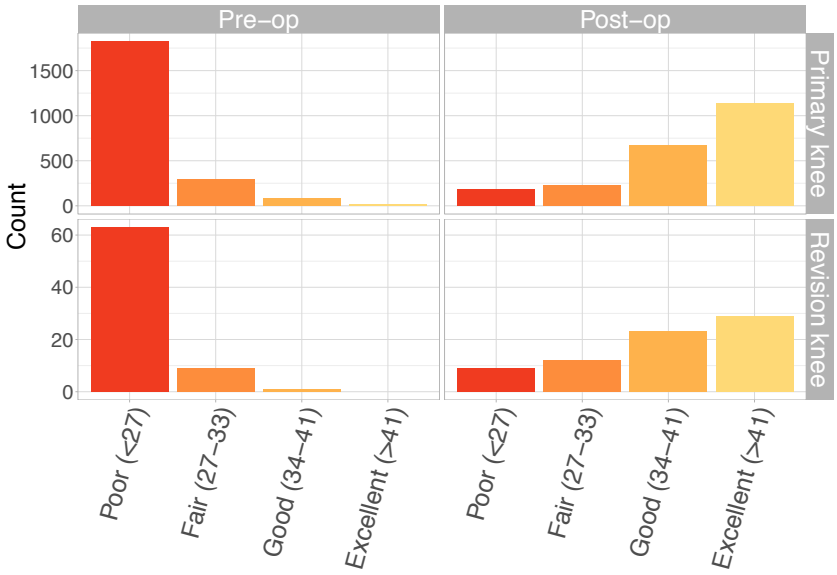


Figure 5.8: Distribution of grouped total Oxford Knee Scores, pre-op to post-op

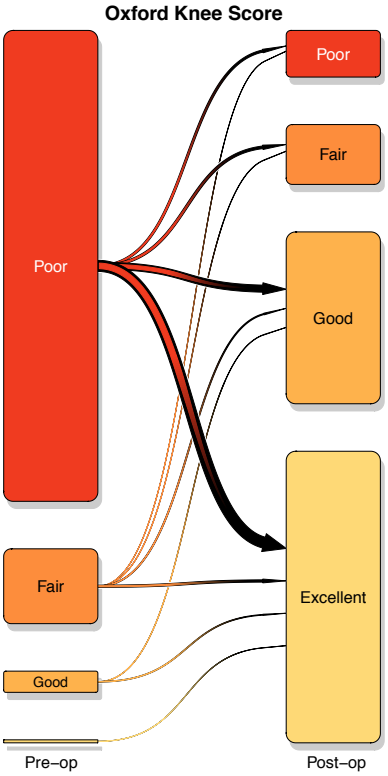
Partitioned total Oxford knee Scores, pre-op and post-op — Primary knees

Total Oxford score	Pre-op		Post-op	
Poor (<27)	1825	83%	178	8%
Fair (27-33)	291	13%	228	10%
Good (34-41)	84	4%	666	30%
Excellent (>41)	12	0.5%	1140	52%

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

Total Oxford score	Pre-op		Post-op	
Poor (<27)	63	86%	9	12%
Fair (27-33)	9	12%	12	16%
Good (34-41)	1	1%	23	32%
Excellent (>41)	0	0%	29	40%

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.



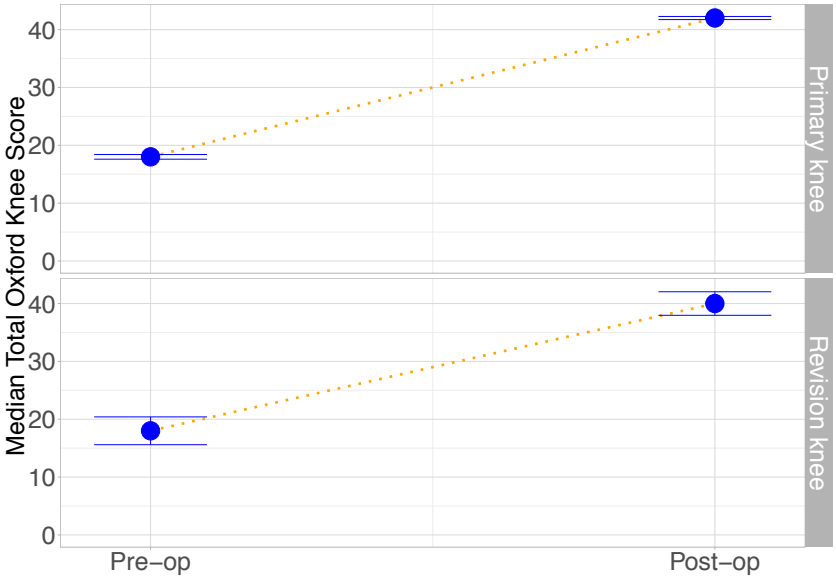


Figure 5.9: Domino plot of median Pre-op and Post-op Oxford Knee Scores

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	IQR¶
Primary knee	Males	Pre-op	1387	17.3	6.0	16.0	31.0	11.5
		Post-op	1387	38.4	21.0	41.0	47.0	8.0
	Females	Pre-op	825	20.9	8.0	20.0	35.0	12.0
		Post-op	825	40.1	23.2	43.0	48.0	7.0
	Persons	Pre-op	2212	18.7	6.0	18.0	33.0	12.0
		Post-op	2212	39.0	22.0	42.0	47.0	8.0
Revision knee	Males	Pre-op	39	16.2	4.9	15.0	31.2	12.5
		Post-op	39	37.1	22.0	41.0	45.2	10.0
	Females	Pre-op	34	18.6	3.7	20.5	28.0	11.8
		Post-op	34	36.7	19.3	39.0	46.0	11.5
	Persons	Pre-op	73	17.3	4.0	18.0	30.0	13.0
		Post-op	73	36.9	21.2	40.0	45.8	11.0

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

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

¶ Inter-quartile range.

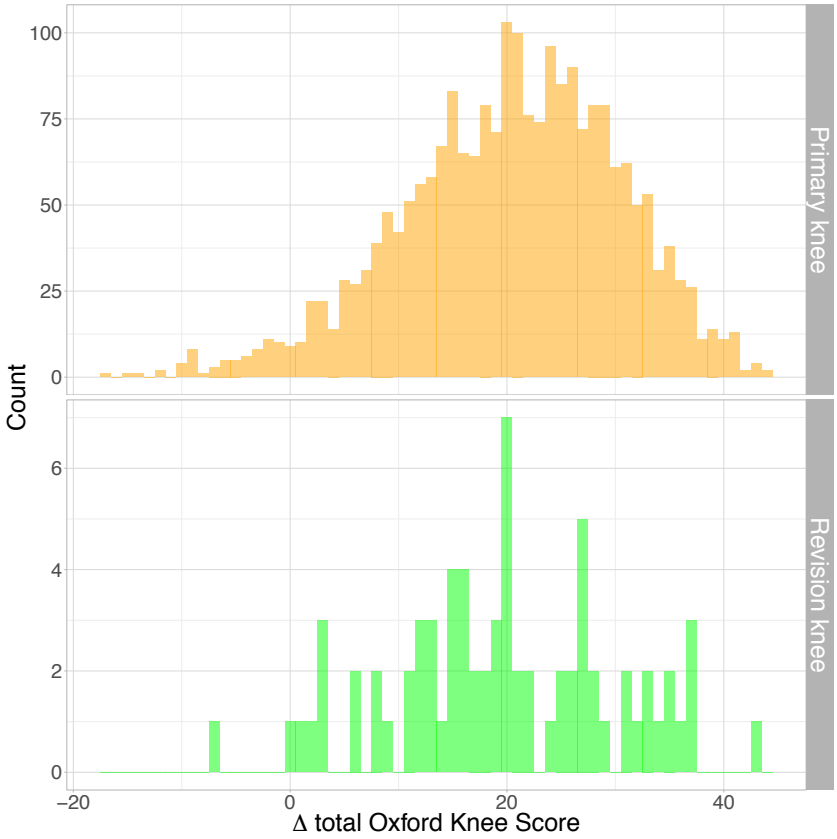
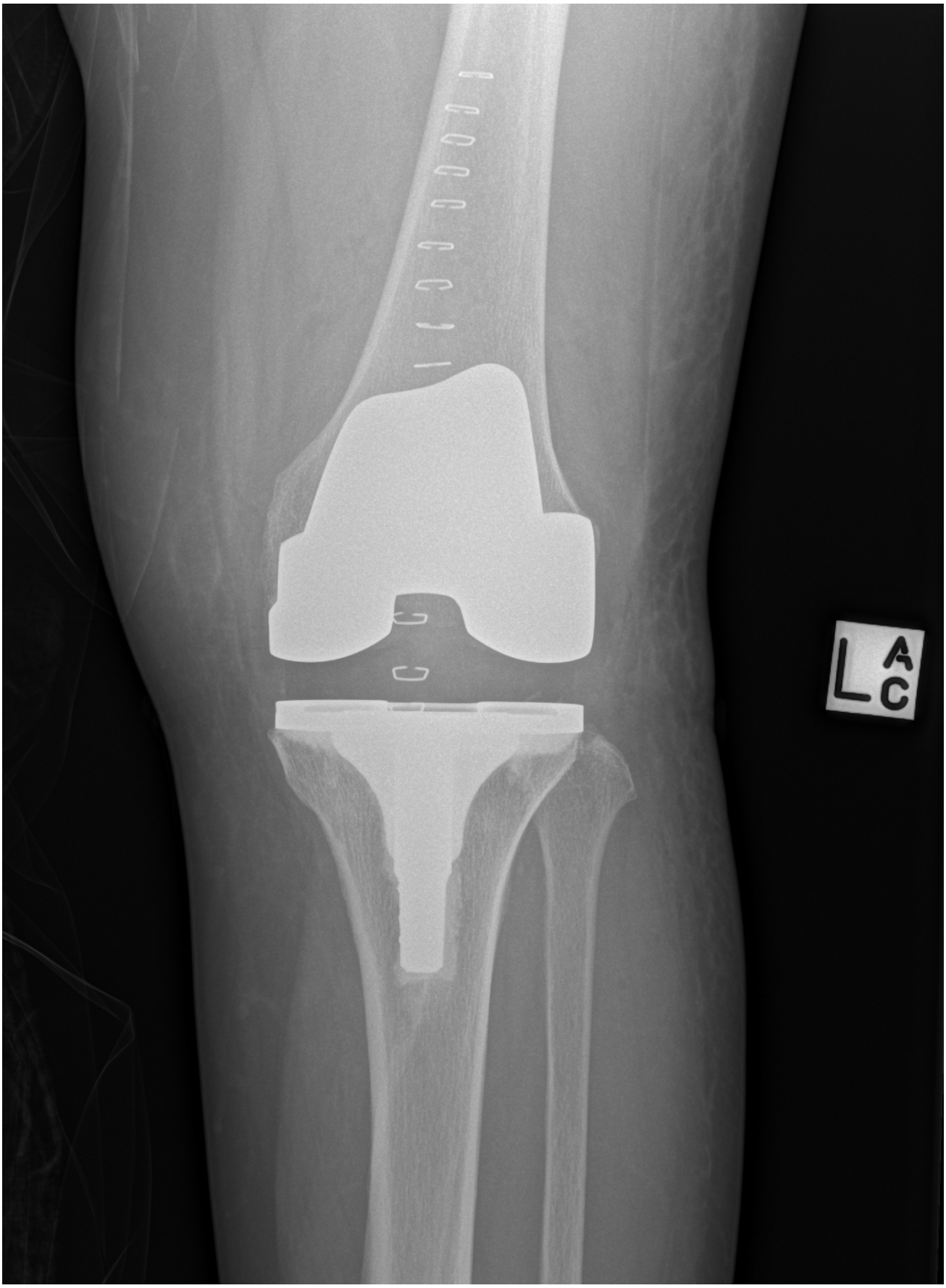


Figure 5.10: Change in total Oxford knee scores, pre-op to post-op

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

	Procedure	Sex	$n^{\dagger}$	Mean change	5^{th} %ile	Median	95^{th} %ile
2	Primary knee	Males	1387	21.1	3.0	22	36.0
1		Females	825	19.1	1.2	20	34.8
5		Persons	2212	20.4	3.0	21	35.4
4	Revision knee	Males	39	20.9	5.7	20	35.1
3		Females	34	18.1	0.7	19	37.0
6		Persons	73	19.6	2.6	20	36.4

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