



CIHI
Snapshot
August 2020

Hip and Knee Replacements in Canada: CJRR Annual Statistics Summary, 2018–2019

This document summarizes the latest annual statistics on hip and knee replacements performed in Canada, which are among the top 3 inpatient surgeries performed annually.¹ Characteristics and trends are highlighted in terms of hospital use, types of joint surgeries, and revisions, including key findings on revision risk (all for patients age 18 and older). Data comes from the Canadian Joint Replacement Registry (CJRR) and from hospitalization and day surgery databases at the Canadian Institute for Health Information (CIHI).

The full range of statistics is presented in 2 companion products available on the [CJRR report page](#):

- *Hip and Knee Replacements in Canada: CJRR Quick Stats, 2018–2019*
- *Hip and Knee Replacements in Canada: CJRR Revision Risk Curves, 2018–2019*

Get more information [about CJRR](#).

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Key findings: Hospital statistics

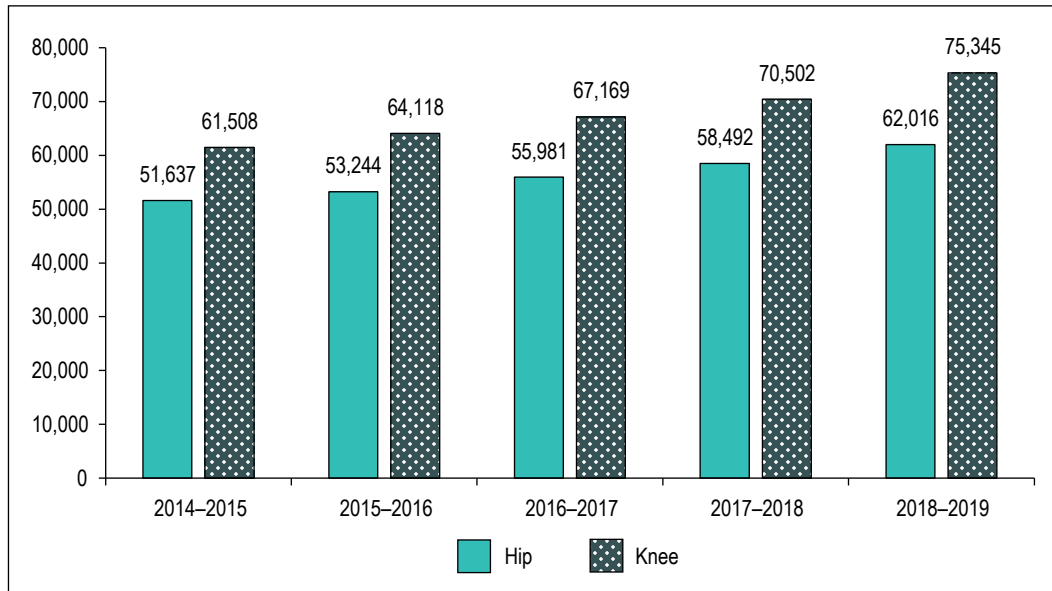
The demand for hip and knee replacements continues to increase, with over 137,000 surgeries and estimated inpatient costs of over \$1.4 billion annually in Canada.

- In 2018–2019 in Canada, 62,016 hip replacements and 75,345 knee replacements were performed. This represents volume increases of 20.1% and 22.5%, respectively, compared with 5 years earlier (Figure 1).
- Age-standardized hip replacement rates varied across the country, ranging from 144 per 100,000 population for Quebec to 223 per 100,000 population for Yukon. For knee replacements, the age-standardized rates ranged from 143 per 100,000 population for the Northwest Territories to 281 per 100,000 population for Saskatchewan (Figure 2).ⁱ
- Most patients were age 65 and older (65.7%). For hip replacements, the most common age group was 75 and older (37.2%). For knee replacements, it was age 65 to 74 (40.2%).
- More than half of the patients were women (58.1%). Among women having a hip replacement, more than 40% were over 75. Among men having a hip replacement, 30% were in this age group.
- The vast majority (99%) of hip and knee replacements required at least one overnight hospital stay. Day surgeries are slowly becoming more common — they increased by more than 4 times in the previous 5 years.
- The most common diagnosis for primary hip and knee replacement patients was degenerative arthritis (also known as osteoarthritis), at 73.1% and 99.3%, respectively. The average acute length of stay was just under 3 days.
- On average, in 2018–2019, a hip or knee replacement surgery had an estimated inpatient hospital and physician cost of over \$11,600 (excluding rehabilitation), representing more than \$1.4 billion spent annually on these surgeries.ⁱⁱ

i. Nunavut had a rate of 469 per 100,000 population; however, this rate is unstable due to small volumes.

ii. For details on how inpatient costs were calculated, refer to *Hip and Knee Replacements in Canada: CJRR Quick Stats, 2018–2019*. Estimated inpatient physician costs are based on billing data available from 5 provinces.

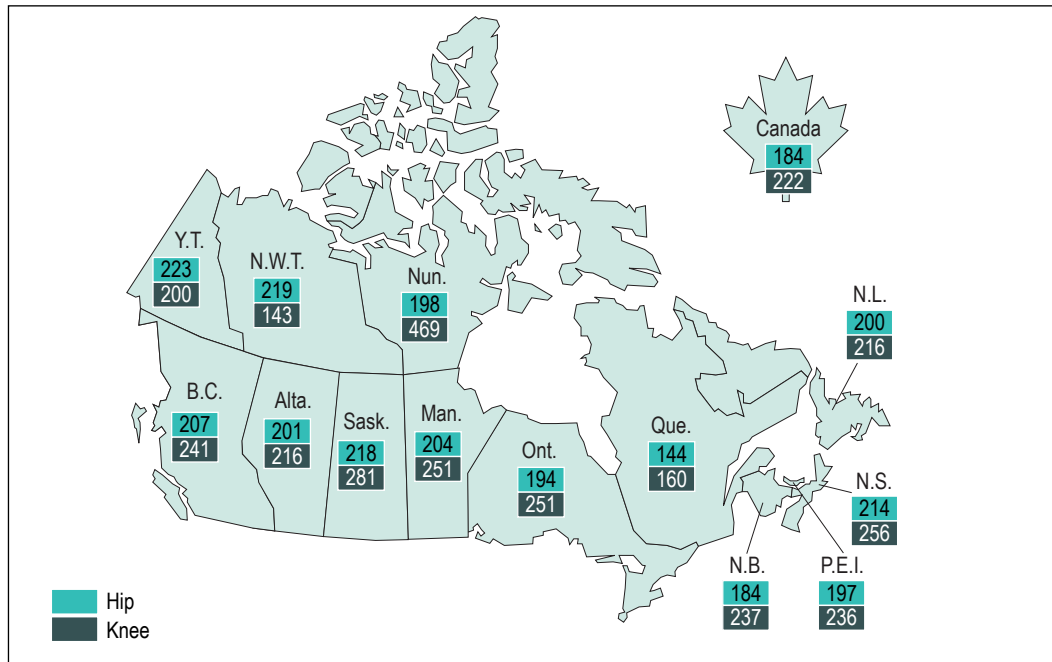
Figure 1 Total number of hip and knee replacements, Canada, 2014–2015 to 2018–2019



Sources

Discharge Abstract Database, Hospital Morbidity Database and National Ambulatory Care Reporting System, 2014–2015 to 2018–2019, Canadian Institute for Health Information.

Figure 2 Age-standardized rates for hip and knee replacements per 100,000 population, by jurisdiction, 2018–2019



Notes

Rates were based on patient residence.

The 2011 Canadian reference population (age 18 and older) was used for age standardization.

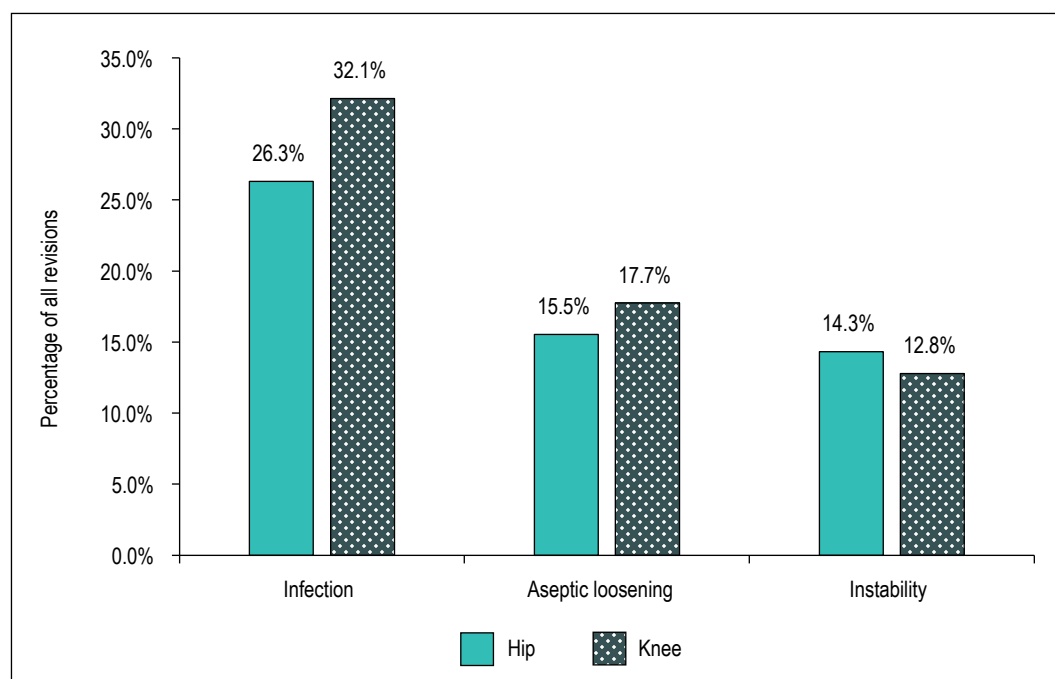
Sources

Discharge Abstract Database, Hospital Morbidity Database and National Ambulatory Care Reporting System, 2018–2019, Canadian Institute for Health Information.

Almost 10,000 hip and knee replacement revision (repeat) surgeries were performed in 2018–2019, translating to an estimated \$165 million in inpatient costs.

- In 2018–2019 in Canada, 7.3% of all hip and 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 surgery (8.7 days versus 3.9 days, respectively). Revision surgeries are typically more complex and require longer recovery time.
- The average inpatient hospital and physician cost for a revision surgery (excluding rehabilitation) was more than \$19,800 — close to 80% higher than the cost for a primary joint surgery (over \$11,000).
- The top 3 reasons for both hip and knee revisions were infection, aseptic loosening and instability (Figure 3). Revisions due to infection are primarily due to prosthetic joint infection, or infection in the area surrounding the prosthesis; this is also the most common reason for having a revision relatively soon after the primary surgery.²

Figure 3 Top reasons for hip and knee replacement revision, Canada, 2018–2019



Note

For details on how the top reasons were determined, refer to *Hip and Knee Replacements in Canada: CJRR Quick Stats, 2018–2019*.

Sources

Canadian Joint Replacement Registry, Discharge Abstract Database, Hospital Morbidity Database and National Ambulatory Care Reporting System, 2018–2019, Canadian Institute for Health Information.

Key findings: Revision risk analyses

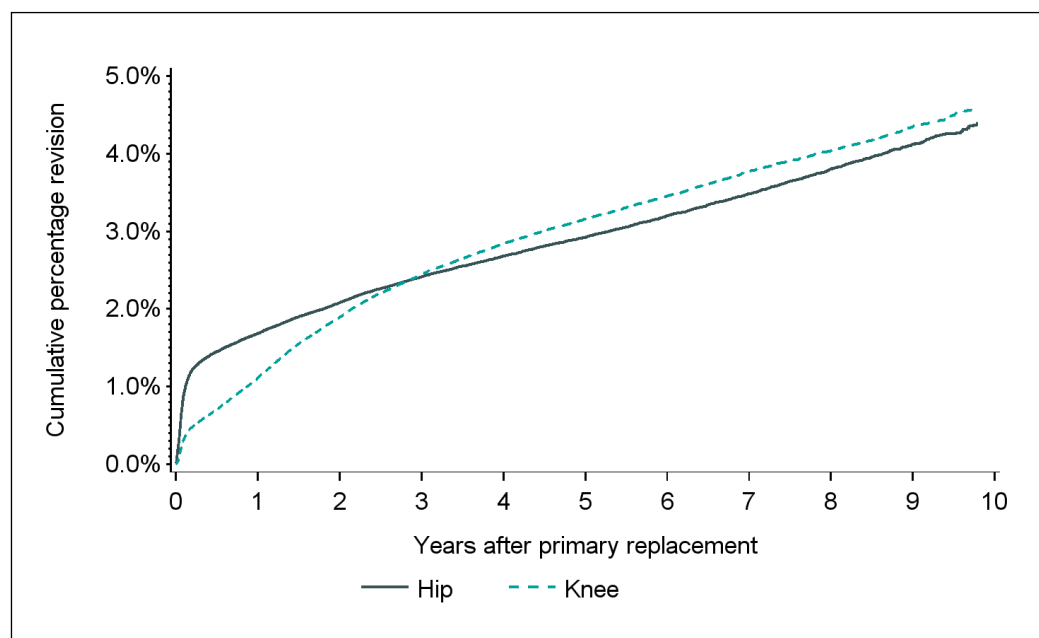
This section highlights the latest cumulative revision risk findings for hip and knee replacements performed in Canada up to 2018–2019. Cumulative percentage revision is presented using revision risk curves, which follow patients from the time of their primary surgery to revision within the specified time period. For all the figures and corresponding data tables, as well as details on the methodology used, refer to the companion document *Hip and Knee Replacements in Canada: CJRR Revision Risk Curves, 2018–2019*.

Regular reporting of revision risk based on Canadian data contributes to knowledge regarding the factors that contribute to a higher risk of revision (e.g., implant, surgical, patient), which can lead to more informed decisions to support better patient care. Comparing these findings with those from other international arthroplasty registries can also influence and shape clinical best practices for joint replacement patients around the world.^{3–5}

In Canada, the overall risk of having a revision 10 years after a hip or knee replacement (due to osteoarthritis) is around 4.5%.

- Based on hospitalization data from all jurisdictions, we included 858,716 primary surgeries and 24,332 subsequent revisions from 2012–2013 to 2018–2019.
- Overall revision risk at 1 year after primary surgery was higher for hip replacements than for knee replacements (1.7% versus 1.1%). At the 3-year mark, revision risk was similar at 2.4%. Following that, revision risk was higher for knees, with both curves following a similar pattern until the 10-year mark (Figure 4).
- Our findings for revision risk for primary procedures align with those from other international joint registries.^{3–5}

Figure 4 Cumulative revision risk for primary hip and knee replacements due to osteoarthritis, Canada, 2009–2010 to 2018–2019



Sources

Discharge Abstract Database, Hospital Morbidity Database and National Ambulatory Care Reporting System, 2009–2010 to 2018–2019, Canadian Institute for Health Information.

Table Data for Figure 4

Joint	Years after primary replacement	Cumulative percentage revision (%)	95% confidence interval	Number at risk*
Hip	1	1.68	1.64–1.73	271,328
	2	2.08	2.03–2.13	231,815
	3	2.42	2.36–2.47	194,510
	4	2.68	2.62–2.74	160,395
	5	2.92	2.86–2.99	128,054
	6	3.20	3.13–3.27	97,741
	7	3.49	3.40–3.57	70,424
	8	3.80	3.71–3.90	45,004
	9	4.12	4.01–4.23	21,779
	10	4.39	4.24–4.54	452

Joint	Years after primary replacement	Cumulative percentage revision (%)	95% confidence interval	Number at risk*
Knee	1	1.12	1.09–1.14	487,242
	2	1.90	1.86–1.93	417,631
	3	2.44	2.40–2.49	352,646
	4	2.84	2.79–2.89	292,250
	5	3.16	3.11–3.21	235,151
	6	3.45	3.40–3.51	180,136
	7	3.77	3.71–3.83	129,445
	8	4.04	3.97–4.11	82,489
	9	4.35	4.27–4.44	39,881
	10	4.57	4.47–4.68	842

Note

* At the end of each time period.

Sources

Discharge Abstract Database, Hospital Morbidity Database and National Ambulatory Care Reporting System, 2009–2010 to 2018–2019, Canadian Institute for Health Information.

Clinical findings based on CJRR data from the 3 provinces with mandated submission from 2012–2013 to 2018–2019 (Ontario, Manitoba and British Columbia) are highlighted below. This data included over 431,000 primary surgeries and almost 10,000 revisions.

- For **total hip replacements** due to osteoarthritis by bearing surface
 - In general, revision risk was similar after adjusting for sex and type of fixation. While metal-on-cross-linked-polyethylene (XLPE) was by far the most commonly used bearing surface (78.3% of total), 6-year revision risk was not significantly different when compared with 6-year revision risk for total hip replacements with ceramic-on-XLPE, ceramic-on-ceramic or metal-on-non-XLPE bearing surface.
 - We did observe a higher risk of revision at 6 years with metal-on-XLPE versus metal-on-non-XLPE for patients age 65 and older, with a 6-year revision risk of 2.80% versus 1.73%, respectively; however, it should be noted that the non-XLPE group is very small (2.8% of total) and that this material is no longer widely used due to availability. We will continue to study this finding, which differs from results reported by other international registries.^{3, 5}
- For **partial hip replacements** due to fracture
 - **Surgeon arthroplasty volume** and **type of femoral fixation** had an effect on revision risk. Surgeries with a cementless fixation had a higher risk compared with those with cemented fixation, after adjusting for age and sex (hazard ratio = 1.33 [1.11–1.61], $p = 0.002$). This finding was consistent regardless of surgeon volume. When cemented fixation was used, low-volume surgeons had more than 2 times the revision risk compared with high-volume surgeons after 1.5 years (hazard ratio = 2.23 [1.19–4.84], $p = 0.043$).

- For **knee replacements**

- **Type of procedure:** Partial knee replacement surgeries had a significantly higher risk of revision than total knee replacement surgeries, even after adjusting for age and sex.ⁱⁱⁱ For total knee replacements, revision risk at 6 years was significantly higher when the patella was not resurfaced compared with procedures with patella resurfacing, with 6-year revision risk of 3.57% versus 2.73%, respectively.
- **Stability:** Surgeries involving posterior-stabilized prostheses had a higher revision risk compared with those involving cruciate-retaining (or minimally stabilized) prostheses, regardless of whether the patella was resurfaced (2.97% versus 2.32%) or not (3.70% versus 3.11%). Infection was the most common reason for revision.
- **Mobility:** Knee replacements with both posterior-stabilized and mobile-bearing design had the highest 6-year revision risk, at 6.87%. For fixed-bearing designs, posterior-stabilized designs had a higher 6-year revision risk than cruciate-retaining prostheses, at 3.11% and 2.56%, respectively.

Conclusion

Hip and knee replacement surgeries continue to be in high demand and account for significant health system costs annually. Revision surgeries are a target area for improvement, with early revisions in particular having significant implications for both patients and health care systems, as shown in a recent CJRR report on early revisions.² This year's annual statistics summary also shows that the most common reason for having a hip or knee revision is infection, which is considered largely avoidable. 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.^{6, 7}

CIHI continues to work with jurisdictions to expand CJRR prosthesis coverage to 90% nationally so data is available to support medical device monitoring and procurement functions. Coverage as of 2018–2019 was 74.3%, which includes prosthesis data captured by CIHI's Discharge Abstract Database (an additional method of CJRR submission made available that year). Future CJRR statistics will reflect the impact of COVID-19 on elective hip and knee replacement surgery trends across the country.

CIHI also has a Patient-Reported Outcome Measures (PROMs) Program with a focus on hip and knee replacement surgeries. National standards (tools, time points, minimum data set) have been published by CIHI,⁸ and initial data collection and reporting are underway in Ontario, the first province to implement these standards; other provinces are considering adoption. CIHI is also co-leading an international hip and knee PROMs working group with the Organisation for Economic Co-operation and Development (OECD). For the first time, PROMs were included in the OECD's 2019 *Health at a Glance* report, including data from Manitoba and Alberta.⁹ Additionally, CIHI and the OECD co-published international guidelines supporting the future increased availability and comparability of hip and knee PROMs.¹⁰ Work is underway in Phase 2 of this international initiative to further increase the number of countries participating in the comparative analyses for the 2021 *Health at a Glance* report and to support collaborations with the International Society of Arthroplasty Registries (ISAR) in this area.

iii. Detailed results are presented in Figure 8 of *Hip and Knee Replacements in Canada: CJRR Revision Risk Curves, 2018–2019*.

Acknowledgements

CJRR Advisory Committee members

- Chair: Dr. Eric Bohm, Manitoba
- Co-chair: Dr. Michael Dunbar, Nova Scotia
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CJRR data is provided by ministries of health, regional health authorities and hospitals across Canada.

Appendix: Text alternative for figures

Figure 1: Total number of hip and knee replacements, Canada, 2014–2015 to 2018–2019

Joint	2014–2015	2015–2016	2016–2017	2017–2018	2018–2019
Hip	51,637	53,244	55,981	58,492	62,016
Knee	61,508	64,118	67,169	70,502	75,345

Sources

Discharge Abstract Database, Hospital Morbidity Database and National Ambulatory Care Reporting System, 2014–2015 to 2018–2019, Canadian Institute for Health Information.

Figure 2: Age-standardized rates for hip and knee replacements per 100,000 population, by jurisdiction, 2018–2019

Jurisdiction	Hip	Knee
Newfoundland and Labrador	200	216
Prince Edward Island	197	236
Nova Scotia	214	256
New Brunswick	184	237
Quebec	144	160
Ontario	194	251
Manitoba	204	251
Saskatchewan	218	281
Alberta	201	216
British Columbia	207	241
Yukon	223	200
Northwest Territories	219	143
Nunavut	198	469
Canada	184	222

Notes

Rates were based on patient residence.

The 2011 Canadian reference population (age 18 and older) was used for age standardization.

Sources

Discharge Abstract Database, Hospital Morbidity Database and National Ambulatory Care Reporting System, 2018–2019, Canadian Institute for Health Information.

Figure 3: Top reasons for hip and knee replacement revision, Canada, 2018–2019

Joint	Infection	Aseptic loosening	Instability
Hip	26.3%	15.5%	14.3%
Knee	32.1%	17.7%	12.8%

Note

For details on how the top reasons were determined, refer to *Hip and Knee Replacements in Canada: CJRR Quick Stats, 2018–2019*.

Sources

Canadian Joint Replacement Registry, Discharge Abstract Database, Hospital Morbidity Database and National Ambulatory Care Reporting System, 2018–2019, Canadian Institute for Health Information.

Figure 4: Cumulative revision risk for primary hip and knee replacements due to osteoarthritis, Canada, 2009–2010 to 2018–2019

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 10 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 4.39% at year 10. The curve for knee replacements shows an increase over time from 1.12% at year 1 to 4.57% at year 10.

Sources

Discharge Abstract Database, Hospital Morbidity Database and National Ambulatory Care Reporting System, 2009–2010 to 2018–2019, Canadian Institute for Health Information.

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10. Canadian Institute for Health Information, Organisation for Economic Co-operation and Development. [OECD Patient-Reported Indicator Surveys \(PaRIS\) Initiative: Patient-Reported Outcome Measures \(PROMs\) for Hip and Knee Replacement Surgery — International Data Collection Guidelines](#). 2019.



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