

Associations between provider and hospital volumes and postoperative mortality following total hip arthroplasty in New Brunswick

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Background

Several international studies have reported links between hospital and/or surgeon caseloads and the risk of death after total hip arthroplasty (THA) surgery; with those having higher caseloads producing fewer deaths. The only Canadian studies on this issue were based in Ontario and found no links in this relationship. Here, we sought to describe associations between postoperative deaths following THA and provider caseload volume, adjusted also for hospital volume, in New Brunswick, Canada.

NB-IRDT

All analyses were conducted in the New Brunswick Institute for Research, Data, and Training (NB-IRDT). NB-IRDT is a research institute at the University of New Brunswick that was established in 2015 through collaboration with several provincial government departments. NB-IRDT provides a central location for researchers to access and link provincial health-related and other datasets, including anonymized patient records, as well as clinical and administrative databases, such as the provincial cancer registry.

Methods

Our analyses are based on hospital discharge abstracts linked to vital statistics (to determine time of death) and to citizen registry data (to determine age and other patient characteristics). We measured all known admissions for THA in New Brunswick between January 1, 2007 and December 31, 2013.

We defined surgeon caseload as the total number of THAs performed over the previous two years. We also dichotomised hospitals into categories of relatively “high” and “low” volume as follows: the four small/medium hospitals were categorized as low, and the four large hospitals were categorized as high.

We used logistic regression models to identify the odds of dying within 30 and 90 days according to surgeon caseload, while controlling for selected personal and contextual characteristics.

Characteristics of patients admitted for total hip arthroplasty at low and high volume hospitals in New Brunswick (2007-2013)

Characteristic	Admitted to low volume hospitals	Admitted to high volume hospitals
Admissions (n)	1,490	5,605
Mean patient age (years)		
male	68.6	68.0
female	75.1	73.6
Male patients (%)	40.6	39.4
Admission status (%)		
elective	62.1	63.4
urgent	37.9	36.6
Comorbidity (%)		
none (0)	85.9	84.6
mild (1-2)	8.1	8.5
moderate to severe (3-4)	3.0	3.5
missing/not applicable	3.0	3.5
Community size classification (%)		
city (population 100,000 – 499,999)	0.0	43.9
small town (population 10,000-99,999)	54.0	17.0
rural area (population <10,000)	46.0	39.2
Neighbourhood income quintile (%)		
lowest	24.5	18.0
medium-low	22.5	18.3
middle	19.5	20.3
medium-high	17.1	22.9
highest	16.4	20.5

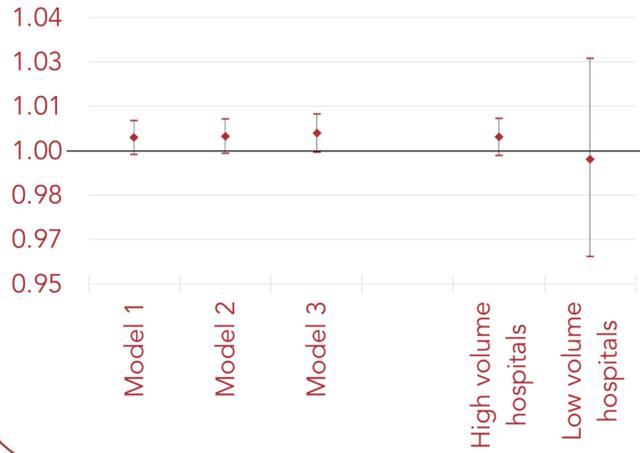
Summary of findings

- Approximately 7,095 patients were admitted for THR in New Brunswick over the seven-year period. Of those patients, 170 died within 30 days.
- Both high and low volume hospitals received approximately equal distributions of elective and urgent cases, as well as similar case mixes.
- We found no links between surgeon caseload and death after surgery. Hospital caseloads had no effect on this association.
- Patients admitted as urgent cases, and with severe comorbidities, had somewhat higher odds of dying when admitted to a low volume hospital compared to those admitted to a high volume hospital; otherwise, there were no substantial differences in outcomes between the high and low volume hospitals.

Characteristics of hospitals with relatively low and high volumes in New Brunswick (2007-2013)

Characteristic	Low volume hospitals	High volume hospitals
Hospitals (n)	4	4
Providers (n)	19	33
Annual hospital volume (mean)	57.4	213.5
Annual provider caseload (mean)	22.2	53.8
30-day mortality (%)	2.4	2.5
Elective patients (%)	0.5	0.6
Urgent patients (%)	5.3	5.9

Odds ratios and 95% confidence intervals for provider volume and 30-day postoperative mortality following total hip arthroplasty



- Model 1:** adjusted for age, sex, admission category (urgent/elective), and patient comorbidity level.
- Model 2:** as above, plus adjusted for neighbourhood income quintile and community size.
- Model 3:** as above, plus adjusted for hospital mean annual THA volume
- High volume hospitals:** same as Model 2; restricted to procedures in high volume hospitals
- Low volume hospitals:** same as Model 2; restricted to procedures in low volume hospitals

Conclusions

Our results suggest that patients admitted for hip replacements in New Brunswick can expect the same chances of dying whether they are admitted to see a surgeon with relatively high or low THA caseload, or whether they are admitted to one of the province’s larger or smaller hospitals.