



# Canadian Joint Replacement Registry

2019–2020

Full Annual Report



Canadian Institute  
for Health Information

Institut canadien  
d'information sur la santé

Production of this document is made possible by financial contributions from Health Canada and provincial and territorial governments. The views expressed herein do not necessarily represent the views of Health Canada or any provincial or territorial government.

Unless otherwise indicated, this product uses data provided by Canada's provinces and territories.

All rights reserved.

The contents of this publication may be reproduced unaltered, in whole or in part and by any means, solely for non-commercial purposes, provided that the Canadian Institute for Health Information is properly and fully acknowledged as the copyright owner. Any reproduction or use of this publication or its contents for any commercial purpose requires the prior written authorization of the Canadian Institute for Health Information. Reproduction or use that suggests endorsement by, or affiliation with, the Canadian Institute for Health Information is prohibited.

For permission or information, please contact CIHI:

Canadian Institute for Health Information  
495 Richmond Road, Suite 600  
Ottawa, Ontario K2A 4H6  
Phone: 613-241-7860  
Fax: 613-241-8120  
[cihi.ca](http://cihi.ca)  
[copyright@cihi.ca](mailto:copyright@cihi.ca)

ISBN 978-1-77479-056-4 (PDF)

© 2021 Canadian Institute for Health Information

How to cite this document:

Canadian Institute for Health Information. *Canadian Joint Replacement Registry: 2019–2020 Full Annual Report*. Ottawa, ON: CIHI; 2021.

Cette publication est aussi disponible en français sous le titre *Registre canadien des remplacements articulaires : rapport annuel complet, 2019-2020*.

ISBN 978-1-77479-057-1 (PDF)

# Table of contents

About this document .....	7
Section 1: Hip and Knee Replacements in Canada: CJRR Annual Statistics Summary, 2019–2020 .....	8
Key findings: Hospital statistics .....	8
One patient’s perspective .....	9
Key findings: Revision (repeat) surgeries .....	10
Conclusion .....	10
Section 2: Hip and Knee Replacements in Canada: CJRR Quick Stats, 2019–2020 .....	11
Section 3: Hip and Knee Replacements in Canada: CJRR Revision Risk Curves, 2019–2020 .....	31
Revision risk curves based on hospitalization data .....	31
Revision risk curves based on CJRR data .....	34
Knee replacement .....	46
Appendices .....	56
Appendix A: Methodology notes for annual statistics .....	56
Appendix B: Glossary for annual statistics .....	62
Appendix C: Methodology notes for revision risk curves .....	64
Appendix D: Text alternative for figures .....	68

## List of tables and figures

Table 1	Number of hip replacements, by jurisdiction of surgery, 2015–2016 to 2019–2020. . . . .	10
Table 2	Number of hip replacements, by type of care, 2015–2016 to 2019–2020 . . . . .	11
Table 3	Age-standardized rate of hospitalizations for hip replacement, by jurisdiction of residence, 2015–2016 to 2019–2020 . . . . .	11
Table 4	Number of hospitalizations for hip replacement and percentage by age group (years), 2019–2020 . . . . .	12
Table 5	Number of hip replacements, by type of replacement and jurisdiction of surgery, 2019–2020. . . . .	12
Table 6	Most responsible diagnosis for primary hip replacements, Canada, 2019–2020. . . . .	13
Table 7a	Type of primary hip replacement due to osteoarthritis, Canada, 2019–2020 . . . . .	14
Table 7b	Type of primary hip replacement due to hip fracture, Canada, 2019–2020 . . . . .	14
Table 8	Reasons for hip revision, Canada, 2019–2020 . . . . .	15
Table 9a-1	Primary hip replacements due to osteoarthritis:* Acute care length of stay for hospitalization (in days), by jurisdiction of surgery, 2019–2020. . . . .	16
Table 9a-2	Primary hip replacements following acute hip fracture:* Acute care length of stay for hospitalization (in days), by jurisdiction of surgery, 2019–2020. . . . .	17
Table 9b	Revisions of hip replacements (any diagnosis): Acute care length of stay for hospitalization (in days), by jurisdiction of surgery, 2019–2020. . . . .	18
Table 10a	Primary hip replacements for osteoarthritis:* Estimated inpatient costs, by jurisdiction, 2019–2020. . . . .	19
Table 10b	Primary hip replacements for acute hip fracture:* Estimated inpatient costs, by jurisdiction, 2019–2020. . . . .	20
Table 11	Revisions of hip replacements (all diagnoses): Estimated inpatient costs, by jurisdiction, 2019–2020. . . . .	21
Table 12	Number of knee replacements, by jurisdiction of surgery, 2015–2016 to 2019–2020. . . . .	22
Table 13	Number of knee replacements, by type of care, 2015–2016 to 2019–2020 . . . . .	22
Table 14	Age-standardized rate of hospitalization for knee replacement, by jurisdiction of residence, 2015–2016 to 2019–2020 . . . . .	23

Table 15	Number of hospitalizations for knee replacement and percentage by age group, 2019–2020. . . . .	24
Table 16	Number of knee replacements, by type of replacement and jurisdiction of surgery, 2019–2020. . . . .	24
Table 17	Most responsible diagnosis for primary knee replacements, Canada, 2019–2020. . . . .	25
Table 18	Type of primary knee replacement, Canada, 2019–2020 . . . . .	26
Table 19	Reasons for knee revision, Canada, 2019–2020 . . . . .	26
Table 20a	Primary knee replacements: Acute care length of stay for hospitalization (in days), by jurisdiction of surgery, 2019–2020. . . . .	27
Table 20b	Revisions of knee replacements: Acute care length of stay for hospitalization (in days), by jurisdiction of surgery, 2019–2020. . . . .	28
Table 21a	Primary knee replacements: Estimated inpatient costs, by jurisdiction, 2019–2020. . . . .	28
Table 21b	Revisions of knee replacements: Estimated inpatient costs, by jurisdiction, 2019–2020. . . . .	29
Figure 1	Cumulative percentage revision for primary hip and knee replacement due to osteoarthritis, Canada, 2009–2010 to 2019–2020 . . . . .	31
Figure 2a	Cumulative percentage revision for primary total hip replacement for men, by age (primary diagnosis of osteoarthritis), 2012–2013 to 2019–2020. . . . .	33
Figure 2b	Cumulative percentage revision for primary total hip replacement for women, by age (primary diagnosis of osteoarthritis), 2012–2013 to 2019–2020. . . . .	35
Table 22	Reasons for revision of total hip replacement for osteoarthritis, by age and sex, 2012–2013 to 2019–2020 . . . . .	36
Figure 3	Cumulative percentage revision for primary total hip replacement, by bearing surface (primary diagnosis of osteoarthritis), 2012–2013 to 2019–2020 . . . . .	37
Table 23	Top reasons for revision of total hip replacement for osteoarthritis, by bearing surface, 2012–2013 to 2019–2020 . . . . .	38
Figure 4	Cumulative percentage revision for primary hip replacement, by type of procedure (primary diagnosis of acute hip fracture), 2012–2013 to 2019–2020. . . . .	39
Figure 5	Cumulative percentage revision for primary partial hip replacement, by type of procedure (primary diagnosis of acute hip fracture, patients age 70 and older), 2012–2013 to 2019–2020. . . . .	40

Figure 6	Cumulative percentage revision for primary partial hip replacement, by femoral fixation (primary diagnosis of acute hip fracture, patients age 70 and older), 2012–2013 to 2019–2020 . . . . .	42
Figure 7	Cumulative percentage revision for primary partial hip replacement, by femoral fixation and surgeon hip arthroplasty volume (primary diagnosis of acute hip fracture), 2012–2013 to 2019–2020 . . . . .	43
Figure 8	Cumulative percentage revision for primary total and partial knee replacement, by type of procedure (primary diagnosis of osteoarthritis), 2012–2013 to 2019–2020 . . . . .	45
Table 24	Reasons for revision of total knee replacement for osteoarthritis, by type of procedure, 2012–2013 to 2019–2020 . . . . .	46
Figure 9a	Cumulative percentage revision for primary total knee replacement for men, by age (primary diagnosis of osteoarthritis), 2012–2013 to 2019–2020 . . . . .	47
Figure 9b	Cumulative percentage revision for primary total knee replacement for women, by age (primary diagnosis of osteoarthritis), 2012–2013 to 2019–2020 . . . . .	49
Table 25	Reasons for revision of total knee replacement for osteoarthritis, by age and sex, 2012–2013 to 2019–2020 . . . . .	50
Figure 10	Cumulative percentage revision for primary total knee replacement, by stability and patella resurfacing (primary diagnosis of osteoarthritis), 2012–2013 to 2019–2020 . . . . .	51
Table 26	Reasons for revision of total knee replacement for osteoarthritis, by stability and patella resurfacing, 2012–2013 to 2019–2020 . . . . .	52
Figure 11	Cumulative percentage revision for primary total knee replacement, by stability and mobility (primary diagnosis of osteoarthritis), 2012–2013 to 2019–2020 . . . . .	53
Table A1a	CCI v2018 codes for hip replacements (1.SQ.53.^ Implantation of internal device, pelvis) . . . . .	58
Table A1b	CCI v2018 codes for hip replacements (1.VA.53.^ Implantation of internal device, hip joint) . . . . .	59
Table A2a	CCI v2018 codes for knee replacements (1.VG.53.^ Implantation of internal device, knee joint) . . . . .	60
Table A2b	CCI v2018 codes for knee replacements (1.VP.53.^ Implantation of internal device, patella) . . . . .	60

# About this document

This document consists of the 3 products that make up the CJRR annual report:

- Section 1: ***Hip and Knee Replacements in Canada: CJRR Annual Statistics Summary, 2019–2020*** — Key findings, including patient perspectives, hospital use, types of surgeries and revision risk (patients age 18 and older).
- Section 2: ***Hip and Knee Replacements in Canada: CJRR Quick Stats, 2019–2020*** — The latest demographic, clinical and surgical statistics by jurisdiction (patients age 18 and older).
- Section 3: ***Hip and Knee Replacements in Canada: CJRR Revision Risk Curves, 2019–2020*** — The latest revision risk curves by subgroups, such as sex, type of procedure and bearing surface, based on CJRR data.

# Section 1: Hip and Knee Replacements in Canada: CJRR Annual Statistics Summary, 2019–2020

This section features a summary of the latest annual statistics on hip and knee replacements in Canada, which are among the top 3 inpatient surgeries performed each year. Key highlights include characteristics and trends for hospital use, types of joint surgeries, and revisions, including main findings on revision risk (all for patients age 18 and older). Data comes from CIHI's Canadian Joint Replacement Registry (CJRR) and hospitalization and day surgery databases.

## Key findings: Hospital statistics

**The demand for hip and knee replacements continues to increase, with more than 138,500 surgeries and estimated inpatient costs of over \$1.4 billion a year in Canada.**

- In 2019–2020 in Canada, 63,496 hip replacements and 75,073 knee replacements were performed. This represents a 2.4% increase for hips and a 0.4% decrease for knees compared with the previous year. In recent years, there was an average annual increase of approximately 5% for both joints. The changes are likely due to the beginning of the COVID-19 pandemic in March 2020, when surgeries were cancelled to provide additional hospital capacity to care for patients with COVID-19.
  - Provisional data for April to December 2020 shows a significant decrease in hip and knee replacements, primarily in April and May. This contributed to an overall decrease of approximately 6,200 (16.1%) hip and 14,000 (29.8%) knee replacements between April and December 2020 compared with the same period in 2019.
- Age-standardized hip replacement rates varied across the country, ranging from 148 per 100,000 population for Quebec to 267 per 100,000 population for Yukon. For knee replacements, the age-standardized rates ranged from 165 per 100,000 population for Quebec to 296 per 100,000 population for Saskatchewan. Most patients were age 65 and older (66.4%). For hip replacements, the most common age group was 75 and older (37.4%). For knee replacements, it was 65 to 74 (41.0%).
- More than half of patients were women (57.9%). Among women having a hip replacement, 43% were older than 75. Among men having a hip replacement, 30% were in this age group.

- Overall, only a small proportion of hip and knee replacements were performed as day surgeries (2.1% and 1.3%, respectively). However, this approach is becoming more common, with 1,329 hip and 960 knee replacement patients not requiring an inpatient admission. This is 3 times and 2 times more day surgery replacements than in the previous year, respectively.
  - Provisional data for April to December 2020 shows an increase in hip and knee replacements performed as day surgeries, primarily in November and December. This contributed to an overall increase of approximately 900 hip and 1,200 knee replacements done as day surgeries between April and December 2020 compared with the same period in 2019, which helped free up inpatient bed capacity during the pandemic.
- The most common diagnosis for primary hip and knee replacement patients was osteoarthritis, at 72.5% and 99.4%, respectively. The average acute length of stay for primary surgeries was just under 3 days.
- On average, in 2019–2020, a hip or knee replacement surgery had an estimated inpatient cost of approximately \$10,500 (including inpatient physician costs and excluding rehabilitation), totaling more than \$1.4 billion spent annually on these surgeries.

## One patient's perspective

Annie Levesque is one of many patients experiencing severe joint pain, and she has been waiting over a year for a hip replacement. Despite taking double the recommended maximum dosage of antiinflammatory drugs, she still faces pain and mobility issues that make it difficult to sleep, move around or complete daily tasks.

*“I’m lucky to be young and proactive, and make sure that I will still be well enough for surgery even if that is 3 years from now, but there are a lot of people waiting who won’t be.”*

COVID-19 has brought additional challenges for people waiting for a joint replacement. Before the pandemic, Ms. Levesque had a support system in place to help manage her pain (e.g., cleaning services, osteopath, massage therapy, acupuncture); however, many of these services were deemed non-essential at certain points or became less accessible during the pandemic.

*“What worries me the most is not knowing when it will end. It’s like the tunnel is very long, and I don’t have a light at the end.”*

## Key findings: Revision (repeat) surgeries

**Over 10,300 hip and knee replacement revision (repeat) surgeries were performed in 2019–2020, representing an estimated \$177 million in inpatient costs.**

- In 2019–2020 in Canada, 8.1% of hip and 6.9% of knee replacements were revision surgeries — repeat joint surgeries where the prosthesis was repaired or replaced.
- On average, patients undergoing revision surgery stayed in hospital (for acute care) more than twice as long as patients undergoing primary joint replacement surgery (9.0 days versus 3.8 days, respectively). Revision surgeries are typically more complex and require longer recovery times.
- The average inpatient cost for a revision surgery (including inpatient physician costs and excluding rehabilitation) was close to \$17,200. This is 70.2% higher than the cost for a primary joint surgery (approximately \$10,100).
- The top 3 reasons for both hip and knee revisions were infection, aseptic loosening and instability.
- In CIHI's recent report [\*Early Revisions of Hip and Knee Replacements in Canada\*](#), the findings showed that early hip and knee revisions led to over \$42.1 million in direct inpatient costs. As well, more than 30% of early revisions were due to prosthetic joint infection.

## Conclusion

Hip and knee replacement surgeries continue to be one of the most common procedures in Canada and account for significant health system costs annually. Joint replacement registries worldwide, including CJRR, are committed to understanding the trends and factors that contribute to revisions, such as characteristics related to the patient, the surgeon/surgery and the implants themselves. In March 2020, as the pandemic began to disrupt surgeries and as hospitals required increased capacity for patients with COVID-19, decreases in primarily elective hip and knee replacements were already being observed. As the pandemic continues, delayed surgeries will have an impact on the quality of life of patients who face years of debilitating pain from osteoarthritis.

## Section 2: Hip and Knee Replacements in Canada: CJRR Quick Stats, 2019–2020

The data in this section is provided to facilitate your research and analysis.

This section uses data from the Discharge Abstract Database (DAD), Hospital Morbidity Database (HMDB), National Ambulatory Care Reporting System (NACRS) and Canadian Joint Replacement Registry (CJRR). Data for the DAD/HMDB and NACRS is provided by Canada's provinces and territories. Data for CJRR is provided by provincial ministries of health, regional health authorities and hospitals across Canada.

Only procedures performed on patients age 18 and older are included in these tables.

Tables include only jurisdictions where the procedure is performed and that have applicable data (i.e., it meets the criteria for the table in question).

Note: Methodology details, including the *Canadian Classification of Health Interventions* (CCI) codes used to identify hip and knee replacements, are available in [Appendix A](#).

**Table 1** Number of hip replacements, by jurisdiction of surgery, 2015–2016 to 2019–2020

Jurisdiction	2015–2016	2016–2017	2017–2018	2018–2019	2019–2020	5-year percentage change
Newfoundland and Labrador	886	914	966	1,069	1,051	18.6%
Prince Edward Island	277	253	280	293	336	21.3%
Nova Scotia	1,767	1,778	2,056	2,073	2,220	25.6%
New Brunswick	1,384	1,524	1,456	1,529	1,696	22.5%
Quebec	10,404	10,778	11,050	11,761	11,831	13.7%
Ontario	21,313	22,540	23,725	24,816	24,993	17.3%
Manitoba	1,975	2,026	2,156	2,249	2,524	27.8%
Saskatchewan	1,961	1,940	2,021	2,100	2,286	16.6%
Alberta	5,569	6,014	6,163	6,240	6,562	17.8%
British Columbia	7,672	8,187	8,593	9,851	9,945	29.6%
Yukon	0	0	0	0	11	—
Northwest Territories	36	27	26	35	41	13.9%
<b>Canada</b>	<b>53,244</b>	<b>55,981</b>	<b>58,492</b>	<b>62,016</b>	<b>63,496</b>	<b>19.3%</b>

**Note**

— The percentage change cannot be calculated as the denominator is 0.

**Sources**

Discharge Abstract Database, Hospital Morbidity Database and National Ambulatory Care Reporting System, 2015–2016 to 2019–2020, Canadian Institute for Health Information.

**Table 2** Number of hip replacements, by type of care, 2015–2016 to 2019–2020

Type of care	2015–2016	2016–2017	2017–2018	2018–2019	2019–2020	5-year percentage change
Acute	53,176	55,875	58,308	61,571	62,167	16.9%
Day surgery	68	106	184	445	1,329	1,854.4%
<b>Total</b>	<b>53,244</b>	<b>55,981</b>	<b>58,492</b>	<b>62,016</b>	<b>63,496</b>	<b>19.3%</b>

**Sources**

Discharge Abstract Database, Hospital Morbidity Database and National Ambulatory Care Reporting System, 2015–2016 to 2019–2020, Canadian Institute for Health Information.

**Table 3** Age-standardized rate of hospitalizations for hip replacement, by jurisdiction of residence, 2015–2016 to 2019–2020

Jurisdiction	2015–2016	2016–2017	2017–2018	2018–2019	2019–2020	5-year percentage change
Newfoundland and Labrador	177	176	181	200	192	8.5%
Prince Edward Island	202	195	198	197	221	9.4%
Nova Scotia	192	192	218	214	224	16.7%
New Brunswick	183	195	183	184	203	10.9%
Quebec	136	137	138	144	148	8.8%
Ontario	179	184	189	194	189	5.6%
Manitoba	188	189	197	204	225	19.7%
Saskatchewan	217	209	216	218	232	6.9%
Alberta	194	204	202	201	206	6.2%
British Columbia	178	184	187	207	204	14.6%
Yukon	228	225	229	223	267	17.1%
Northwest Territories	169	123	155	219	188	11.2%
Nunavut	105	n/r	258	198	n/r	—
<b>Canada</b>	<b>170</b>	<b>175</b>	<b>178</b>	<b>184</b>	<b>186</b>	<b>9.4%</b>

**Notes**

n/r: Not reported due to small cell count (i.e., between 1 and 4) or incomplete data.

— The percentage change cannot be calculated as the numerator is suppressed.

Rates are per 100,000 population, using the 2011 Canadian reference population age 18 and older.

Low volumes for the territories may result in more variability when looking at percentage change calculations over time.

Results are presented by patients' jurisdiction of residence, rather than by the province or territory of the facility where the treatment occurred.

**Sources**

Discharge Abstract Database, Hospital Morbidity Database and National Ambulatory Care Reporting System, 2015–2016 to 2019–2020, Canadian Institute for Health Information.

**Table 4** Number of hospitalizations for hip replacement and percentage by age group (years), 2019–2020

Jurisdiction	Age 18–54 (%)	Age 55–64 (%)	Age 65–74 (%)	Age 75+ (%)	Total number of hospitalizations
Newfoundland and Labrador	10.7	20.6	34.3	34.4	1,046
Prince Edward Island	8.7	20.9	32.8	37.6	335
Nova Scotia	10.5	22.1	33.1	34.3	2,206
New Brunswick	9.8	17.6	32.2	40.5	1,686
Quebec	9.1	20.3	30.9	39.7	11,758
Ontario	9.6	22.2	30.9	37.3	24,882
Manitoba	9.9	24.2	30.8	35.1	2,516
Saskatchewan	10.7	24.0	30.3	35.0	2,273
Alberta	11.2	24.1	29.0	35.7	6,487
British Columbia	8.8	22.5	31.0	37.7	9,899
Yukon	n/r	n/r	n/r	n/r	10
Northwest Territories	24.4	36.6	17.1	22.0	41
<b>Canada</b>	<b>9.7</b>	<b>22.1</b>	<b>30.9</b>	<b>37.4</b>	<b>63,139</b>

**Note**

n/r: Not reported due to small cell count (i.e., between 1 and 4) or due to residual disclosure.

**Sources**

Discharge Abstract Database, Hospital Morbidity Database and National Ambulatory Care Reporting System, 2019–2020, Canadian Institute for Health Information.

**Table 5** Number of hip replacements, by type of replacement and jurisdiction of surgery, 2019–2020

Jurisdiction	Number of primaries	Percentage of all replacements	Number of revisions	Percentage of all replacements
Newfoundland and Labrador	941	89.5%	110	10.5%
Prince Edward Island	307	91.4%	29	8.6%
Nova Scotia	2,040	91.9%	181	8.2%
New Brunswick	1,583	93.3%	113	6.7%
Quebec	10,840	91.5%	1,003	8.5%
Ontario	22,990	92.0%	2,004	8.0%
Manitoba	2,353	93.2%	171	6.8%
Saskatchewan	2,122	92.8%	164	7.2%
Alberta	5,936	90.4%	631	9.6%

Jurisdiction	Number of primaries	Percentage of all replacements	Number of revisions	Percentage of all replacements
British Columbia	9,222	92.7%	723	7.3%
Yukon	n/r	—	n/r	—
Northwest Territories	41	—	0	0.0%
<b>Canada</b>	<b>58,375</b>	<b>91.9%</b>	<b>5,129</b>	<b>8.1%</b>

**Notes**

n/r: Not reported due to small cell count (i.e., between 1 and 4) or due to residual disclosure.

— The percentage cannot be calculated as either the denominator or the numerator is suppressed.

**Sources**

Discharge Abstract Database, Hospital Morbidity Database and National Ambulatory Care Reporting System, 2019–2020, Canadian Institute for Health Information.

**Table 6** Most responsible diagnosis for primary hip replacements, Canada, 2019–2020

Diagnosis groups*	Number of records	Percentage of total
Osteoarthritis	41,219	72.5%
Acute hip fracture	13,441	23.6%
Osteonecrosis (e.g., AVN)	1,137	2.0%
Old hip fracture (e.g., non-union, hardware failure)	446	0.8%
Tumour (primary and metastatic, including synovial)	396	0.7%
Inflammatory arthritis (e.g., RA, AS, SLE)	116	0.2%
Childhood hip problem (e.g., hip dysplasia)	76	0.1%
Infection (i.e., infectious arthritis)	21	0.0%
<b>Total†</b>	<b>56,852</b>	<b>100.0%</b>

**Notes**

\* Determined using the most responsible diagnosis (MRDx) collected in the DAD/HMDB or the main problem collected in NACRS. Note that MRDx represents the clinical condition that consumes the most hospital resources during that hospitalization and may not necessarily be the main reason for having a primary hip replacement. For a list of ICD-10-CA codes used, email [cjrr@cihi.ca](mailto:cjrr@cihi.ca).

† Total excludes hospitalizations that could not be assigned to any of these diagnosis groups (n = 1,531).

AVN: Avascular necrosis.

RA: Rheumatoid arthritis.

AS: Ankylosing spondylitis.

SLE: Systemic lupus erythematosus.

**Sources**

Discharge Abstract Database, Hospital Morbidity Database and National Ambulatory Care Reporting System, 2019–2020, Canadian Institute for Health Information.

**Table 7a** Type of primary hip replacement due to osteoarthritis, Canada, 2019–2020

Type of primary procedure*	Number of procedures	Percentage of total
Total hip arthroplasty	40,535	99.4%
Bipolar hemiarthroplasty	102	0.3%
Modular monopolar hemiarthroplasty	60	0.1%
Monoblock monopolar hemiarthroplasty	52	0.1%
Resurfacing	29	0.1%
Hemiarthroplasty unspecified	9	<0.1%
<b>Total†</b>	<b>40,787</b>	<b>100.0%</b>

**Notes**

\* Determined using *Canadian Classification of Health Interventions* (CCI) codes and extent attribute codes. For more details, email [cjrr@cihi.ca](mailto:cjrr@cihi.ca).

† Total excludes the procedures that could not be assigned to any of the groups listed above (n = 432).

**Sources**

Discharge Abstract Database, Hospital Morbidity Database and National Ambulatory Care Reporting System, 2019–2020, Canadian Institute for Health Information.

**Table 7b** Type of primary hip replacement due to hip fracture, Canada, 2019–2020

Type of primary procedure*	Number of procedures	Percentage of total
Bipolar hemiarthroplasty	6,740	51.7%
Modular monopolar hemiarthroplasty	3,729	28.6%
Total hip arthroplasty	2,037	15.6%
Monoblock monopolar hemiarthroplasty	301	2.3%
Hemiarthroplasty unspecified	226	1.7%
<b>Total†</b>	<b>13,033</b>	<b>100.0%</b>

**Notes**

\* Determined using *Canadian Classification of Health Interventions* (CCI) codes and extent attribute codes. For more details, email [cjrr@cihi.ca](mailto:cjrr@cihi.ca).

† Total excludes the procedures that could not be assigned to any of the groups listed above (n = 408).

**Sources**

Discharge Abstract Database, Hospital Morbidity Database and National Ambulatory Care Reporting System, 2019–2020, Canadian Institute for Health Information.

**Table 8** Reasons for hip revision, Canada, 2019–2020

Reason for revision*	Number of records	Percentage of total
Infection	1,307	25.4%
Aseptic loosening	815	15.8%
Instability	803	15.6%
Peri-prosthetic fracture	561	10.9%
Bearing wear (e.g., poly wear)	230	4.5%
Pain and other complications	204	4.0%
Implant fracture and dissociation	186	3.6%
Osteolysis	127	2.5%
Acetabular erosion	47	0.9%
Leg length discrepancy	17	0.3%
Remaining reasons†	848	16.5%
<b>Total</b>	<b>5,145</b>	<b>100%</b>

**Notes**

\* Determined using revision reason (from CJRR or DAD Group 20), most responsible diagnosis (DAD/HMDB) or main diagnosis (NACRS). For more details, refer to [Appendix A](#).

† Includes stiffness, unspecified complications, other most responsible diagnosis codes not generally related to hip replacement revision surgery (e.g., cancer) and groups with small cell counts.

Note that the total number of revisions in this table differs slightly from the total in other tables because bilateral revisions collected in CJRR are 2 separate records (i.e., left and right side).

**Sources**

Discharge Abstract Database, Hospital Morbidity Database, National Ambulatory Care Reporting System and Canadian Joint Replacement Registry, 2019–2020, Canadian Institute for Health Information.

**Table 9a-1** Primary hip replacements due to osteoarthritis:\* Acute care length of stay for hospitalization (in days), by jurisdiction of surgery, 2019–2020

Jurisdiction	Mean	Median	25th percentile	75th percentile
Newfoundland and Labrador	3.5	3.0	2.0	4.0
Prince Edward Island	4.3	3.5	3.0	5.0
Nova Scotia	1.7	1.0	1.0	2.0
New Brunswick	3.4	3.0	2.0	4.0
Quebec	3.5	3.0	2.0	4.0
Ontario	2.1	2.0	1.0	2.0
Manitoba	3.0	2.0	2.0	3.0
Saskatchewan	3.7	3.0	3.0	4.0
Alberta	2.4	2.0	1.0	2.0
British Columbia	2.3	2.0	1.0	3.0
Northwest Territories	3.5	3.0	2.5	3.5
<b>Canada</b>	<b>2.6</b>	<b>2.0</b>	<b>1.0</b>	<b>3.0</b>

**Notes**

\* Identified using the most responsible diagnosis for the hospitalization. For a list of ICD-10-CA codes used, email [cjrr@cihi.ca](mailto:cjrr@cihi.ca). This table presents only the acute portion of the hospital stay. Due to a difference in collection of acute and alternate level of care (ALC) data, caution should be used when comparing Quebec length of stay results with results for other jurisdictions.

**Source**

Hospital Morbidity Database, 2019–2020, Canadian Institute for Health Information.

**Table 9a-2** Primary hip replacements following acute hip fracture:\* Acute care length of stay for hospitalization (in days), by jurisdiction of surgery, 2019–2020

Jurisdiction	Mean	Median	25th percentile	75th percentile
Newfoundland and Labrador	9.4	6.0	4.0	11.0
Prince Edward Island	7.8	5.0	3.5	9.5
Nova Scotia	11.1	7.0	4.0	13.0
New Brunswick	10.7	7.0	5.0	12.0
Quebec	14.5	10.0	5.0	18.0
Ontario	8.8	6.0	4.0	10.0
Manitoba	10.7	7.0	4.0	12.0
Saskatchewan	8.9	7.0	5.0	10.0
Alberta	10.4	8.0	5.0	12.0
British Columbia	11.6	8.0	5.0	13.0
Yukon	16.8	13.0	7.0	21.0
Northwest Territories	7.6	7.0	6.0	8.5
<b>Canada</b>	<b>10.8</b>	<b>7.0</b>	<b>5.0</b>	<b>12.0</b>

**Notes**

\* Identified using the most responsible diagnosis for the hospitalization. For a list of ICD-10-CA codes used, email [cjrr@cihi.ca](mailto:cjrr@cihi.ca). This table presents only the acute portion of the hospital stay. Due to a difference in collection of acute and alternate level of care (ALC) data, caution should be used when comparing Quebec length of stay results with results for other jurisdictions.

**Source**

Hospital Morbidity Database, 2019–2020, Canadian Institute for Health Information.

**Table 9b** Revisions of hip replacements (any diagnosis): Acute care length of stay for hospitalization (in days), by jurisdiction of surgery, 2019–2020

Jurisdiction	Mean	Median	25th percentile	75th percentile
Newfoundland and Labrador	13.5	7.0	3.0	19.0
Prince Edward Island	15.4	8.0	4.0	20.5
Nova Scotia	11.5	6.0	3.0	12.0
New Brunswick	13.6	7.0	3.5	16.0
Quebec	11.4	6.0	3.0	13.0
Ontario	8.6	5.0	2.0	9.0
Manitoba	10.9	7.0	4.0	13.0
Saskatchewan	9.8	6.0	3.0	9.0
Alberta	12.0	7.0	3.0	13.0
British Columbia	11.7	6.0	3.0	11.0
Yukon	n/r	n/r	n/r	n/r
<b>Canada</b>	<b>10.4</b>	<b>6.0</b>	<b>3.0</b>	<b>11.0</b>

**Notes**

n/r: Not reported due to small cell count (i.e., between 1 and 4).

This table presents only the acute portion of the hospital stay. Due to a difference in collection of acute and alternate level of care (ALC) data, caution should be used when comparing Quebec length of stay results with results for other jurisdictions.

**Source**

Hospital Morbidity Database, 2019–2020, Canadian Institute for Health Information.

**Table 10a** Primary hip replacements for osteoarthritis:\* Estimated inpatient costs, by jurisdiction, 2019–2020

Jurisdiction	Mean	Median	25th percentile	75th percentile
Newfoundland and Labrador	\$7,517	\$7,361	\$7,361	\$7,361
Prince Edward Island	\$7,960	\$7,912	\$7,912	\$7,912
Nova Scotia	\$7,784	\$7,664	\$7,664	\$7,664
New Brunswick	\$6,843	\$6,747	\$6,747	\$6,747
Quebec	\$7,719	\$7,459	\$7,459	\$7,459
Ontario	\$6,797	\$6,676	\$6,676	\$6,676
Manitoba	\$7,778	\$7,691	\$7,691	\$7,691
Saskatchewan	\$8,957	\$8,866	\$8,866	\$8,866
Alberta	\$9,648	\$9,456	\$9,456	\$9,456
British Columbia	\$7,934	\$7,830	\$7,830	\$7,830
Northwest Territories	\$15,079	\$14,944	\$14,944	\$14,944
Canada (excluding physician costs) <sup>†</sup>	<b>\$7,659</b>	<b>\$7,512</b>	<b>\$7,512</b>	<b>\$7,512</b>
Estimated physician cost based on 6 provinces <sup>‡</sup>	<b>\$1,931</b>	<b>\$1,852</b>	<b>\$1,613</b>	<b>\$2,147</b>
Canada total (including physician costs)	<b>\$9,591</b>	<b>\$9,364</b>	<b>\$9,125</b>	<b>\$9,659</b>

**Notes**

\* Identified using the most responsible diagnosis for the hospitalization. For a list of ICD-10-CA codes used, email [cjrr@cihi.ca](mailto:cjrr@cihi.ca).

† Only typical cases are included. Estimates do not include payments made to physicians, rehabilitation or amortization expenses on land, buildings and building service equipment.

‡ Estimated inpatient physician cost is based on physician billing data per primary hip replacement hospitalization from 6 provinces (Nova Scotia, Ontario, Manitoba, Saskatchewan, Alberta and British Columbia). Only typical cases are included.

**Sources**

Hospital Morbidity Database, Canadian Management Information System Database and Patient-Level Physician Billing Data Repository, 2019–2020, Canadian Institute for Health Information.

**Table 10b** Primary hip replacements for acute hip fracture:\*  
Estimated inpatient costs, by jurisdiction, 2019–2020

Jurisdiction	Mean	Median	25th percentile	75th percentile
Newfoundland and Labrador	\$12,875	\$10,324	\$10,324	\$13,315
Prince Edward Island	\$12,525	\$11,097	\$11,097	\$11,097
Nova Scotia	\$13,541	\$10,749	\$10,749	\$13,863
New Brunswick	\$11,253	\$9,462	\$9,462	\$12,205
Quebec	\$14,140	\$10,461	\$10,461	\$16,077
Ontario	\$12,566	\$9,363	\$9,363	\$14,389
Manitoba	\$12,228	\$10,787	\$10,787	\$10,787
Saskatchewan	\$15,193	\$12,435	\$12,435	\$16,038
Alberta	\$16,626	\$13,263	\$13,263	\$17,106
British Columbia	\$14,623	\$10,983	\$10,983	\$16,878
Yukon	n/r	n/r	n/r	n/r
Northwest Territories	\$23,782	\$20,959	\$20,959	\$27,033
Canada (excluding physician costs) <sup>†</sup>	<b>\$13,869</b>	<b>\$10,536</b>	<b>\$10,536</b>	<b>\$16,192</b>
Estimated physician cost based on 6 provinces <sup>‡</sup>	<b>\$3,363</b>	<b>\$3,142</b>	<b>\$2,525</b>	<b>\$3,917</b>
Canada total (including physician costs)	<b>\$17,232</b>	<b>\$13,678</b>	<b>\$13,062</b>	<b>\$20,109</b>

#### Notes

\* Identified using the most responsible diagnosis for the hospitalization. For a list of ICD-10-CA codes used, email [cjrr@cihi.ca](mailto:cjrr@cihi.ca).

† Only typical cases are included. Estimates do not include payments made to physicians, rehabilitation or amortization expenses on land, buildings and building service equipment.

‡ Estimated inpatient physician cost is based on physician billing data per primary hip replacement hospitalization from 6 provinces (Nova Scotia, Ontario, Manitoba, Saskatchewan, Alberta and British Columbia). Only typical cases are included.

n/r: Not reported due to small cell count (i.e., between 1 and 4).

#### Sources

Hospital Morbidity Database, Canadian Management Information System Database and Patient-Level Physician Billing Data Repository, 2019–2020, Canadian Institute for Health Information.

**Table 11** Revisions of hip replacements (all diagnoses): Estimated inpatient costs, by jurisdiction, 2019–2020

Jurisdiction	Mean	Median	25th percentile	75th percentile
Newfoundland and Labrador	\$15,521	\$10,695	\$10,695	\$13,977
Prince Edward Island	\$17,081	\$14,486	\$11,496	\$16,485
Nova Scotia	\$16,363	\$14,031	\$11,135	\$16,948
New Brunswick	\$13,360	\$9,803	\$9,803	\$12,811
Quebec	\$16,094	\$11,306	\$10,838	\$16,621
Ontario	\$13,257	\$9,700	\$9,700	\$13,909
Manitoba	\$14,311	\$11,175	\$11,175	\$16,024
Saskatchewan	\$14,758	\$12,882	\$12,882	\$16,232
Alberta	\$19,522	\$14,064	\$13,740	\$19,703
British Columbia	\$15,645	\$11,378	\$11,378	\$16,315
Yukon	n/r	n/r	n/r	n/r
<b>Canada (excluding physician costs)*</b>	<b>\$15,231</b>	<b>\$10,915</b>	<b>\$10,915</b>	<b>\$15,652</b>
<b>Estimated physician cost based on 6 provinces†</b>	<b>\$3,759</b>	<b>\$3,318</b>	<b>\$2,565</b>	<b>\$4,468</b>
<b>Canada total (including physician costs)</b>	<b>\$18,990</b>	<b>\$14,234</b>	<b>\$13,481</b>	<b>\$20,120</b>

**Notes**

\* Only typical cases are included. Estimates do not include payments made to physicians, rehabilitation or amortization expenses on land, buildings and building service equipment.

† Estimated inpatient physician cost is based on physician billing data per primary hip replacement hospitalization from 6 provinces (Nova Scotia, Ontario, Manitoba, Saskatchewan, Alberta and British Columbia). Only typical cases are included.  
n/r: Not reported due to small cell count (i.e., between 1 and 4).

**Sources**

Hospital Morbidity Database, Canadian Management Information System Database and Patient-Level Physician Billing Data Repository, 2019–2020, Canadian Institute for Health Information.

**Table 12** Number of knee replacements, by jurisdiction of surgery, 2015–2016 to 2019–2020

Jurisdiction	2015–2016	2016–2017	2017–2018	2018–2019	2019–2020	5-year percentage change
Newfoundland and Labrador	944	1,142	1,173	1,231	1,174	24.4%
Prince Edward Island	295	305	330	360	373	26.4%
Nova Scotia	2,179	2,253	2,337	2,553	2,700	23.9%
New Brunswick	1,798	2,005	1,906	2,017	1,891	5.2%
Quebec	12,195	12,571	12,810	13,227	13,144	7.8%
Ontario	27,150	28,793	30,692	32,136	31,971	17.8%
Manitoba	2,262	2,281	2,423	2,745	2,904	28.4%
Saskatchewan	2,448	2,386	2,601	2,655	2,933	19.8%
Alberta	6,693	6,760	6,624	6,795	6,409	-4.2%
British Columbia	8,087	8,614	9,553	11,541	11,469	41.8%
Yukon	26	28	30	45	57	119.2%
Northwest Territories	41	31	23	40	48	17.1%
<b>Canada</b>	<b>64,118</b>	<b>67,169</b>	<b>70,502</b>	<b>75,345</b>	<b>75,073</b>	<b>17.1%</b>

**Sources**

Discharge Abstract Database, Hospital Morbidity Database and National Ambulatory Care Reporting System, 2015–2016 to 2019–2020, Canadian Institute for Health Information.

**Table 13** Number of knee replacements, by type of care, 2015–2016 to 2019–2020

Type of care	2015–2016	2016–2017	2017–2018	2018–2019	2019–2020	5-year percentage change
Acute	63,966	66,942	70,201	74,882	74,113	15.9%
Day surgery	152	227	298	463	960	531.6%
<b>Total</b>	<b>64,118</b>	<b>67,169</b>	<b>70,499</b>	<b>75,345</b>	<b>75,073</b>	<b>17.1%</b>

**Sources**

Discharge Abstract Database, Hospital Morbidity Database and National Ambulatory Care Reporting System, 2015–2016 to 2019–2020, Canadian Institute for Health Information.

**Table 14** Age-standardized rate of hospitalization for knee replacement, by jurisdiction of residence, 2015–2016 to 2019–2020

Jurisdiction	2015–2016	2016–2017	2017–2018	2018–2019	2019–2020	5-year percentage change
Newfoundland and Labrador	176	207	207	216	201	14.2%
Prince Edward Island	213	213	227	236	243	14.1%
Nova Scotia	237	242	245	256	263	11.0%
New Brunswick	230	249	232	237	219	-4.8%
Quebec	157	158	157	160	165	5.1%
Ontario	230	237	245	251	242	5.2%
Manitoba	215	214	221	251	259	20.5%
Saskatchewan	277	265	281	281	296	6.9%
Alberta	234	228	215	216	198	-15.4%
British Columbia	189	194	209	241	232	22.8%
Yukon	158	200	183	200	226	43.0%
Northwest Territories	188	126	103	143	171	-9.0%
Nunavut	329	n/r	320	469	n/r	—
<b>Canada</b>	<b>205</b>	<b>209</b>	<b>214</b>	<b>222</b>	<b>217</b>	<b>5.9%</b>

**Notes**

n/r: Not reported due to small cell count or incomplete data.

— The percentage change cannot be calculated as the numerator is suppressed.

Rates are per 100,000 population, using the 2011 Canadian reference population age 18 and older.

Low volumes within the territories may result in more variability when looking at percentage change calculations over time.

Results are presented by patients' jurisdiction of residence, rather than by the province or territory of the facility where the treatment occurred.

**Sources**

Discharge Abstract Database, Hospital Morbidity Database and National Ambulatory Care Reporting System, 2015–2016 to 2019–2020, Canadian Institute for Health Information.

**Table 15** Number of hospitalizations for knee replacement and percentage by age group, 2019–2020

Jurisdiction	Age 18–54 (%)	Age 55–64 (%)	Age 65–74 (%)	Age 75+ (%)	Total number of hospitalizations
Newfoundland and Labrador	9.6	29.8	43.6	17.1	1,172
Prince Edward Island	7.8	26.7	42.3	23.2	371
Nova Scotia	6.4	31.1	41.4	21.2	2,692
New Brunswick	7.6	31.1	40.2	21.1	1,887
Quebec	6.4	27.8	40.5	25.3	13,102
Ontario	6.4	28.7	40.8	24.2	31,936
Manitoba	8.1	29.3	40.7	22.0	2,902
Saskatchewan	7.2	31.4	40.4	21.0	2,926
Alberta	6.8	30.7	40.3	22.3	6,384
British Columbia	5.4	26.2	42.5	25.9	11,459
Yukon	n/r	30.4	44.6	19.6	56
Northwest Territories	16.7	43.8	27.1	12.5	48
<b>Canada</b>	<b>6.5</b>	<b>28.6</b>	<b>41.0</b>	<b>24.0</b>	<b>74,935</b>

**Note**

n/r: Not reported due to small cell count (i.e., between 1 and 4) or due to residual disclosure.

**Sources**

Discharge Abstract Database, Hospital Morbidity Database and National Ambulatory Care Reporting System, 2019–2020, Canadian Institute for Health Information.

**Table 16** Number of knee replacements, by type of replacement and jurisdiction of surgery, 2019–2020

Jurisdiction	Number of primaries	Percentage of all replacements	Number of revisions	Percentage of all replacements
Newfoundland and Labrador	1,104	94.0%	70	6.0%
Prince Edward Island	330	88.5%	43	11.5%
Nova Scotia	2,479	91.8%	223	8.3%
New Brunswick	1,792	94.4%	106	5.6%
Quebec	12,258	93.1%	916	7.0%
Ontario	29,838	93.2%	2,185	6.8%
Manitoba	2,739	94.1%	171	5.9%
Saskatchewan	2,717	92.3%	227	7.7%

Jurisdiction	Number of primaries	Percentage of all replacements	Number of revisions	Percentage of all replacements
Alberta	5,876	91.5%	548	8.5%
British Columbia	10,798	94.0%	692	6.0%
Yukon	52	91.2%	5	8.8%
Northwest Territories	43	89.6%	5	10.4%
<b>Canada</b>	<b>70,026</b>	<b>93.1%</b>	<b>5,191</b>	<b>6.9%</b>

**Sources**

Discharge Abstract Database, Hospital Morbidity Database and National Ambulatory Care Reporting System, 2019–2020, Canadian Institute for Health Information.

**Table 17** Most responsible diagnosis for primary knee replacements, Canada, 2019–2020

Diagnosis grouping*	Number of records	Percentage of total
Osteoarthritis	68,839	99.4%
Inflammatory arthritis (e.g., RA, AS, SLE)	232	0.3%
Osteonecrosis (e.g., AVN)	64	0.1%
Fracture (femur or tibia)	50	0.1%
Tumour (primary and metastatic, including synovial)	34	0.0%
Infection (i.e., infectious arthritis)	5	0.0%
<b>Total†</b>	<b>69,224</b>	<b>100.0%</b>

**Notes**

\* Determined using the most responsible diagnosis (MRDx) collected in the DAD/HMDB or the main problem collected in NACRS. Note that MRDx represents the clinical condition that consumes the most hospital resources during that hospitalization and may not necessarily be the main reason for having a primary knee replacement. For a list of ICD-10-CA codes used, email [cjrr@cihi.ca](mailto:cjrr@cihi.ca).

† Total excludes hospitalizations that could not be assigned to any of these diagnosis groups (n = 802).

RA: Rheumatoid arthritis.

AS: Ankylosing spondylitis.

SLE: Systemic lupus erythematosus.

AVN: Avascular necrosis.

**Sources**

Discharge Abstract Database, Hospital Morbidity Database and National Ambulatory Care Reporting System, 2019–2020, Canadian Institute for Health Information.

**Table 18** Type of primary knee replacement, Canada, 2019–2020

Type of primary procedure*	Number of procedures	Percentage of total
Total knee arthroplasty, including patella	32,878	49.6%
Total knee arthroplasty, excluding patella	27,331	41.3%
Unicompartmental arthroplasty, medial	4,688	7.1%
Unicompartmental arthroplasty, unspecified	826	1.2%
Unicompartmental arthroplasty, lateral	311	0.5%
Patellofemoral arthroplasty (PFA)	206	0.3%
<b>Total†</b>	<b>66,240</b>	<b>100.0%</b>

**Notes**

\* Determined using *Canadian Classification of Health Interventions* (CCI) codes and extent attribute codes. For more details, email [cjrr@cihi.ca](mailto:cjrr@cihi.ca).

† Total excludes the procedures that could not be assigned to any of the groups listed above (n = 3,786).

**Sources**

Discharge Abstract Database, Hospital Morbidity Database and National Ambulatory Care Reporting System, 2019–2020, Canadian Institute for Health Information.

**Table 19** Reasons for knee revision, Canada, 2019–2020

Reason for revision*	Number of records	Percentage of total
Infection	1,770	33.9%
Aseptic loosening	904	17.3%
Instability	712	13.6%
Pain and other complications	379	7.3%
Arthritis in previously unresurfaced compartment	150	2.9%
Bearing wear (e.g., poly wear)	142	2.7%
Peri-prosthetic fracture	138	2.6%
Implant fracture and dissociation	106	2.0%
Stiffness	103	2.0%
Patella maltracking or instability	55	1.1%
Osteolysis	24	0.5%
Remaining reasons†	736	14.1%
<b>Total</b>	<b>5,219</b>	<b>100.0%</b>

**Notes**

\* Determined using revision reason (from CJRR or DAD Group 20), most responsible diagnosis (DAD/HMDB) or main diagnosis (NACRS). For more details, refer to [Appendix A](#).

† Includes unspecified complications as well as other most responsible diagnosis codes not generally related to knee replacement revision surgery (e.g., cancer).

Note that the total number of revisions in this table differs slightly from the total in other tables because bilateral revisions collected in CJRR are 2 separate records (i.e., left and right side).

**Sources**

Discharge Abstract Database, Hospital Morbidity Database, National Ambulatory Care Reporting System and Canadian Joint Replacement Registry, 2019–2020, Canadian Institute for Health Information.

**Table 20a** Primary knee replacements: Acute care length of stay for hospitalization (in days), by jurisdiction of surgery, 2019–2020

Jurisdiction	Mean	Median	25th percentile	75th percentile
Newfoundland and Labrador	3.6	3.0	2.0	4.0
Prince Edward Island	4.1	3.0	3.0	4.0
Nova Scotia	1.7	1.0	1.0	2.0
New Brunswick	3.0	3.0	2.0	3.0
Quebec	3.6	3.0	2.0	4.0
Ontario	2.2	2.0	1.0	2.0
Manitoba	3.3	3.0	2.0	4.0
Saskatchewan	4.2	4.0	3.0	5.0
Alberta	2.5	2.0	2.0	3.0
British Columbia	2.5	2.0	1.0	3.0
Yukon	3.9	3.0	2.0	3.0
Northwest Territories	3.2	3.0	3.0	3.0
<b>Canada</b>	<b>2.7</b>	<b>2.0</b>	<b>2.0</b>	<b>3.0</b>

**Note**

This table presents only the acute portion of the hospital stay. Due to a difference in collection of acute and alternate level of care (ALC) data, caution should be used when comparing Quebec length of stay results with results for other jurisdictions.

**Source**

Hospital Morbidity Database, 2019–2020, Canadian Institute for Health Information.

**Table 20b** Revisions of knee replacements: Acute care length of stay for hospitalization (in days), by jurisdiction of surgery, 2019–2020

Jurisdiction	Mean	Median	25th percentile	75th percentile
Newfoundland and Labrador	11.3	4.0	3.0	8.0
Prince Edward Island	13.0	5.0	3.0	8.0
Nova Scotia	7.4	3.0	2.0	7.0
New Brunswick	16.2	4.0	2.0	8.0
Quebec	7.9	4.0	3.0	8.0
Ontario	6.2	3.0	2.0	6.0
Manitoba	10.7	6.0	3.0	11.0
Saskatchewan	7.4	4.0	3.0	7.0
Alberta	9.4	4.0	2.0	10.0
British Columbia	7.2	3.0	2.0	7.0
Yukon	n/r	n/r	n/r	n/r
Northwest Territories	12.6	15.0	3.0	15.0
<b>Canada</b>	<b>7.6</b>	<b>4.0</b>	<b>2.0</b>	<b>7.0</b>

**Notes**

n/r: Not reported due to small cell count (i.e., between 1 and 4) or due to residual disclosure.

This table presents only the acute portion of the hospital stay. Due to a difference in collection of acute and alternate level of care (ALC) data, caution should be used when comparing Quebec length of stay results with results for other jurisdictions.

**Source**

Hospital Morbidity Database, 2019–2020, Canadian Institute for Health Information.

**Table 21a** Primary knee replacements: Estimated inpatient costs, by jurisdiction, 2019–2020

Jurisdiction	Mean	Median	25th percentile	75th percentile
Newfoundland and Labrador	\$7,074	\$6,802	\$6,802	\$6,802
Prince Edward Island	\$7,580	\$7,312	\$7,312	\$7,312
Nova Scotia	\$7,258	\$7,082	\$7,082	\$7,082
New Brunswick	\$6,370	\$6,235	\$6,235	\$6,235
Quebec	\$7,192	\$6,893	\$6,893	\$6,893
Ontario	\$6,372	\$6,169	\$6,169	\$6,169
Manitoba	\$7,290	\$7,107	\$7,107	\$7,107
Saskatchewan	\$8,713	\$8,193	\$8,193	\$8,193
Alberta	\$9,005	\$8,738	\$8,738	\$8,738
British Columbia	\$7,417	\$7,236	\$7,236	\$7,236
Yukon	\$9,984	\$9,170	\$9,170	\$9,170
Northwest Territories	\$13,810	\$13,810	\$13,810	\$13,810

Jurisdiction	Mean	Median	25th percentile	75th percentile
Canada (excluding physician costs)*	\$7,175	\$6,942	\$6,942	\$6,942
Estimated physician cost based on 6 provinces†	\$1,908	\$1,840	\$1,597	\$2,111
Canada total (including physician costs)	\$9,083	\$8,782	\$8,539	\$9,053

**Notes**

\* Only typical cases are included. Estimates do not include payments made to physicians, rehabilitation or amortization expenses on land, buildings and building service equipment.

† Estimated inpatient physician cost is based on physician billing data per primary knee replacement hospitalization from 6 provinces (Nova Scotia, Ontario, Manitoba, Saskatchewan, Alberta and British Columbia). Only typical cases are included.

**Sources**

Hospital Morbidity Database, Canadian Management Information System Database and Patient-Level Physician Billing Data Repository, 2019–2020, Canadian Institute for Health Information.

**Table 21b** Revisions of knee replacements: Estimated inpatient costs, by jurisdiction, 2019–2020

Jurisdiction	Mean	Median	25th percentile	75th percentile
Newfoundland and Labrador	\$10,646	\$9,378	\$9,378	\$12,853
Prince Edward Island	\$14,238	\$10,081	\$10,081	\$10,081
Nova Scotia	\$12,319	\$9,764	\$9,764	\$13,382
New Brunswick	\$10,752	\$8,596	\$8,596	\$11,781
Quebec	\$13,197	\$9,503	\$9,503	\$13,025
Ontario	\$11,084	\$8,505	\$8,505	\$11,657
Manitoba	\$12,690	\$10,895	\$9,799	\$13,430
Saskatchewan	\$13,377	\$11,296	\$11,296	\$15,481
Alberta	\$17,055	\$12,048	\$12,048	\$16,512
British Columbia	\$12,880	\$9,977	\$9,977	\$13,673
Yukon	n/r	n/r	n/r	n/r
Northwest Territories	n/r	n/r	n/r	n/r
Canada (excluding physician costs)*	\$12,614	\$9,571	\$9,571	\$13,118
Estimated physician cost based on 6 provinces†	\$3,013	\$2,773	\$2,292	\$3,324
Canada total (including physician costs)	\$15,628	\$12,344	\$11,864	\$16,442

**Notes**

\* Only typical cases are included. Estimates do not include payments made to physicians, rehabilitation or amortization expenses on land, buildings and building service equipment.

† Estimated inpatient physician cost is based on physician billing data per primary knee replacement hospitalization from 6 provinces (Nova Scotia, Ontario, Manitoba, Saskatchewan, Alberta and British Columbia). Only typical cases are included.

n/r: Not reported due to small cell count (i.e., between 1 and 4) or due to residual disclosure.

**Sources**

Hospital Morbidity Database, Canadian Management Information System Database and Patient-Level Physician Billing Data Repository, 2019–2020, Canadian Institute for Health Information.

## Section 3: Hip and Knee Replacements in Canada: CJRR Revision Risk Curves, 2019–2020

This section presents revision risk curves for hip and knee replacements performed in Canada from 2009–2010 up to 2019–2020, along with corresponding data tables.

These revision risk curves, which show the cumulative percentage risk of having a revision surgery following a joint replacement, follow patients from the time of their primary surgery to revision within a specific period. Refer to [Appendix C](#) for details.

### Revision risk curves based on hospitalization data

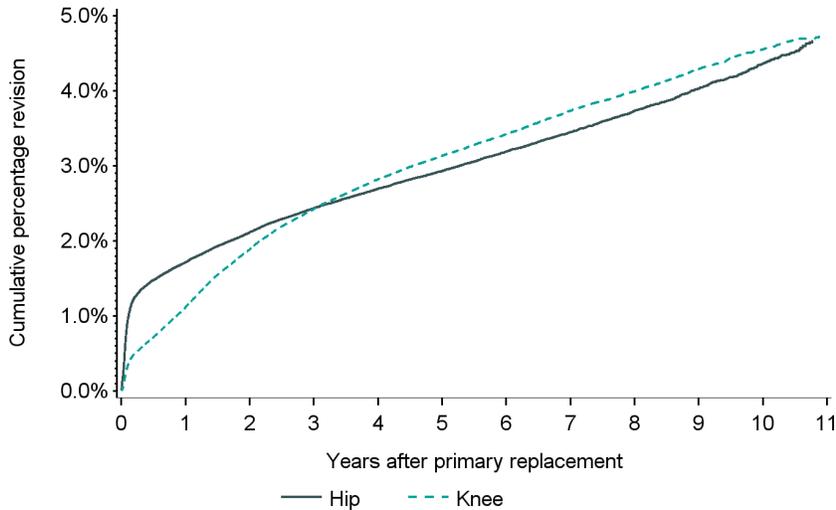
The following revision curves are based on hospitalization and day surgery data in Canada, sourced from the Discharge Abstract Database–Hospital Morbidity Database (DAD-HMDB) and the National Ambulatory Care Reporting System (NACRS) at the Canadian Institute for Health Information (CIHI). Figure 1 shows the cumulative percentage revision for all primary hip and knee replacements performed in all Canadian jurisdictions with a main diagnosis of osteoarthritis (OA). From 2009–2010 to 2019–2020, there were 359,898 primary hip replacements and 634,526 primary knee replacements due to OA with up to 11 years of follow-up.<sup>i</sup>

Details regarding the methodology can be found in [Appendix C](#).

---

i. OA is the most common primary diagnosis for both hip and knee replacements in Canada (over 70% of primary hip replacements and over 99% of primary knee replacements).

**Figure 1** Cumulative percentage revision for primary hip and knee replacement due to osteoarthritis, Canada, 2009–2010 to 2019–2020



**Sources**

Discharge Abstract Database, Hospital Morbidity Database and National Ambulatory Care Reporting System, 2009–2010 to 2019–2020, Canadian Institute for Health Information.

Joint	Years after primary replacement	Cumulative percentage revision (%)	95% confidence interval	Number at risk*
Hip	1	1.71	1.67–1.76	311,617
	2	2.11	2.07–2.16	268,489
	3	2.44	2.38–2.49	229,107
	4	2.70	2.64–2.75	192,269
	5	2.93	2.87–2.99	158,308
	6	3.19	3.13–3.26	126,268
	7	3.45	3.38–3.52	96,281
	8	3.73	3.65–3.81	69,324
	9	4.03	3.94–4.12	44,149
	10	4.36	4.25–4.47	21,325
	11	4.66	4.51–4.81	520

Joint	Years after primary replacement	Cumulative percentage revision (%)	95% confidence interval	Number at risk*
Knee	1	1.12	1.09–1.15	556,549
	2	1.89	1.85–1.92	480,681
	3	2.42	2.38–2.46	412,421
	4	2.82	2.77–2.86	348,458
	5	3.13	3.08–3.18	288,573
	6	3.42	3.37–3.48	231,887
	7	3.73	3.68–3.79	177,439
	8	3.99	3.93–4.06	127,480
	9	4.29	4.22–4.36	80,980
	10	4.55	4.47–4.63	39,095
	11	4.73	4.63–4.83	933

**Note**

\* At the end of each time period.

**Sources**

Discharge Abstract Database, Hospital Morbidity Database and National Ambulatory Care Reporting System, 2009–2010 to 2019–2020, Canadian Institute for Health Information.

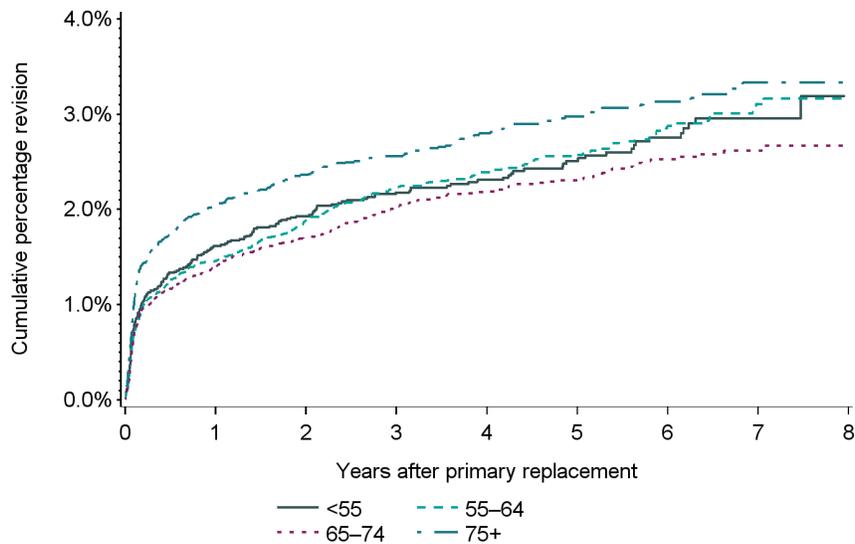
## Revision risk curves based on CJRR data

The following revision curves are based on primary replacements found in the Canadian Joint Replacement Registry (CJRR). Registry data contains more detailed information on these joint replacements, including prosthesis characteristics such as bearing surface, which allows for comparison of findings with other international arthroplasty registries. These cumulative revision risk curves are presented based on a large Canadian cohort of over 506,107 primary hip and knee surgeries from 3 provinces (Ontario, Manitoba and British Columbia) that have more than 90% coverage of CJRR prosthesis data.

Details on the methodology and subgroups examined can be found in [Appendix C](#).

### Hip replacement

**Figure 2a** Cumulative percentage revision for primary total hip replacement for men, by age (primary diagnosis of osteoarthritis), 2012–2013 to 2019–2020



**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

Age	Years after primary replacement	Cumulative percentage revision (%)	95% confidence interval	Number at risk*
<55	1	1.62	1.37–1.86	8,727
	2	1.93	1.65–2.20	7,098
	3	2.18	1.88–2.48	5,812
	4	2.31	2.00–2.62	4,562
	5	2.51	2.17–2.85	3,369
	6	2.75	2.37–3.14	2,163
	7	2.96	2.52–3.39	1,028
55–64	1	1.46	1.30–1.62	18,039
	2	1.89	1.70–2.08	14,476
	3	2.23	2.02–2.45	11,516
	4	2.39	2.16–2.62	8,714
	5	2.57	2.33–2.82	6,249
	6	2.88	2.58–3.17	3,847
	7	3.11	2.76–3.46	1,788
65–74	1	1.40	1.25–1.56	19,757
	2	1.71	1.54–1.88	15,944
	3	2.01	1.82–2.20	12,641
	4	2.19	1.98–2.40	9,556
	5	2.30	2.09–2.52	6,733
	6	2.53	2.28–2.78	4,209
	7	2.62	2.35–2.89	1,898
75+	1	2.05	1.82–2.27	13,219
	2	2.36	2.12–2.61	10,685
	3	2.56	2.30–2.82	8,473
	4	2.80	2.52–3.08	6,315
	5	2.97	2.67–3.27	4,391
	6	3.13	2.80–3.45	2,733
	7	3.33	2.95–3.71	1,242

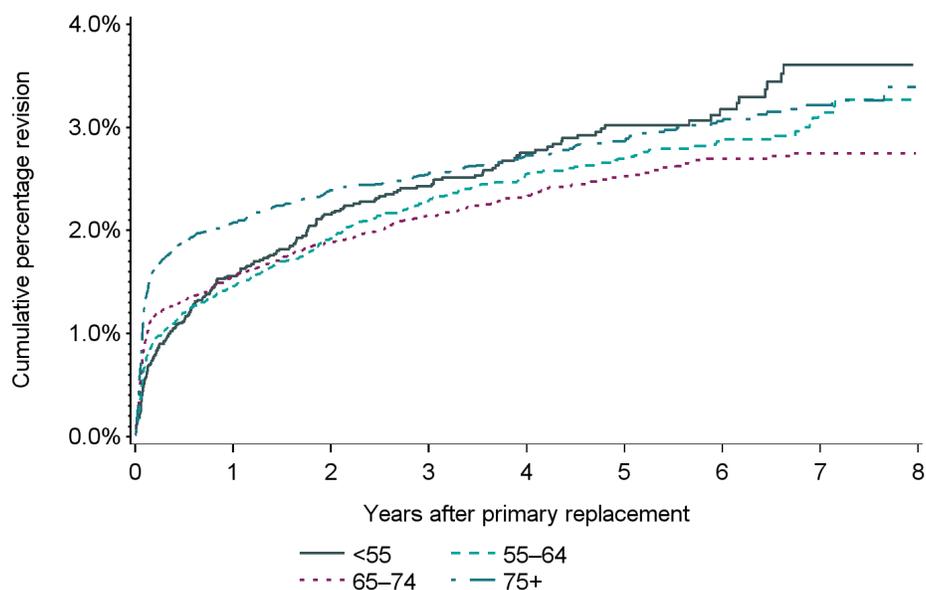
**Note**

\* At the end of each time period.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

**Figure 2b** Cumulative percentage revision for primary total hip replacement for women, by age (primary diagnosis of osteoarthritis), 2012–2013 to 2019–2020



**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

Age	Years after primary replacement	Cumulative percentage revision (%)	95% confidence interval	Number at risk*
<55	1	1.56	1.28–1.83	7,017
	2	2.16	1.83–2.49	5,784
	3	2.43	2.07–2.79	4,762
	4	2.76	2.36–3.15	3,703
	5	3.02	2.59–3.45	2,753
	6	3.17	2.71–3.64	1,753
	7	3.61	3.03–4.18	795
55–64	1	1.46	1.30–1.62	18,027
	2	1.92	1.73–2.12	14,718
	3	2.29	2.07–2.51	11,794
	4	2.54	2.31–2.78	8,966
	5	2.70	2.45–2.95	6,454
	6	2.89	2.61–3.16	4,053
	7	3.14	2.80–3.49	1,876

Age	Years after primary replacement	Cumulative percentage revision (%)	95% confidence interval	Number at risk*
65–74	1	1.54	1.41–1.68	26,172
	2	1.89	1.73–2.05	21,112
	3	2.14	1.97–2.31	16,746
	4	2.32	2.13–2.50	12,664
	5	2.53	2.32–2.73	8,890
	6	2.70	2.48–2.92	5,587
	7	2.75	2.52–2.98	2,578
75+	1	2.08	1.90–2.25	21,757
	2	2.39	2.20–2.58	17,679
	3	2.56	2.36–2.76	14,192
	4	2.73	2.51–2.94	10,979
	5	2.87	2.64–3.09	7,808
	6	3.06	2.81–3.30	4,920
	7	3.22	2.94–3.49	2,306

**Note**

\* At the end of each time period.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

**Table 22** Reasons for revision of total hip replacement for osteoarthritis, by age and sex, 2012–2013 to 2019–2020

Sex	Age	Aseptic loosening	Infection	Instability	Periprosthetic fracture	Remaining reasons
Women	<55	24 (17.9%)	30 (22.4%)	32 (23.9%)	13 (9.7%)	35 (26.1%)
	55–64	69 (22.0%)	75 (24.0%)	62 (19.8%)	49 (15.7%)	58 (18.5%)
	65–74	67 (15.8%)	107 (25.3%)	79 (18.7%)	111 (26.2%)	59 (13.9%)
	75+	59 (14.6%)	77 (19.1%)	74 (18.4%)	133 (33.0%)	60 (14.9%)
Men	<55	30 (19.6%)	49 (32.0%)	30 (19.6%)	12 (7.8%)	32 (20.9%)
	55–64	71 (23.3%)	111 (36.4%)	47 (15.4%)	28 (9.2%)	48 (15.7%)
	65–74	70 (23.6%)	101 (34.0%)	45 (15.2%)	40 (13.5%)	41 (13.8%)
	75+	40 (17.2%)	69 (29.7%)	35 (15.1%)	50 (21.6%)	38 (16.4%)

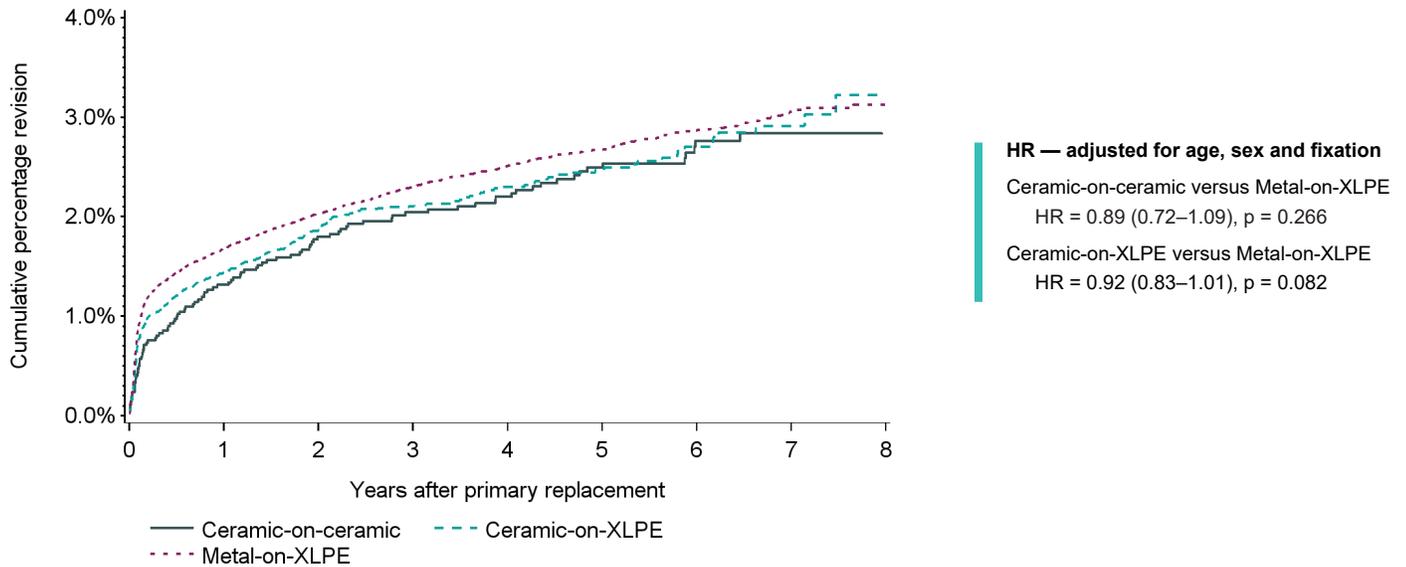
**Note**

Only revision records with a specific revision reason were included. Revisions with a reason listed as “other” (n = 618) and ones in the DAD and NACRS that could not be linked to a CJRR reason for revision (n = 761) were excluded. Remaining reasons for revision included bearing wear, osteolysis, pain of unknown origin, implant fracture, implant dissociation, acetabular erosion, leg length discrepancy and stiffness.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

**Figure 3** Cumulative percentage revision for primary total hip replacement, by bearing surface (primary diagnosis of osteoarthritis), 2012–2013 to 2019–2020



**Notes**

XLPE: Cross-linked polyethylene.  
 HR: Hazard ratio.  
 p: p-value.  
 Metal-on-non-XLPE is no longer being reported since this bearing surface is no longer widely used.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

Bearing surface of primary replacement	Years after primary replacement	Cumulative percentage revision (%)	95% confidence interval	Number at risk*
Ceramic-on-ceramic	1	1.31	0.97–1.66	4,009
	2	1.80	1.39–2.20	3,751
	3	2.04	1.61–2.48	3,376
	4	2.20	1.74–2.66	2,918
	5	2.49	1.99–2.99	2,384
	6	2.76	2.21–3.31	1,659
	7	2.84	2.27–3.41	861

Bearing surface of primary replacement	Years after primary replacement	Cumulative percentage revision (%)	95% confidence interval	Number at risk*
Ceramic-on-XLPE	1	1.44	1.30–1.58	21,040
	2	1.86	1.69–2.04	14,332
	3	2.11	1.92–2.30	9,297
	4	2.30	2.08–2.52	5,808
	5	2.47	2.22–2.71	3,723
	6	2.71	2.40–3.01	2,298
	7	2.91	2.55–3.28	1,030
Metal-on-XLPE	1	1.68	1.60–1.75	95,119
	2	2.03	1.95–2.12	79,932
	3	2.30	2.21–2.40	65,635
	4	2.51	2.41–2.61	50,658
	5	2.67	2.57–2.78	36,002
	6	2.87	2.75–2.99	22,186
	7	3.05	2.91–3.19	10,014

**Notes**

\* At the end of each time period.

XLPE: Cross-linked polyethylene.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

**Table 23** Top reasons for revision of total hip replacement for osteoarthritis, by bearing surface, 2012–2013 to 2019–2020

Bearing surface	Aseptic loosening	Infection	Instability	Periprosthetic fracture
Ceramic-on-ceramic	16 (29.1%)	22 (40.0%)	11 (20.0%)	6 (10.9%)
Ceramic-on-XLPE	54 (22.0%)	74 (30.1%)	78 (31.7%)	40 (16.3%)
Metal-on-XLPE	316 (23.3%)	429 (31.6%)	276 (20.4%)	335 (24.7%)

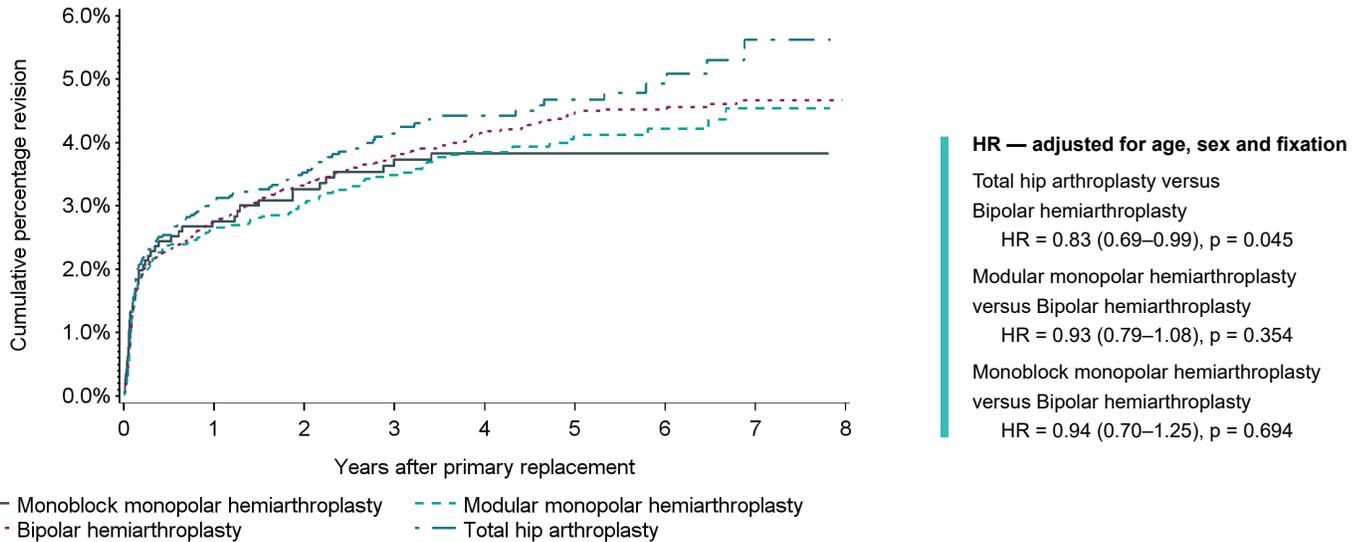
**Notes**

Only revision records with a specific revision reason were included. Revisions with a reason listed as “other” (n = 580) and ones in the DAD and NACRS that could not be linked to a CJRR reason for revision (n = 690) were excluded. Remaining reasons for revision are not shown in table due to small cell counts and include bearing wear, osteolysis, pain of unknown origin, implant fracture, implant dissociation, leg length discrepancy and stiffness (n = 331).

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

**Figure 4** Cumulative percentage revision for primary hip replacement, by type of procedure (primary diagnosis of acute hip fracture), 2012–2013 to 2019–2020



**Notes**  
HR: Hazard ratio.  
p: p-value.

**Sources**  
Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

Type of hip arthroplasty	Years after primary replacement	Cumulative percentage revision (%)	95% confidence interval	Number at risk*
<b>Total hip arthroplasty</b>	1	3.06	2.52–3.61	3,102
	2	3.53	2.93–4.13	2,436
	3	4.15	3.47–4.82	1,872
	4	4.42	3.70–5.14	1,323
	5	4.67	3.90–5.45	951
	6	4.93	4.08–5.78	596
	7	5.62	4.45–6.79	263
<b>Modular monopolar hemiarthroplasty</b>	1	2.64	2.24–3.04	4,927
	2	3.05	2.60–3.49	3,905
	3	3.49	3.00–3.98	3,020
	4	3.84	3.31–4.38	2,208
	5	4.12	3.53–4.71	1,536
	6	4.21	3.60–4.83	890
	7	4.54	3.78–5.31	351

Type of hip arthroplasty	Years after primary replacement	Cumulative percentage revision (%)	95% confidence interval	Number at risk*
Bipolar hemiarthroplasty	1	2.76	2.52–3.00	14,459
	2	3.32	3.05–3.59	11,233
	3	3.79	3.49–4.09	8,703
	4	4.18	3.85–4.51	6,448
	5	4.48	4.12–4.83	4,499
	6	4.52	4.16–4.89	2,746
	7	4.67	4.27–5.06	1,300
Monoblock monopolar hemiarthroplasty	1	2.75	1.89–3.62	1,195
	2	3.27	2.31–4.22	1,093
	3	3.73	2.70–4.76	1,009
	4	3.83	2.78–4.87	930
	5	3.83	2.78–4.87	792
	6	3.83	2.78–4.87	589
	7	3.83	2.78–4.87	303

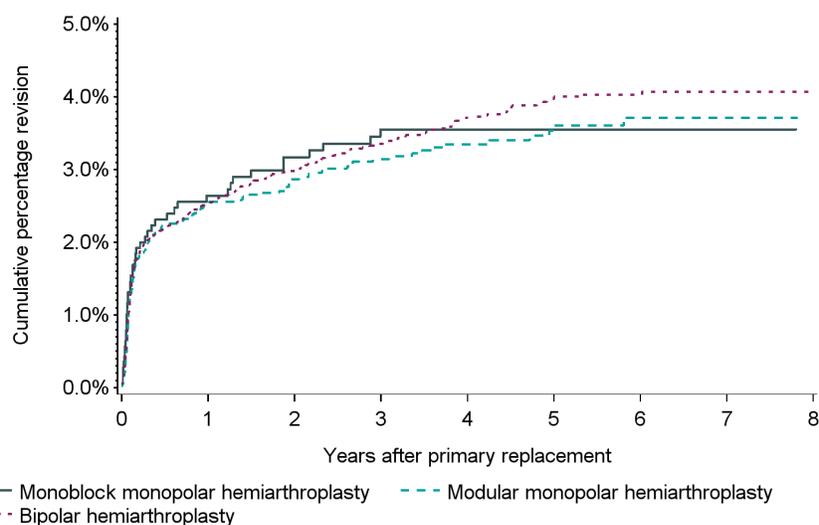
**Note**

\* At the end of each time period.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

**Figure 5** Cumulative percentage revision for primary partial hip replacement, by type of procedure (primary diagnosis of acute hip fracture, patients age 70 and older), 2012–2013 to 2019–2020

**HR — adjusted for sex and fixation**Modular monopolar hemiarthroplasty versus Bipolar hemiarthroplasty  
HR = 0.89 (0.75–1.06), p = 0.185Monoblock monopolar hemiarthroplasty versus Bipolar hemiarthroplasty  
HR = 0.87 (0.63–1.17), p = 0.382**Notes**

HR: Hazard ratio.

p: p-value.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

Type of hip arthroplasty	Years after primary replacement	Cumulative percentage revision (%)	95% confidence interval	Number at risk*
<b>Bipolar hemiarthroplasty</b>	1	2.54	2.30–2.78	12,711
	2	2.98	2.71–3.25	9,849
	3	3.35	3.06–3.65	7,623
	4	3.72	3.39–4.05	5,630
	5	3.98	3.62–4.33	3,920
	6	4.03	3.66–4.39	2,363
	7	4.07	3.69–4.44	1,099
<b>Modular monopolar hemiarthroplasty</b>	1	2.54	2.12–2.95	4,438
	2	2.87	2.41–3.32	3,518
	3	3.15	2.66–3.63	2,708
	4	3.35	2.83–3.87	1,986
	5	3.60	3.03–4.18	1,370
	6	3.71	3.10–4.32	781
	7	3.71	3.10–4.32	308
<b>Monoblock monopolar hemiarthroplasty</b>	1	2.64	1.78–3.50	1,154
	2	3.17	2.21–4.13	1,059
	3	3.55	2.53–4.58	980
	4	3.55	2.53–4.58	907
	5	3.55	2.53–4.58	774
	6	3.55	2.53–4.58	576
	7	3.55	2.53–4.58	297

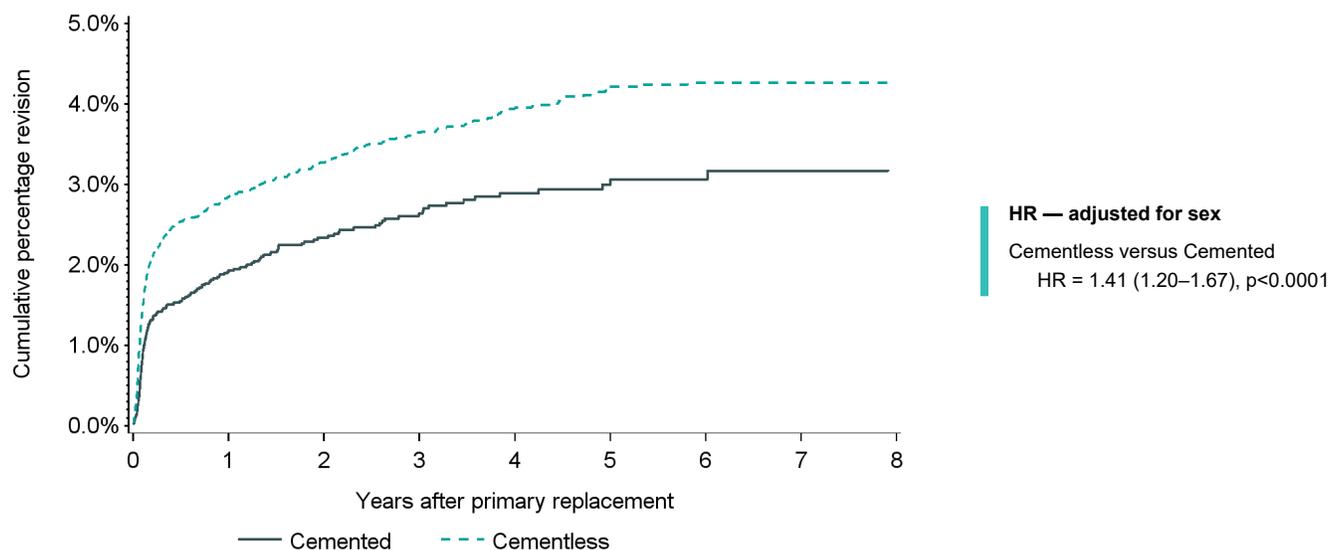
**Note**

\* At the end of each time period.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

**Figure 6** Cumulative percentage revision for primary partial hip replacement, by femoral fixation (primary diagnosis of acute hip fracture, patients age 70 and older), 2012–2013 to 2019–2020



**Notes**

HR: Hazard ratio.

p: p-value.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

Femoral fixation	Years after primary replacement	Cumulative percentage revision (%)	95% confidence interval	Number at risk*
Cemented	1	1.93	1.62–2.25	5,633
	2	2.34	1.98–2.70	4,056
	3	2.64	2.24–3.04	3,033
	4	2.89	2.45–3.33	2,195
	5	3.00	2.53–3.47	1,532
	6	3.06	2.58–3.54	912
	7	3.17	2.64–3.70	456
Cementless	1	2.85	2.58–3.11	12,670
	2	3.27	2.99–3.56	10,370
	3	3.64	3.33–3.95	8,278
	4	3.95	3.62–4.29	6,328
	5	4.21	3.85–4.57	4,532
	6	4.27	3.90–4.63	2,808
	7	4.27	3.90–4.63	1,248

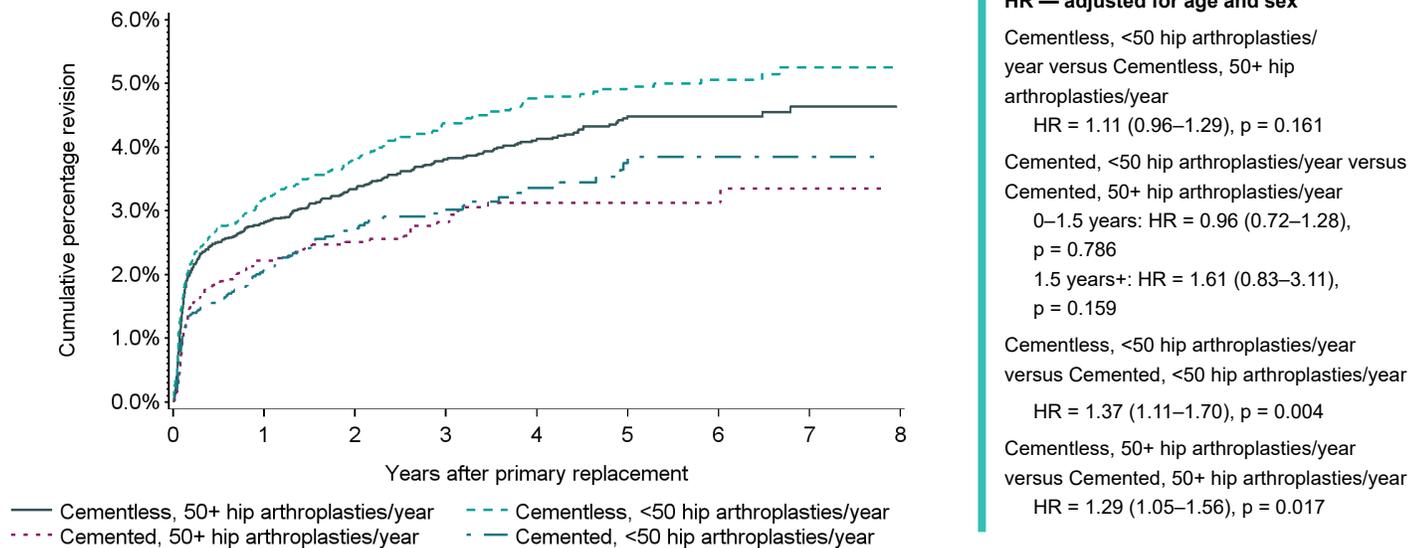
**Note**

\* At the end of each time period.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

**Figure 7** Cumulative percentage revision for primary partial hip replacement, by femoral fixation and surgeon hip arthroplasty volume (primary diagnosis of acute hip fracture), 2012–2013 to 2019–2020



**Notes**

HR: Hazard ratio.

p: p-value.

Surgeon volume refers to the number of hip arthroplasties performed by the surgeon in a fiscal year.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

Femoral fixation	Surgeon volume	Years after primary replacement	Cumulative percentage revision (%)	95% confidence interval	Number at risk*
Cementless	50 or more procedures a year	1	2.82	2.50–3.14	8,454
		2	3.34	2.98–3.69	7,010
		3	3.81	3.42–4.20	5,562
		4	4.13	3.71–4.55	4,255
		5	4.48	4.02–4.94	3,032
		6	4.48	4.02–4.94	1,894
		7	4.64	4.13–5.14	901
	Fewer than 50 procedures a year	1	3.19	2.78–3.60	5,974
		2	3.79	3.34–4.24	4,864
		3	4.37	3.87–4.87	3,941
		4	4.79	4.25–5.34	3,027
		5	4.95	4.39–5.51	2,225
		6	5.06	4.48–5.64	1,427
		7	5.26	4.62–5.90	645

Femoral fixation	Surgeon volume	Years after primary replacement	Cumulative percentage revision (%)	95% confidence interval	Number at risk*
Cemented	50 or more procedures a year	1	2.22	1.77–2.67	3,046
		2	2.51	2.02–3.01	2,231
		3	2.82	2.27–3.37	1,668
		4	3.13	2.52–3.74	1,157
		5	3.13	2.52–3.74	769
		6	3.13	2.52–3.74	439
		7	3.35	2.60–4.10	224
	Fewer than 50 procedures a year	1	2.10	1.65–2.55	3,044
		2	2.73	2.19–3.27	2,224
		3	3.02	2.43–3.61	1,671
		4	3.36	2.70–4.02	1,255
		5	3.75	2.99–4.50	907
		6	3.85	3.07–4.64	570
		7	3.85	3.07–4.64	286

**Notes**

\* At the end of each time period.

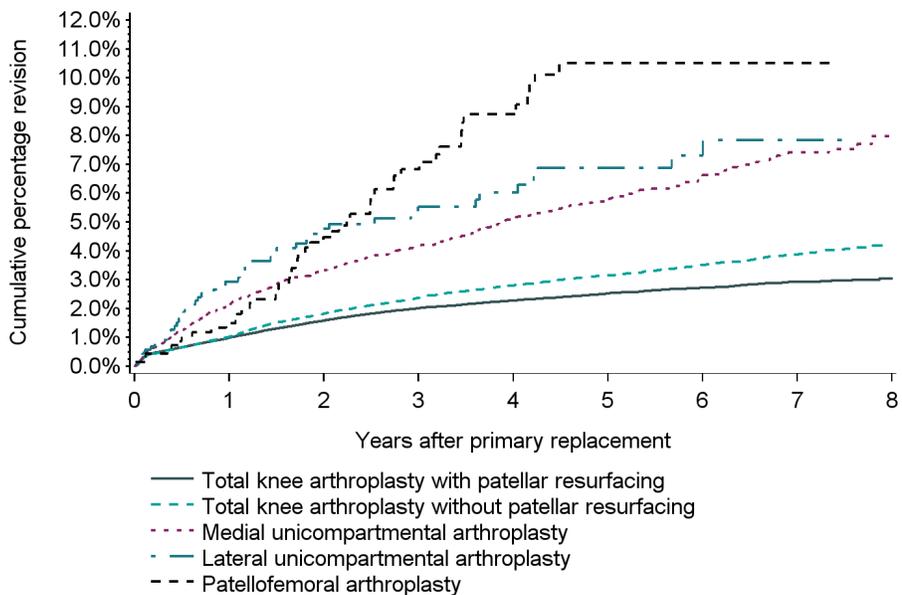
Surgeon volume refers to the number of hip arthroplasties performed by the surgeon in a fiscal year.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

# Knee replacement

**Figure 8** Cumulative percentage revision for primary total and partial knee replacement, by type of procedure (primary diagnosis of osteoarthritis), 2012–2013 to 2019–2020



**HR — adjusted for age and sex**

- Total knee arthroplasty without patellar resurfacing versus Total knee arthroplasty with patellar resurfacing  
HR = 1.20 (1.13–1.26), p<0.0001
- Medial unicompartmental arthroplasty versus Total knee arthroplasty with patellar resurfacing  
HR = 1.98 (1.81–2.16), p<0.0001
- Lateral unicompartmental arthroplasty versus Total knee arthroplasty with patellar resurfacing  
HR = 2.35 (1.74–3.10), p<0.0001
- Patellofemoral arthroplasty versus Total knee arthroplasty with patellar resurfacing  
0–1 year: HR = 1.27 (0.64–2.24), p = 0.452  
1 year+: HR = 3.65 (2.61–4.92), p<0.0001

**Notes**

HR: Hazard ratio.

p: p-value.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

Type of knee arthroplasty	Years after primary replacement	Cumulative percentage revision (%)	95% confidence interval	Number at risk*
Total knee arthroplasty with patellar resurfacing	1	0.99	0.94–1.04	147,078
	2	1.58	1.52–1.64	124,556
	3	2.01	1.94–2.08	102,498
	4	2.28	2.20–2.36	80,380
	5	2.52	2.43–2.61	58,539
	6	2.72	2.62–2.82	37,687
	7	2.92	2.81–3.03	18,029
Total knee arthroplasty without patellar resurfacing	1	1.03	0.96–1.10	78,564
	2	1.82	1.73–1.91	59,485
	3	2.37	2.25–2.48	45,389
	4	2.80	2.67–2.93	33,678
	5	3.15	3.00–3.29	23,856
	6	3.51	3.35–3.68	14,939
	7	3.87	3.67–4.07	6,802

Type of knee arthroplasty	Years after primary replacement	Cumulative percentage revision (%)	95% confidence interval	Number at risk*
Medial unicompartmental arthroplasty	1	2.13	1.87–2.39	10,555
	2	3.32	2.99–3.66	8,519
	3	4.17	3.78–4.56	6,890
	4	5.13	4.68–5.59	5,423
	5	5.77	5.27–6.28	4,001
	6	6.62	6.03–7.20	2,610
	7	7.42	6.72–8.11	1,362
Lateral unicompartmental arthroplasty	1	2.93	1.77–4.09	705
	2	4.76	3.22–6.29	554
	3	5.53	3.83–7.22	458
	4	6.01	4.20–7.83	341
	5	6.88	4.83–8.93	266
	6	7.31	5.11–9.52	175
	7	7.84	5.42–10.27	100
Patellofemoral arthroplasty	1	1.49	0.57–2.40	612
	2	4.49	2.82–6.15	506
	3	6.83	4.71–8.95	377
	4	8.73	6.23–11.24	278
	5	10.51	7.60–13.41	192
	6	10.51	7.60–13.41	125
	7	10.51	7.60–13.41	59

**Note**

\* At the end of each time period.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

**Table 24** Reasons for revision of total knee replacement for osteoarthritis, by type of procedure, 2012–2013 to 2019–2020

Primary procedure type	Infection	Instability	Aseptic loosening	Remaining reasons
Total knee arthroplasty with patellar resurfacing	761 (35.9%)	487 (23.0%)	385 (18.2%)	485 (22.9%)
Total knee arthroplasty without patellar resurfacing	361 (27.6%)	249 (19.1%)	226 (17.3%)	470 (36.0%)

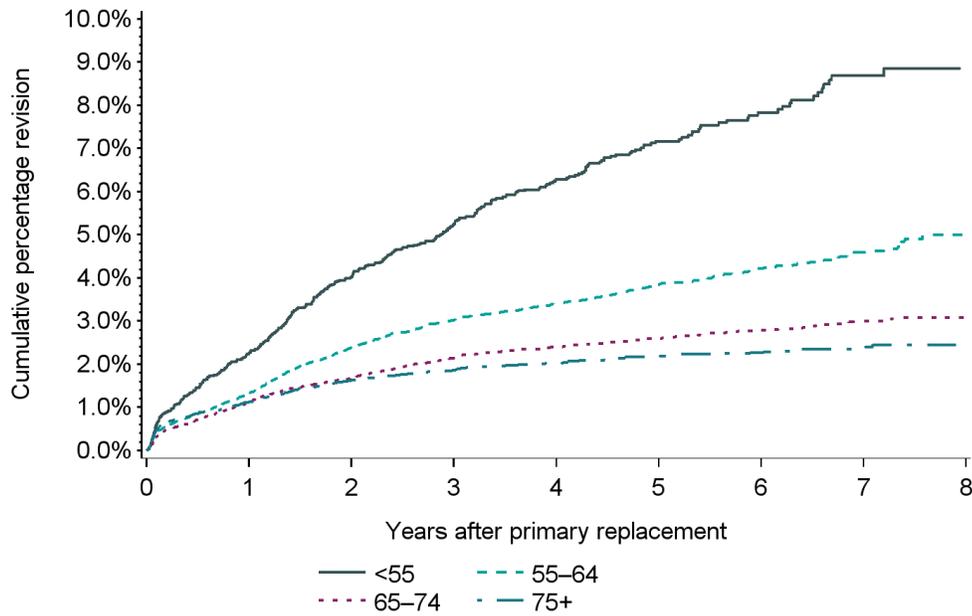
**Note**

Only revision records with a specific revision reason were included. Revisions with a reason listed as “other” (n = 859) and ones in the DAD and NACRS that could not be linked to a CJRR reason for revision (n = 1,422) were excluded. Remaining reasons included pain of unknown origin, patella maltracking or instability, periprosthetic fracture (femur or tibia), bearing wear, implant dissociation, implant fracture, osteolysis and stiffness.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

**Figure 9a** Cumulative percentage revision for primary total knee replacement for men, by age (primary diagnosis of osteoarthritis), 2012–2013 to 2019–2020



**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

Age	Years after primary replacement	Cumulative percentage revision (%)	95% confidence interval	Number at risk*
<55	1	2.27	1.89–2.64	5,510
	2	4.03	3.52–4.54	4,586
	3	5.24	4.64–5.84	3,782
	4	6.29	5.61–6.97	3,022
	5	7.17	6.41–7.92	2,288
	6	7.83	7.00–8.67	1,456
	7	8.68	7.70–9.67	690
55–64	1	1.33	1.20–1.47	25,699
	2	2.38	2.20–2.57	20,920
	3	3.02	2.80–3.23	16,804
	4	3.40	3.16–3.64	13,038
	5	3.84	3.57–4.10	9,399
	6	4.22	3.92–4.51	5,916
	7	4.59	4.24–4.94	2,817

Age	Years after primary replacement	Cumulative percentage revision (%)	95% confidence interval	Number at risk*
65–74	1	1.13	1.03–1.24	34,657
	2	1.69	1.56–1.83	27,871
	3	2.14	1.98–2.29	22,077
	4	2.40	2.23–2.57	16,886
	5	2.59	2.41–2.78	12,004
	6	2.79	2.58–2.99	7,651
	7	3.01	2.77–3.25	3,535
75+	1	1.12	0.99–1.25	21,473
	2	1.63	1.46–1.79	17,354
	3	1.86	1.68–2.04	13,803
	4	2.02	1.83–2.21	10,575
	5	2.17	1.97–2.38	7,520
	6	2.26	2.04–2.48	4,726
	7	2.36	2.12–2.59	2,222

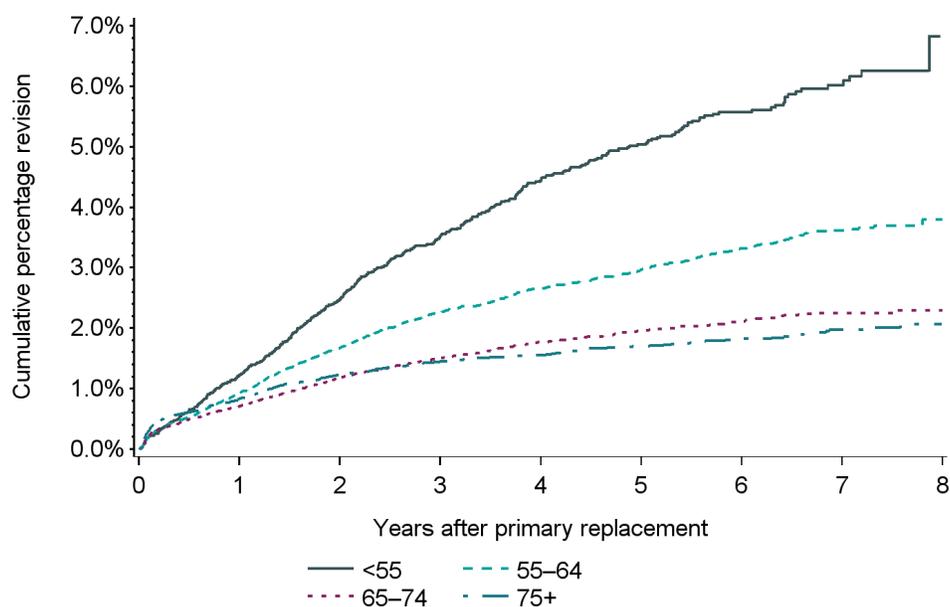
**Note**

\* At the end of each time period.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

**Figure 9b** Cumulative percentage revision for primary total knee replacement for women, by age (primary diagnosis of osteoarthritis), 2012–2013 to 2019–2020



#### Sources

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

Age	Years after primary replacement	Cumulative percentage revision (%)	95% confidence interval	Number at risk*
<55	1	1.22	1.02–1.43	10,464
	2	2.48	2.18–2.77	8,801
	3	3.51	3.15–3.88	7,307
	4	4.44	4.01–4.86	5,762
	5	5.03	4.56–5.51	4,307
	6	5.57	5.05–6.09	2,797
	7	6.02	5.43–6.61	1,322
55–64	1	0.93	0.84–1.02	40,307
	2	1.67	1.55–1.79	33,333
	3	2.27	2.12–2.42	27,101
	4	2.65	2.48–2.82	20,971
	5	2.96	2.77–3.15	15,347
	6	3.31	3.10–3.52	9,876
	7	3.61	3.37–3.86	4,717

Age	Years after primary replacement	Cumulative percentage revision (%)	95% confidence interval	Number at risk*
65–74	1	0.71	0.64–0.77	54,351
	2	1.18	1.09–1.27	44,104
	3	1.50	1.40–1.61	35,124
	4	1.77	1.65–1.89	26,943
	5	1.96	1.83–2.09	19,202
	6	2.11	1.97–2.26	12,193
	7	2.25	2.09–2.42	5,599
75+	1	0.84	0.74–0.93	33,181
	2	1.23	1.11–1.34	27,072
	3	1.45	1.32–1.57	21,889
	4	1.55	1.41–1.68	16,861
	5	1.71	1.56–1.86	12,328
	6	1.83	1.66–1.99	8,011
	7	1.97	1.78–2.16	3,929

**Note**

\* At the end of each time period.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

**Table 25** Reasons for revision of total knee replacement for osteoarthritis, by age and sex, 2012–2013 to 2019–2020

Sex	Age	Aseptic loosening	Infection	Instability	Remaining reasons
Women	<55	59 (19.2%)	67 (21.8%)	87 (28.3%)	94 (30.6%)
	55–64	148 (21.4%)	159 (22.9%)	182 (26.3%)	204 (29.4%)
	65–74	95 (15.9%)	182 (30.5%)	124 (20.8%)	196 (32.8%)
	75+	41 (12.8%)	114 (35.5%)	61 (19.0%)	105 (32.7%)
Men	<55	47 (19.6%)	78 (32.5%)	47 (19.6%)	68 (28.3%)
	55–64	109 (19.4%)	200 (35.6%)	123 (21.9%)	130 (23.1%)
	65–74	90 (19.3%)	185 (39.6%)	84 (18.0%)	108 (23.1%)
	75+	22 (9.3%)	137 (57.8%)	28 (11.8%)	50 (21.1%)

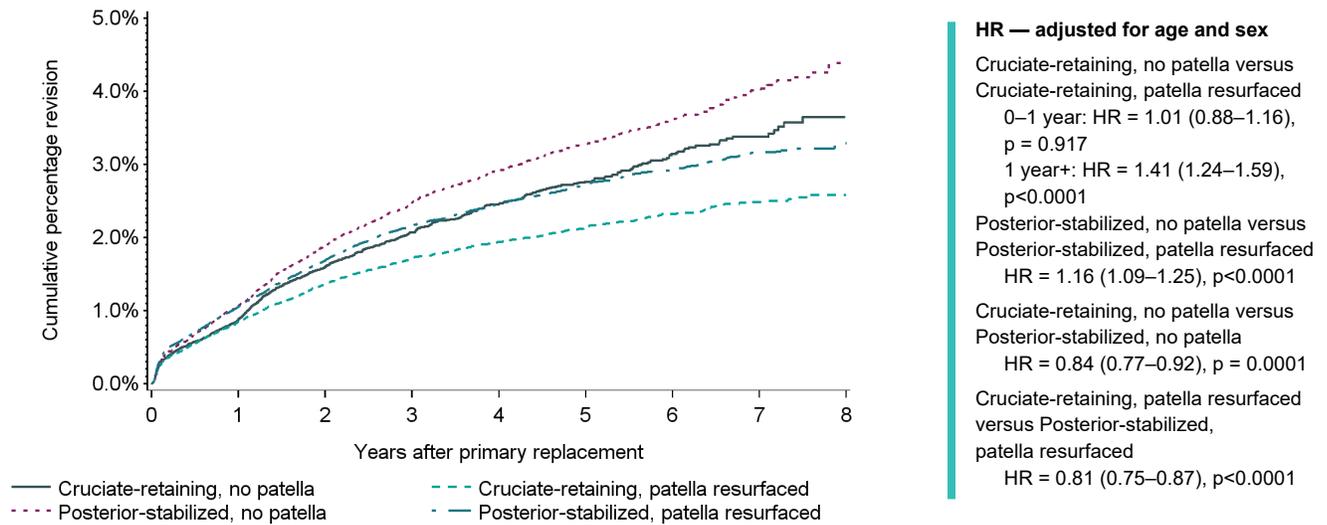
**Note**

Only revision records with a specific revision reason were included. Revisions with a reason listed as “other” (n = 859) and ones in the DAD and NACRS that could not be linked to a CJRR reason for revision (n = 1,422) were excluded. Remaining reasons for revision included bearing wear, osteolysis, pain of unknown origin, patellar maltracking, periprosthetic fracture, implant fracture, implant dissociation, arthritis in previously unresurfaced compartment and stiffness.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

**Figure 10** Cumulative percentage revision for primary total knee replacement, by stability and patella resurfacing (primary diagnosis of osteoarthritis), 2012–2013 to 2019–2020



**Notes**  
HR: Hazard ratio.  
p: p-value.

**Sources**  
Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

Stability and patella resurfacing	Years after primary replacement	Cumulative percentage revision (%)	95% confidence interval	Number at risk*
Cruciate-retaining, no patella	1	0.89	0.79–0.98	32,191
	2	1.60	1.46–1.73	23,778
	3	2.06	1.90–2.23	17,850
	4	2.45	2.26–2.64	13,063
	5	2.76	2.55–2.98	9,197
	6	3.14	2.88–3.39	5,633
	7	3.38	3.09–3.67	2,591
Cruciate-retaining, patella resurfaced	1	0.85	0.77–0.92	52,547
	2	1.36	1.26–1.46	44,235
	3	1.70	1.59–1.81	36,659
	4	1.94	1.81–2.06	29,097
	5	2.13	2.00–2.27	21,593
	6	2.32	2.18–2.47	14,203
	7	2.49	2.32–2.65	6,896

Stability and patella resurfacing	Years after primary replacement	Cumulative percentage revision (%)	95% confidence interval	Number at risk*
Posterior-stabilized, no patella	1	1.07	0.98–1.16	43,212
	2	1.89	1.76–2.01	33,595
	3	2.47	2.32–2.63	26,013
	4	2.92	2.74–3.09	19,677
	5	3.28	3.08–3.47	14,012
	6	3.62	3.40–3.84	8,964
	7	4.01	3.74–4.28	4,071
Posterior-stabilized, patella resurfaced	1	1.06	0.99–1.12	91,270
	2	1.69	1.61–1.77	77,799
	3	2.16	2.06–2.26	63,820
	4	2.46	2.35–2.56	49,731
	5	2.73	2.61–2.84	35,979
	6	2.93	2.80–3.06	23,028
	7	3.16	3.01–3.30	10,948
	8	3.28	3.08–3.49	45

**Note**

\* At the end of each time period.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

**Table 26** Reasons for revision of total knee replacement for osteoarthritis, by stability and patella resurfacing, 2012–2013 to 2019–2020

Stability and patella resurfacing	Infection	Instability	Aseptic loosening	Remaining reasons
Cruciate-retaining, no patella	122 (26.1%)	95 (20.3%)	83 (17.8%)	167 (35.8%)
Cruciate-retaining, patella resurfaced	232 (35.4%)	167 (25.5%)	113 (17.3%)	143 (21.8%)
Posterior-stabilized, no patella	219 (29.6%)	134 (18.1%)	122 (16.5%)	265 (35.8%)
Posterior-stabilized, patella resurfaced	496 (35.4%)	313 (22.3%)	266 (19.0%)	328 (23.4%)

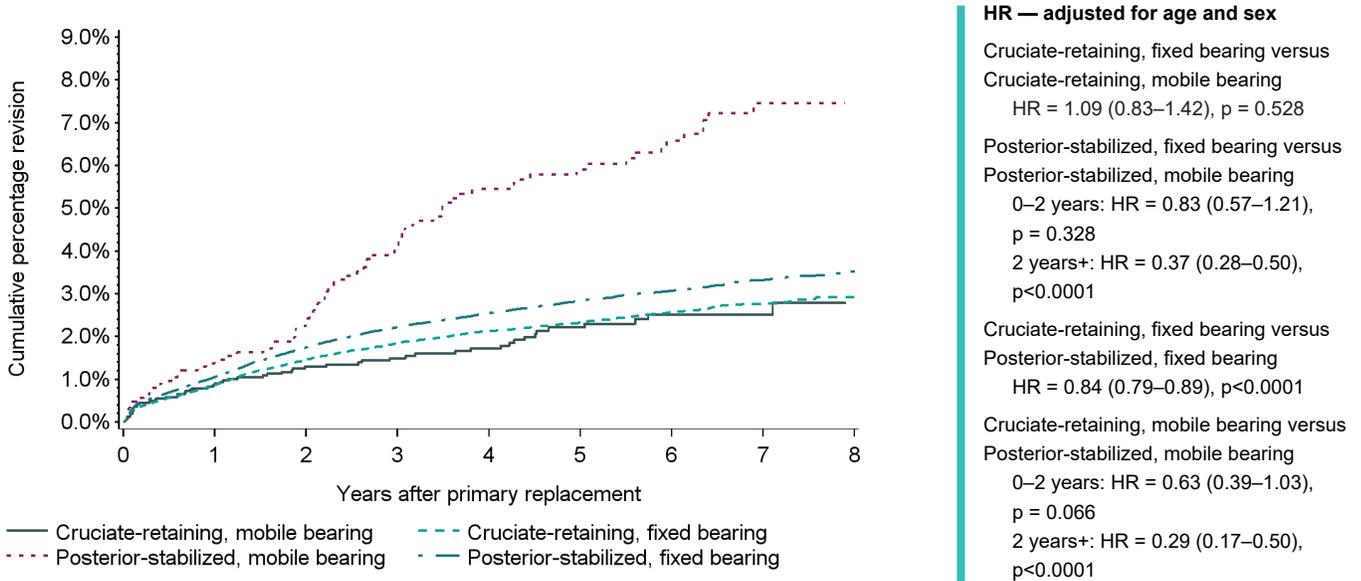
**Note**

Only revision records with a specific revision reason were included. Revisions with a reason listed as “other” (n = 837) and ones in the DAD and NACRS that could not be linked to a CJRR reason for revision (n = 1,360) were excluded. Remaining reasons for revision included bearing wear, osteolysis, pain of unknown origin, patellar maltracking, periprosthetic fracture, implant fracture, implant dissociation and stiffness.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

**Figure 11** Cumulative percentage revision for primary total knee replacement, by stability and mobility (primary diagnosis of osteoarthritis), 2012–2013 to 2019–2020



**Notes**  
HR: Hazard ratio.  
p: p-value.

**Sources**  
Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

Stability and mobility	Years after primary replacement	Cumulative percentage revision (%)	95% confidence interval	Number at risk*
<b>Cruciate-retaining, fixed bearing</b>	1	0.87	0.80–0.93	74,323
	2	1.45	1.37–1.54	61,286
	3	1.83	1.74–1.93	49,983
	4	2.12	2.01–2.23	39,002
	5	2.33	2.21–2.45	28,472
	6	2.57	2.43–2.70	18,336
	7	2.76	2.61–2.92	8,709
<b>Cruciate-retaining, mobile bearing</b>	1	0.90	0.56–1.23	2,731
	2	1.30	0.88–1.72	2,242
	3	1.49	1.03–1.95	1,889
	4	1.72	1.21–2.22	1,523
	5	2.21	1.59–2.83	1,170
	6	2.51	1.80–3.22	751
	7	2.51	1.80–3.22	375

Stability and mobility	Years after primary replacement	Cumulative percentage revision (%)	95% confidence interval	Number at risk*
Posterior-stabilized, fixed bearing	1	1.05	1.00–1.11	127,592
	2	1.74	1.67–1.81	106,859
	3	2.22	2.14–2.30	86,741
	4	2.54	2.45–2.63	67,149
	5	2.83	2.73–2.94	48,290
	6	3.07	2.96–3.18	30,720
	7	3.32	3.19–3.45	14,349
	8	3.52	3.33–3.71	64
Posterior-stabilized, mobile bearing	1	1.46	0.79–2.13	1,178
	2	2.33	1.48–3.18	1,084
	3	4.10	2.95–5.25	962
	4	5.45	4.10–6.80	853
	5	5.91	4.49–7.33	766
	6	6.58	5.06–8.11	653
	7	7.45	5.76–9.15	379

**Note**

\* At the end of each time period.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

# Appendices

## Appendix A: Methodology notes for annual statistics

### Hospital statistics

#### Population reference period

Hip and knee replacements are based on data provided through the Discharge Abstract Database (DAD), Hospital Morbidity Database (HMDB) and National Ambulatory Care Reporting System (NACRS), reflecting procedures performed in both acute care inpatient and day surgery settings in Canada. For information about day surgery data, please refer to CIHI's [Emergency and Ambulatory Care web page](#).

*Canadian Classification of Health Interventions* (CCI) codes are used to identify hip and knee replacements. [Coding methodology for hip and knee replacements](#) (below) details the CCI codes for all hip and knee procedures included in this report.

Data is presented on a fiscal year basis from 2015–2016 to 2019–2020, with the main focus on 2019–2020 (April 1, 2019, to March 31, 2020). The number of replacements reported reflects the number of surgical episodes with a replacement within 1 hospitalization. For example, a simultaneous bilateral procedure within 1 episode of surgery is counted as 1 procedure. Procedures performed in different episodes of surgery within 1 hospitalization are counted individually.

#### Population age reporting

For the CJRR Quick Stats tables, only procedures performed on patients 18 and older were included. Note that less than 0.1% of all hip and knee replacement procedures were performed on patients younger than 18.

#### Geographic reporting

Jurisdictional analyses are based on where the procedure was performed, except for analyses involving age-standardized rates, which are based on a patient's province or territory of residence.

## Joint replacement hospitalization cost estimate

The hospitalization cost estimate for hip and knee replacements is calculated by multiplying the provincial or national Resource Intensity Weight (RIW) from the HMDB by the corresponding jurisdictional or national Cost of a Standard Hospital Stay (CSHS).

The RIW values are based on the 2020 CMG+ (Case Mix Group) grouping methodology. The CSHS values are retrieved from CIHI's [Your Health System: In Brief](#) web tool.

Note: The following records are excluded from the cost estimation:

- If 1 hospitalization contains both primary and revision replacement procedures
- If 1 hospitalization contains both hip and knee replacement procedures
- If the replacement type is unknown

Only typical cases are included. Typical cases represent the completion of a full course of treatment at a single hospital, while atypical cases fall into 1 of 4 categories: deaths, sign-outs, transfers and long-stay outliers.

The hospitalization cost estimates do not include the following: payments made to physicians, rehabilitation or amortization expenses on land, buildings and building service equipment.

The national inpatient physician cost estimates are based on billing data from 6 provinces (Nova Scotia, Ontario, Manitoba, Saskatchewan, Alberta and British Columbia) available in the Patient-Level Physician Billing Data Repository.

## Clinical statistics

The Canadian Joint Replacement Registry (CJRR) is a national registry that collects demographic, administrative, clinical and prosthesis information on hip and knee replacement procedures performed in Canada. As of 2019–2020, hip and knee replacement prosthesis data can be submitted via the DAD hospitalization abstract (Group 20), depending on the province.

The main diagnosis groups align with information collected in other arthroplasty registries. Diagnosis information is based on data captured in CJRR and the DAD and is obtained directly from the diagnosis group collected in CJRR or derived from the most responsible diagnosis in the DAD/HMDB or the main diagnosis in NACRS. For a list of ICD-10-CA codes used, email [cjrr@cihi.ca](mailto:cjrr@cihi.ca).

Reason for revision is obtained from Revision Reason collected in CJRR and the DAD. If this field has not been submitted, then it is derived from the most responsible diagnosis in the DAD/HMDB or the main diagnosis in NACRS. For a list of ICD-10-CA codes used, email [cjrr@cihi.ca](mailto:cjrr@cihi.ca).

## Population reference period

Tables sourced from CJRR present procedures based on surgery dates from April 1, 2019, to March 31, 2020 (fiscal year period).

Tables sourced from the DAD/HMDB and NACRS are based on discharge date or visit disposition date from April 1, 2019, to March 31, 2020 (fiscal year period).

## Hip and knee replacement with prosthesis coverage

As of April 1, 2018, hip and knee replacement with prosthesis information can also be submitted via the DAD in Group 20. In 2019–2020, the national-level coverage rate for hip and knee replacement with prosthesis was 73.5% of all replacement procedures performed in public acute care facilities across Canada. The coverage of hip and knee replacements with prosthesis data is based on the number of reported procedures in CJRR or the DAD (with Group 20 completed) compared with the number of procedures submitted to the DAD/HMDB and NACRS (when applicable) by each jurisdiction. In 2019–2020, the submission of hip and knee replacement with prosthesis was mandatory in Nova Scotia, Ontario, Manitoba and British Columbia. Submission is primarily voluntary in other provinces/territories.

## Coding methodology for hip and knee replacements in DAD/HMDB and NACRS for annual statistics

As of 2006–2007, all provinces and territories have adopted the *International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Canada* (ICD10CA) and the *Canadian Classification of Health Interventions* (CCI) as the coding standard for diagnoses and interventions.

For hip and knee replacements, CCI codes provide great specificity in the classification of partial versus total replacements.

Procedures coded as “abandoned” were excluded from analyses. Procedures coded as being performed out of hospital were also excluded to avoid double-counting cases.

Primaries were identified using a supplementary data element called a Status Attribute, where Status Attribute = P.

## Hip replacements

**Table A1a** CCI v2018 codes for hip replacements (1.SQ.53.^ ^ Implantation of internal device, pelvis)

Approach	Type of replacement	Description	Uncemented	Using bone autograft (uncemented)	Using bone homograft (uncemented)	Using combined sources of tissue (e.g., bone graft, cement/paste)	Using synthetic tissue (e.g., bone cement or paste)
Open approach	Partial	Prosthetic device, dual component (e.g., cup with protrusion ring or additional screw, plate fixation)	1.SQ.53.LA-PN	1.SQ.53.LA-PN-A	1.SQ.53.LA-PN-K	1.SQ.53.LA-PN-Q	1.SQ.53.LA-PN-N
		Prosthetic device, single component (e.g., cup)	1.SQ.53.LA-PM	1.SQ.53.LA-PM-A	1.SQ.53.LA-PM-K	1.SQ.53.LA-PM-Q	1.SQ.53.LA-PM-N

**Table A1b** CCI v2018 codes for hip replacements (1.VA.53.^ ^ Implantation of internal device, hip joint)

Approach	Type of replacement	Description	Uncemented	Using bone autograft (uncemented)	Using bone homograft (uncemented)	Using synthetic material (e.g., bone paste, cement, Dynagraft, Osteoset)	Using combined sources of tissue (e.g., bone graft, cement/paste)
<b>Open approach (direct lateral, posterolateral, posterior, transgluteal)</b>	Total	Dual component prosthetic device (femoral and acetabular)	1.VA.53.LA-PN	1.VA.53.LA-PN-A	1.VA.53.LA-PN-K	1.VA.53.LA-PN-N	1.VA.53.LA-PN-Q
	Partial	Single component prosthetic device (femoral)	1.VA.53.LA-PM	1.VA.53.LA-PM-A	1.VA.53.LA-PM-K	1.VA.53.LA-PM-N	1.VA.53.LA-PM-Q
	n/a	Cement spacer (temporary, impregnated with antibiotics)	n/a	n/a	n/a	1.VA.53.LA-SL-N	n/a
<b>Open anterior (muscle sparing) approach (anterolateral, direct anterior)</b>	Total	Dual component prosthetic device (femoral and acetabular)	1.VA.53.LL-PN	1.VA.53.LL-PN-A	1.VA.53.LL-PN-K	1.VA.53.LL-PN-N	1.VA.53.LL-PN-Q
	Partial	Single component prosthetic device (femoral)	1.VA.53.LL-PM	1.VA.53.LL-PM-A	1.VA.53.LL-PM-K	1.VA.53.LL-PM-N	1.VA.53.LL-PM-Q
	n/a	Cement spacer [temporary, impregnated with antibiotics]	n/a	n/a	n/a	1.VA.53.LL-SL-N	n/a

**Note**

n/a: Not applicable.

## Knee replacements

**Table A2a** CCI v2018 codes for knee replacements (1.VG.53.^.^ Implantation of internal device, knee joint)

Description	With synthetic material (e.g., bone paste, cement, Dynagraft, Osteoset)	Uncemented	With bone autograft	With bone homograft	With combined sources of tissue (e.g., bone graft, cement, paste)
Single component prosthetic device	1.VG.53.LA-PM-N	1.VG.53.LA-PM	1.VG.53.LA-PM-A	1.VG.53.LA-PM-K	1.VG.53.LA-PM-Q
Dual component prosthetic device	1.VG.53.LA-PN-N	1.VG.53.LA-PN	1.VG.53.LA-PN-A	1.VG.53.LA-PN-K	1.VG.53.LA-PN-Q
Tri component prosthetic device	1.VG.53.LA-PP-N	1.VG.53.LA-PP	1.VG.53.LA-PP-A	1.VG.53.LA-PP-K	1.VG.53.LA-PP-Q
Cement spacer (temporary) (impregnated with antibiotics)	1.VG.53.LA-SL-N	n/a	n/a	n/a	n/a
Partial component [e.g. tibial liner (insert) alone]	n/a	1.VG.53.LA-PR	n/a	n/a	n/a

**Note**

n/a: Not applicable.

**Table A2b** CCI v2018 codes for knee replacements (1.VP.53.^.^ Implantation of internal device, patella)

Description	Cemented	Uncemented
Single component [patella only] prosthetic device	1.VP.53.LA-PM-N	1.VP.53.LA-PM
Dual component [patellofemoral] prosthetic device	1.VP.53.LA-PN-N	1.VP.53.LA-PN

## Appendix B: Glossary for annual statistics

### **age-standardized rate**

Age standardization is a common analytical technique used to compare rates over time, since it takes into account changes in age structure across populations and time.

### **aseptic loosening**

Aseptic loosening is the loosening of the total joint without involvement of bacteria.

### **hip fracture (acute)**

Acute hip fracture refers to a new break of the upper end of the femur close to the pelvis.

### **hip replacement**

This surgery is performed to replace all or part of the hip joint with an artificial implant. The hip is essentially a ball-and-socket joint, linking the ball at the head of the thigh bone (femur) with the cup-shaped socket in the pelvic bone. A hip prosthesis is surgically implanted to replace the damaged bone within the hip joint.

### **knee replacement**

Knee joint replacement is surgery to replace a painful damaged or diseased knee joint with an artificial joint. The orthopedic surgeon makes a cut over the affected knee. The patella (kneecap) is moved out of the way, and the ends of the femur (thigh bone) and tibia (shin bone) are cut to fit the prosthesis. Similarly, the under-surface of the patella cap is often cut to allow for placement of an artificial component.

### **osteoarthritis**

Osteoarthritis refers to deterioration of the articular cartilage that lines a joint, which results in narrowing of the joint space and pain.

### **osteolysis**

An active process of bone breaking down and dissolving.

### **osteonecrosis**

In Greek, osteonecrosis means “death of bone,” often as a result of obstruction of its blood supply.

**poly wear**

Polyethylene wear. The patterns of poly wear include deformation, delamination, breakage, pitting, abrasion and third-body wear.

**primary replacement**

A primary replacement is the first replacement procedure, where the natural bone is replaced with an artificial joint prosthesis.

**revision**

Revisions are modifications to or replacements of an existing artificial hip or knee joint prosthesis/component. A revision procedure may be necessary when an existing old or worn-out hip or knee component needs to be removed and replaced with a new or improved prosthesis. This may include removing 1 or more hip or knee components as necessary.

# Appendix C: Methodology notes for revision risk curves

## Study population and data sources

- **For cumulative revision curves using hospitalization data:** Primary hip and knee replacement surgeries (total or partial) performed on patients age 18 and older in Canada, followed up to a maximum of 11 years
  - **Primary and revision surgeries:** Discharge Abstract Database, Hospital Morbidity Database and National Ambulatory Care Reporting System, 2009–2010 to 2019–2020
- **For cumulative revision curves using CJRR data:** Primary hip and knee replacement surgeries (total or partial) performed on patients age 18 and older from 3 provinces where CJRR submission is mandated (Ontario, Manitoba and British Columbia), followed up to a maximum of 8 years
  - **Primary surgeries:** Canadian Joint Replacement Registry, 2012–2013 to 2019–2020, and Discharge Abstract Database, 2019–2020
  - **Revision surgeries:** Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020
  - **Prosthesis characteristics:** Sourced from the International Prosthesis Library (IPL),<sup>ii</sup> downloaded on January 7, 2021
  - **GTIN product number:** Mapped to catalogue number based on Global Trade Item Number (GTIN) cross-reference tables from the following manufacturer websites:
    - [Zimmer-Biomet](#)
    - [Johnson & Johnson](#)
    - [Smith & Nephew](#)
    - [Stryker](#)

## Survival analysis

- Time from the primary replacement to the first revision for a revised joint event. For censored surgeries, time from primary replacement to in-hospital death or the end of the study period (March 31, 2020) was used.<sup>iii</sup>
- Stratified Kaplan–Meier survival analysis was used to estimate the survival curves, and the Cox proportional hazards model was used to compare different groups while adjusting for age, sex or cement fixation, as appropriate.
- The level of significance was set at 0.05 for all statistical tests.

ii. A standardized hip and knee arthroplasty product library owned by the International Society of Arthroplasty Registries. For more information, email [cjrr@cihi.ca](mailto:cjrr@cihi.ca).

iii. In-hospital death was identified using the DAD or NACRS.

## Unit of analysis

- 1 primary hip or knee joint replacement surgery

## Study outcome

- The cumulative percentage revision, also known as a joint replacement failure rate, is calculated as the probabilistic complement of the Kaplan–Meier survivorship function at the given time point, multiplied by 100.
- Cumulative percentage revision at 1 to 8 years is presented with 95% confidence interval at each year. Number of cases at risk by the end of each time period is also reported. The cumulative percentage revision is displayed until the number at risk for the group reaches 40.
- Hazard ratios for specific comparisons adjusted for age, sex and cement fixation, as appropriate, are presented with 95% confidence intervals and p-values. Analytical comparisons of revision rates using the proportional hazards model are based on all available data.

## Considerations

- The first occurrence of a revision surgery was identified by linkage to the primary surgery using encrypted health care number and the jurisdiction issuing the health care number, as well as a match for joint type (hip or knee) and replacement side (left or right). As such, surgeries with an invalid health care number or surgery side were excluded from the analysis.
- Patients who died during the primary replacement surgery were excluded from the analysis.
- Bilateral replacement patients are double-counted because different prostheses may be used for each side.
- The revision surgery could have been performed in any Canadian province or territory; however, each jurisdiction manages its own health care numbers, so any patient movements may result in slight under-reporting.
- Quebec does not provide CIHI with information on procedures done on individuals from out of province; thus any revision surgery done in Quebec following a primary surgery performed outside of Quebec for non-Quebec residents is not available for this analysis.
- This analysis assumes that the survivorship of a replacement on one side is independent from survivorship on the other side, even if performed on the same patient.
- Revisions done on the same day as the primary surgery were excluded from this analysis, as were revisions recorded as occurring earlier than the primary surgery.

- Re-revisions are not included, even though patients may have more than one revision on the same side.
- Only in-hospital deaths could be identified using the data sources for this analysis, which could potentially influence the results for the oldest age group more than for other groups. As a result, the true probability of revision may be under-estimated.

## Definitions for derived categories

### Bearing surface for total hip replacement

- For the bearing surface analysis, CJRR catalogue numbers submitted for the total hip replacements identified in the cohort were linked to the IPL, January 7, 2021.
- Bearing surface was determined as the material of the femoral head on the material of the acetabular articulating surface (the insert, if one existed; otherwise, the acetabular component).
  - Bearing surface materials were categorized as ceramic, metal, cross-linked polyethylene and non-cross-linked polyethylene.
  - A joint replacement’s bearing surface was considered missing if linkage to the IPL indicated
    - Missing bearing surface material for the femoral or acetabular articulating surface; and/or
    - More than one material for femoral or acetabular articulating surface identified.

### Monopolar hemiarthroplasty: Monoblock versus modular

- This information is collected in CJRR using the data element Primary Procedure Type.
- Among procedures identified as monopolar hemiarthroplasties, the following criteria were used:
  - If it had a femoral component but no femoral head, it was considered a **monoblock** monopolar hemiarthroplasty.
  - If it had a femoral component and a femoral head, it was considered a **modular** monopolar hemiarthroplasty.
  - If it did not have a femoral component, the procedure type was **unknown**. These were removed from the cohort for analyses examining the procedure type of partial hip replacements.

## **Fixation for hip replacement: Cement used versus cementless**

- This was determined based on cement information reported in CJRR and the intervention code in DAD.

## **Surgeon arthroplasty volume**

- This was determined as the number of hip replacements a surgeon performed in a fiscal year. It was dichotomized as low volume (fewer than 50 hip replacements a year) and high volume (50 or more hip replacements a year) based on the univariate distribution of the variable.

## **Knee stability**

- Stability can be determined from both the femoral component and the tibial insert; however, the stability of the insert is sufficient for determining stability of the construct. If the insert information was missing, stability of the femoral component was considered. Records where stability was other than minimally stabilized (cruciate-retaining) or posterior-stabilized, as well as those where stability information was not available, were excluded from the cohort for analyses examining the effect of stability.

## **Knee bearing mobility**

- Mobility can be determined from both the tibial component and the tibial insert; however, the mobility of the insert is sufficient for determining mobility of the construct. If the insert information was missing, bearing mobility of the tibial component was considered. Bearing mobility was classified into mobile (rotating, sliding, or rotating and sliding) and fixed. Records where mobility information was not available were excluded from the cohort for analyses examining the effect of knee bearing mobility.

## Appendix D: Text alternative for figures

### **Text alternative for Figure 1: Cumulative percentage revision for primary hip and knee replacement due to osteoarthritis, Canada, 2009–2010 to 2019–2020**

The cumulative percentage revision for primary hip and knee replacements due to osteoarthritis is plotted as 2 separate curves. The x-axis represents the number of years after primary replacement and ranges from 0 to 11 years. The y-axis represents the cumulative percentage revision and ranges from 0.0% to 5.0%. The curve for hip replacements shows a steep increase to around 1% quite close to the baseline (year 0). After that, there is a steady increase to 4.7% at 11 years. The curve for knee replacements shows an increase over time from 1.1% at year 1 to 4.7% at year 11. The table below the figure includes the related statistics.

#### **Sources**

Discharge Abstract Database, Hospital Morbidity Database and National Ambulatory Care Reporting System, 2009–2010 to 2019–2020, Canadian Institute for Health Information.

### **Text alternative for Figure 2a: Cumulative percentage revision for primary total hip replacement for men, by age (primary diagnosis of osteoarthritis), 2012–2013 to 2019–2020**

The cumulative percentage revision for each age group is plotted as a separate curve. The x-axis represents the number of years after primary replacement and ranges from 0 to 8 years. The y-axis represents the cumulative percentage revision and ranges from 0.0% to 4.0%. The 4 curves have a similar shape: a steep increase to around 1% quite close to the baseline (year 0). After that, the increase is quite flat. The curve for age 75 and older is higher than the curves for the other 3 age groups, with a more profound steep increase, to about 1.5% close to year 0. The table below the figure includes the related statistics.

#### **Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

### **Text alternative for Figure 2b: Cumulative percentage revision for primary total hip replacement for women, by age (primary diagnosis of osteoarthritis), 2012–2013 to 2019–2020**

The cumulative percentage revision for each age group is plotted as a separate curve. The x-axis represents the number of years after primary replacement and ranges from 0 to 8 years. The y-axis represents the cumulative percentage revision and ranges from 0.0% to 4.0%. 3 of the 4 curves (age groups younger than 55, 55 to 64 and 65 to 74) have a very similar shape: a steep increase to about 1% quite close to the baseline (year 0). The curve for age 75 and older is considerably higher than those for the other 3, with a more profound steep increase, to about 2%. After that, the increase is quite flat for all curves. Just after the

3-year mark, the 75 and older curve becomes closer to the others, and it overlaps with the first 2 younger groups after the 4-year mark, while the 65 to 74 curve starts to separate, becoming considerably lower. The table below the figure includes the related statistics.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

**Text alternative for Figure 3: Cumulative percentage revision for primary total hip replacement, by bearing surface (primary diagnosis of osteoarthritis), 2012–2013 to 2019–2020**

The cumulative percentage revision for each bearing surface (ceramic-on-XLPE, ceramic-on-ceramic and metal-on-XLPE) is plotted as a separate curve. The x-axis represents the number of years after primary replacement and ranges from 0 to 8 years. The y-axis represents the cumulative percentage revision and ranges from 0.0% to 4.0%. The 3 curves have a similar shape: a steep increase to around 1% quite close to the baseline (year 0). After that, the increase is quite flat. The table below the figure includes the related statistics.

**Notes**

XLPE: Cross-linked polyethylene.

Metal-on-non-XLPE is no longer being reported since this bearing surface is no longer widely used.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

**Text alternative for Figure 4: Cumulative percentage revision for primary hip replacement, by type of procedure (primary diagnosis of acute hip fracture), 2012–2013 to 2019–2020**

The cumulative percentage revision for each replacement type (total, monoblock monopolar, modular monopolar and bipolar hemiarthroplasty) is plotted as a separate curve. The x-axis represents the number of years after primary replacement and ranges from 0 to 8 years. The y-axis represents the cumulative percentage revision and ranges from 0.0% to 6.0%. All curves look very similar, with a steep increase to about 2% quite close to the baseline (year 0). After that, the increase is quite flat. The table below the figure includes the related statistics.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

**Text alternative for Figure 5: Cumulative percentage revision for primary partial hip replacement, by type of procedure (primary diagnosis of acute hip fracture, patients age 70 and older), 2012–2013 to 2019–2020**

The cumulative percentage revision for each hemiarthroplasty type (modular monopolar, monoblock monopolar and bipolar) is plotted as a separate curve. The x-axis represents the number of years after primary replacement and ranges from 0 to 8 years. The y-axis represents the cumulative percentage revision and ranges from 0.0% to 5.0%. The bipolar and modular monopolar curves look very similar, with a steep increase to just under 2% quite close to the baseline (year 0); after that, the increase is quite flat. The curve representing monoblock monopolar hemiarthroplasties is slightly higher than the other 2 curves. The table below the figure includes the related statistics.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

**Text alternative for Figure 6: Cumulative percentage revision for primary partial hip replacement, by femoral fixation (primary diagnosis of acute hip fracture, patients age 70 and older), 2012–2013 to 2019–2020**

The cumulative percentage revision for each of the 2 femoral fixation approaches, cemented and cementless, is plotted as a separate curve. The x-axis represents the number of years after primary replacement and ranges from 0 to 8 years. The y-axis represents the cumulative percentage revision and ranges from 0.0% to 5.0%. The curve for the cementless femoral fixation is higher and increases in a steeper manner shortly after the baseline (year 0). After that, the increase is quite flat for both curves. The table below the figure includes the related statistics.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

**Text alternative for Figure 7: Cumulative percentage revision for primary partial hip replacement, by femoral fixation and surgeon hip arthroplasty volume (primary diagnosis of acute hip fracture), 2012–2013 to 2019–2020**

The cumulative percentage revision for each of the 4 groups studied (cemented, 50+ hip arthroplasties a year; cemented, fewer than 50 hip arthroplasties a year; cementless, 50+ hip arthroplasties a year; cementless, fewer than 50 hip arthroplasties a year) is plotted as a separate curve. The x-axis represents the number of years after primary replacement and ranges from 0 to 8 years. The y-axis represents the cumulative percentage revision and ranges from 0.0% to 6.0%. The cemented curves (both 50+ and fewer than 50 arthroplasties) are considerably lower than the cementless curves. All 4 curves have a steep increase

shortly after the baseline (year 0); cemented curves reach just higher than 1%, while cementless ones are close to 2.5%. When comparing the cementless curves, the one for fewer than 50 is considerably higher than the 50+ one. The table below the figure includes the related statistics.

**Note**

Surgeon volume refers to the number of hip arthroplasties performed by the surgeon in a fiscal year.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

**Text alternative for Figure 8: Cumulative percentage revision for primary total and partial knee replacement, by type of procedure (primary diagnosis of osteoarthritis), 2012–2013 to 2019–2020**

The cumulative percentage revision for each knee replacement type (medial, lateral and patellofemoral partials, as well as total knee arthroplasties with and without patellar resurfacing) is plotted as a separate curve. The x-axis represents the number of years after primary replacement and ranges from 0 to 8 years. The y-axis represents the cumulative percentage revision and ranges from 0.0% to 12.0%. The total knee replacement curves are lower than the partial ones, with the total knee replacement with patellar resurfacing being the lowest. Near 2.5 years, the lateral unicompartmental curve is the highest. The patellofemoral curve has the steepest increase and after 2.5 years becomes the highest after overlapping the lateral curve. The table below the figure includes the related statistics.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

**Text alternative for Figure 9a: Cumulative percentage revision for primary total knee replacement for men, by age (primary diagnosis of osteoarthritis), 2012–2013 to 2019–2020**

The cumulative percentage revision for each age group is plotted as a separate curve. The x-axis represents the number of years after primary replacement and ranges from 0 to 8 years. The y-axis represents the cumulative percentage revision and ranges from 0.0% to 10.0%. The highest curve and the curve with the steepest increase is for the age group younger than 55. The other 3 curves almost overlap up until the 1-year mark, after which they start diverging, with the 75+ group being the lowest, followed by 65 to 74, then 55 to 64. The increase for those 3 curves is steady over time. The table below the figure includes the related statistics.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

**Text alternative for Figure 9b: Cumulative percentage revision for primary total knee replacement for women, by age (primary diagnosis of osteoarthritis), 2012–2013 to 2019–2020**

The cumulative percentage revision for each age group is plotted as a separate curve. The x-axis represents the number of years after primary replacement and ranges from 0 to 8 years. The y-axis represents the cumulative percentage revision and ranges from 0.0% to 7.0%. The 4 curves have a very similar shape, although they diverge shortly after year 1, with the exception of the age groups 65 to 74 and 75+, which almost overlap. The increase is steady over time. The highest curve is for the age group younger than 55, then 55 to 64, followed by 65 to 74, then 75+. The table below the figure includes the related statistics.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

**Text alternative for Figure 10: Cumulative percentage revision for primary total knee replacement, by stability and patella resurfacing (primary diagnosis of osteoarthritis), 2012–2013 to 2019–2020**

The cumulative percentage revision for each of the 4 groups studied (cruciate-retaining, no patella; cruciate-retaining, patella resurfaced; posterior-stabilized, no patella; posterior-stabilized, patella resurfaced) is plotted as a separate curve. The x-axis represents the number of years after primary replacement and ranges from 0 to 8 years. The y-axis represents the cumulative percentage revision and ranges from 0.0% to 5.0%. All curves have a similar shape, although they diverge slowly after year 1. The posterior-stabilized with no patella curve is highest and the cruciate-retaining with patella resurfaced curve is lowest. The cruciate-retaining with no patella and the posterior-stabilized with patella resurfaced curves almost overlap. The table below the figure includes the related statistics.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

**Text alternative for Figure 11: Cumulative percentage revision for primary total knee replacement, by stability and mobility (primary diagnosis of osteoarthritis), 2012–2013 to 2019–2020**

The cumulative percentage revision for each of the 4 groups studied (cruciate-retaining, mobile bearing; cruciate-retaining, fixed bearing; posterior-stabilized, mobile bearing; posterior-stabilized, fixed bearing) is plotted as a separate curve. The x-axis represents the number of years after primary replacement and ranges from 0 to 8 years. The y-axis represents the cumulative percentage revision and ranges from 0.0% to 9.0%. Both fixed curves (posterior-stabilized and cruciate-retaining) have a similar shape. The posterior-stabilized and mobile bearing curve is the highest and diverges significantly from all others after the 2-year mark. The table below the figure includes the related statistics.

**Sources**

Canadian Joint Replacement Registry (Ontario, Manitoba and British Columbia only), Discharge Abstract Database and National Ambulatory Care Reporting System, 2012–2013 to 2019–2020, Canadian Institute for Health Information.

**CIHI Ottawa**

495 Richmond Road  
Suite 600  
Ottawa, Ont.  
K2A 4H6  
**613-241-7860**

**CIHI Toronto**

4110 Yonge Street  
Suite 300  
Toronto, Ont.  
M2P 2B7  
**416-481-2002**

**CIHI Victoria**

880 Douglas Street  
Suite 600  
Victoria, B.C.  
V8W 2B7  
**250-220-4100**

**CIHI Montréal**

1010 Sherbrooke Street West  
Suite 602  
Montréal, Que.  
H3A 2R7  
**514-842-2226**

---

cihi.ca

24843-0821

