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Brief Communication

Trends in Cemented Fixation in Hemiarthroplasty for Hip Fractures in Canada

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ABSTRACT

Bacground: The use of cemented fixation is widely recommended in hip arthroplasty for hip fractures, although it is not used universally.
Methods: We describe the trends in cementing prevalence in hemiarthroplasty for hip fractures in Canada for patients ≥55 years old between April 2017 and March 2022.
Results: The national prevalence of cemented fixation increased from 43% in 2017/18 to 58% in 2021/22, but there was a large variety of both the baseline prevalence and the trends across the country and between individual hospitals. The proportion of surgeons only performing cementless fixation fell from 30% to 21% between 2018/19 and 2021/22.
Conclusions: As cemented fixation is now universally recommended, more coordination is needed to track these trends and to help drive implementation of this evidence-based practice across Canada.

Introduction

The use of cemented fixation is widely recommended in hip arthroplasty for hip fractures, for example, by the Canadian Orthopaedic Association's Choosing Wisely guidelines. [1,2] Although we know anecdotally that cemented fixation is not universally used in hemiarthroplasty, there is little data on the usage of cementing in Canada. In our era of long Canadian arthroplasty wait lists, it is essential to advocate for implementation of the lowest-risk procedures nation-wide. We intended to describe the trends in cement usage in hemiarthroplasty for hip fractures to evaluate efforts to implement evidence-based arthroplasty care in Canada.

Material and methods

This study included data from the Canadian Institute for Health Information Discharge Abstract Database (DAD) and National Ambulatory Care Reporting Systems (NACRS), which includes all outpatient and inpatient hospital visits from public hospitals in Canada outside of Quebec. DAD and NACRS include detailed information on patient diagnoses and procedures using the International Classification of Diseases, Tenth Revision, Canadian Adaptation, and the Canadian Classification of Health Interventions (CCI), respectively. We identified all patients ≥55 years old who had hemiarthroplasty (CCI 1.VA.53.LA-PM/1.VA.53.LL-PM and extend attribute M2/M1/MO/UN) for hip fractures (International Classification of Diseases, Tenth Revision, Canadian Adaptation S72.0/S72.10/S72.2/M80.05/M80.15/M80.25/M80.35/M80.45/M80.55/M80.85/M80.95/M84.35/M84.45) between April 2017 and March 2022 (the latest available data), but excluded patients with fractures that occurred in hospital (diagnosis type 2). We identified cemented fixation from the tenth digit of the CCI code (cementless, none/A/K; cemented, N/Q). We also identified the surgeon and hospital for each inpatient hemiarthroplasty and

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summarized the results according to these factors, province, and year (fiscal years running April-March). Canadian Institute for Health Information's privacy rules mandate the suppression or omission of results that could lead to reidentification of patients, surgeons, or hospitals. To avoid reidentification, which is most likely to occur for small cell sizes, we excluded hospitals without cemented fixation or with ≤10 hemiarthroplasties for hip fractures (20 in 2018/19; 22 in 2021/22) from the hospital-based analysis.

This study was approved by the University of Manitoba Research Ethics Board (HS25086/H2021:275).

Results

Overall, we identified 42,386 patients, of which about 67% were female, with a mean age of 82 years and a median length of hospital stay of 7 days. The national proportion of cemented fixation increased from 43% in 2017/18 to 58% in 2021/22 (Fig. 1A; Table 1), but there was a large variety of both the baseline proportion and the trends across the country. The proportion increased the most (+29 percent-point) in Manitoba, although only New Brunswick had a lower proportion (31%) in 2021/22. The other Atlantic provinces led the country in cementing. Saskatchewan was the only province to see a decrease in proportion (−2 percent-point). The 3 largest included provinces (BC, AB, and ON) all saw steady increases in proportion during this time period (9-17 percent-point).

There was a large variation in hospital proportion for cemented fixation in hip hemiarthroplasty, although both the mean and median hospital proportion increased for each province between 2018/19 and 2021/22 (Fig. 1B; Table 2). Newfoundland and Labrador had the highest median hospital proportion (86%) and Nova Scotia had the highest mean hospital proportion (86%) in 2021/22, whereas New Brunswick had the lowest (median 30%, mean 41%). The interquartile range increased the most for Saskatchewan (+43 percent-point) and was reduced in 5 provinces. The lowest hospital proportion increased in each province, most remarkably in Nova Scotia (+61 percent-point) and Newfoundland and Labrador (+25 percent-point).

The proportion of surgeons only performing cementless fixation fell from 30% to 21% between 2018/19 and 2021/22 (Fig. 1C; Table 3). This change was largest in Newfoundland and Labrador (−26 percent-point); the proportion increased in a single province: New Brunswick (+10 percent-point). Prince Edward Island had no surgeons performing only cementless fixation in either year. Nova Scotia, Newfoundland, and Labrador are the other provinces where <10% of surgeons still exclusively use cementless fixation.

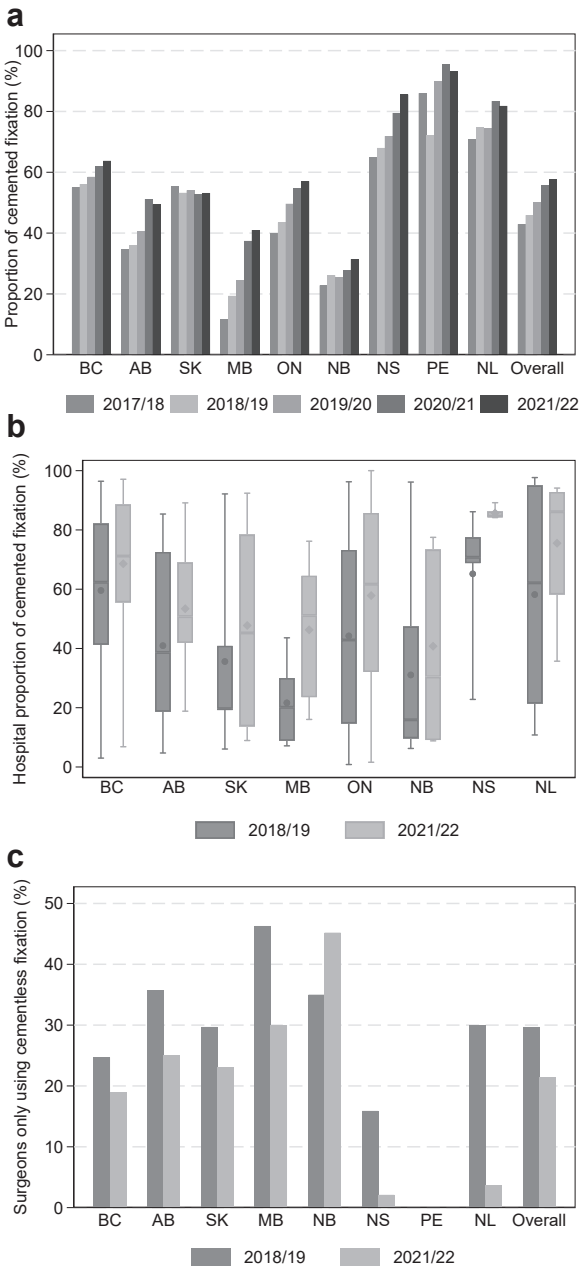

Figure 1. Femoral fixation in hemiarthroplasty for hip fractures in Canadian provinces except Quebec. (a) Cementing proportion over time. (b) Cementing proportion for hospitals: the dot is the mean, the box plot is the interquartile range with median, and the lines extend to minimum and maximum. This excludes hospitals without cemented fixation or with ≤10 hemiarthroplasties for hip fractures (20 in 2018/19; 22 in 2021/22). (c) Proportion of surgeons using only cementless fixation. This excludes Ontario, as it does not have a unique surgeon ID.

Discussion

We observed a 15 percent-point increase in cemented fixation in hemiarthroplasty for hip fractures in Canada over a 5-year period. Most provinces show similar increases, although trends are mostly flat in Saskatchewan and New Brunswick. There is also a large variation in cementing proportion between hospitals and individual surgeons, yet there is no easy direct link between these differences and differences in provincial proportion. This is likely due to the wide range of surgeon and hospital volume that is weighted differently depending on the unit of analysis, for example, patient vs surgeon level. This differential weighting can lead to counterintuitive results; for example, in New Brunswick, the overall proportion of cementing went up, but the percentage of surgeons only using cementless fixation went up as well. High-volume surgeons are likely contributing more cemented cases to increase the per-patient proportion without affecting the per-surgeon proportion. In Canada, there is an increased revision risk for cementless fixation, hazard ratio = 1.33 (95% confidence interval 1.16-1.55), and there is one additional revision at 5 years for approximately every 100 cementless hip fracture hemiarthroplasties. [3]

There is a paucity of data describing trends in fixation for hip fracture patients. The Canadian cementing proportion is close to what is reported in the United States; in a US integrated healthcare system, a cementing proportion of around 50% was reported between 2009 and 2017 in hemiarthroplasty for hip fractures. [4] A more recent report from the American Joint Replacement Registry, which included data up to 2021, showed slight increases in cementing proportion in the US to just under 50% in 2021 [5]. A German study reported that 86% of hemiarthroplasties for intracapsular hip fractures included

Table 1
Cementing proportion over time by province.

Province	2017/18	2018/19	2019/20	2020/21	2021/22
British Columbia (BC)	55.0	56.1	58.5	61.9	63.8
Alberta (AB)	34.6	35.9	40.5	51.2	49.5
Saskatchewan (SK)	55.4	53.3	54.1	52.6	53.2
Manitoba (MB)	11.5	19.4	24.6	37.4	41.0
Ontario (ON)	39.8	43.5	49.6	54.8	57.0
New Brunswick (NB)	22.8	26.1	25.4	27.8	31.5
Nova Scotia (NS)	64.9	68.0	71.9	79.5	85.6
Prince Edward Island (PE)	86.0	72.0	90.0	95.6	93.1
Newfoundland and Labrador (NL)	70.8	74.8	74.4	83.4	81.8
Overall	42.9	45.9	50.2	55.8	57.7

Table 3
Proportion of surgeons using only cementless fixation.

Province	Surgeons[a]	2018/19	2021/22
British Columbia (BC)	174	24.7	19.0
Alberta (AB)	114	35.7	25.0
Saskatchewan (SK)	38	29.7	23.1
Manitoba (MB)	41	46.3	30.0
New Brunswick (NB)	41	35.0	45.2
Nova Scotia (NS)	45[S]	15.9	S
Prince Edward Island (PE)	6	0.0	0.0
Newfoundland and Labrador (NL)	30[S]	30.0	S
Overall	493	29.7	21.4

This excludes Ontario, as it does not have a unique surgeon ID.
[a] Number of surgeons (average between both years); S = When the number of surgeons using only cementless fixation is less than 5, the exact value for the proportion is suppressed. For these provinces, the number of surgeons is rounded to the nearest multiple of 5.

cemented femoral fixation in 2019. [6] Although this is substantially higher than Canada's overall proportion of 58% in 2021/22, Prince Edward Island (93%) showed that achieving this proportion of cementing is feasible in Canada as well.

Although our study includes national data, data from Quebec, which houses close to a quarter of the Canadian population, was not included. We also did not have a unique surgeon ID in Ontario to report surgeon-specific metrics there, but the patient and hospital-level data still point to an increasing uptake in cemented fixation. The quality and completeness of the DAD and NACRS have consistently been very high, and it is unlikely that hip fractures are not included as reporting is mandatory in all provinces (except Quebec). It is possible that a few coding errors occurred in the tenth digit of the CCI used to identify the cemented fixation status. Because we report proportion on a provincial level, it is unlikely that these rare errors would affect any of the numbers reported in this study.

Conclusions

Cemented fixation in hemiarthroplasty for hip fractures is increasing in Canada, but the proportion and trends vary widely between provinces, institutions, and individual surgeons. As cemented fixation is now universally recommended, more coordination is needed to track these trends and to help drive implementation of this evidence-based practice across Canada.

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Conflicts of interest

C. H. Righolt is a paid employee of the Orthopaedic Innovation Center; receives research support from Pfizer Canada; receives institutional support from Smith & Nephew, DePuy, and Hit Innovation Technologies; and is a board/committee member of the Canadian Orthopaedic Association. E. R. Bohm is a paid consultant and speaker for Stryker; is an unpaid consultant of Orthopaedic Innovation Center; receives research support from DePuy, Smith & Nephew, Hip Innovation Technologies, Canadian Institutes for Health Research, Arthritis Society Canada, and Orthopaedic Innovation Center; receives financial/material support from Smith & Nephew and Orthopaedic Innovation Center; is an editorial/governing board member of the Canadian Joint Replacement Registry Advisory Committee; and is a board/committee member of the International Society of Arthroplasty Registries and the Canadian Arthroplasty Society. G. C. A. Wood is a Stryker speaker; receives research support from Stryker, Zimmer, and DePuy; is a member of the Canadian Joint Replacement Registry; and is the chair of the Canadian Orthopaedic Standards Committee. J. R. Werle is a speaker for Zimmer Biomet Inc., Depuy, and Johnson & Johnson

Table 2
Cementing proportion for hospitals by province.

Province	Year	Mean	Minimum	Lower quartile	Median	Upper quartile	Maximum
British Columbia (BC)	2018/19	59.6	3.0	41.3	62.3	82.1	96.4
	2021/22	68.6	6.8	55.6	71.2	88.6	97.1
Alberta (AB)	2018/19	41.0	4.7	18.7	38.7	72.6	85.4
	2021/22	53.4	18.8	41.9	50.8	69.0	89.1
Saskatchewan (SK)	2018/19	35.6	6.1	19.2	19.7	40.9	92.2
	2021/22	47.8	8.9	13.8	45.2	78.4	92.4
Manitoba (MB)	2018/19	21.7	7.1	8.9	20.1	30.0	43.6
	2021/22	46.3	16.1	23.5	51.1	64.6	76.2
Ontario (ON)	2018/19	44.2	0.8	14.7	42.9	73.2	96.3
	2021/22	57.9	1.6	32.1	61.7	85.7	100.0
New Brunswick (NB)	2018/19	31.1	6.3	9.7	15.9	47.4	96.2
	2021/22	40.8	8.8	9.1	30.4	73.3	77.5
Nova Scotia (NS)	2018/19	65.2	22.8	68.8	70.8	77.5	86.1
	2021/22	85.7	84.2	84.4	84.6	86.2	89.2
Newfoundland and Labrador (NL)	2018/19	58.2	10.8	21.4	62.2	95.0	97.7
	2021/22	75.5	35.7	58.2	86.1	92.8	94.1

This excludes hospitals without cemented fixation or with $\leq$10 hemiarthroplasties for hip fractures (20 in 2018/19; 22 in 2021/22).

and is a board/committee member of the Canadian Arthroplasty Society.

For full disclosure statements refer to https://doi.org/10.1016/j.artd.2024.101441.

CRediT authorship contribution statement

Christiaan H. Righolt: Writing – original draft, Visualization, Project administration, Investigation. **Gavin C.A. Wood:** Writing – review & editing, Methodology, Investigation, Conceptualization. **Jason R. Werle:** Writing – review & editing, Methodology, Investigation, Conceptualization. **Eric R. Bohm:** Writing – review & editing, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Data curation, Conceptualization.

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