Predictors of long-term opioid use in senior patients following hip and knee arthroplasty: a retrospective cohort study

Johnson A[1], Milne B[2], Pasquali M[3], Jamali N[4], Mann S[4], Gilron I[5], Moore K[6], Graves E[7], Parlow J[8],

[1]Department of Public Health Sciences, Queen's University, [2]Department of Anesthesiology and Perioperative Medicine, Queen's University, [3]Queen's University & Western University, [4]Queen's University & McGill University, [4]Division of Orthopedic Surgery, Queen's University, [5]Department of Anesthesiology and Perioperative Medicine, Queen's University [6]Department of Emergency and family Medicine, Queen's University, and Chief Medical Officer of Health for Ontario, [7]Institute for Clinical Evaluative Sciences, [8]Department of Anesthesiology and Perioperative Medicine, Queen's University,

BACKGROUND

- Many senior patients present for joint replacement surgery; in 2018-2019, every 2/3 patients undergoing hip/knee arthroplasty were over the age of 65 in Canada[1]
- Long-term opioid dependence is the one of the most common post-surgical complications[2]
- Most studies examining the relationship between preoperative opioid use and patient factors on postoperative use have been set in private healthcare systems, have had small cohorts, excluded knee and hip surgery, or have not focused on senior patients[3-6]

OBJECTIVES

- To describe the duration and incidence of opioid use in senior patients (aged ≥66 years) in the 90 days prior to and one year following total hip or knee replacement surgery
- To examine the impact of preoperative opioid use and other patient characteristics on chronic postoperative opioid use.

METHODS

Study Design: A historical cohort study to evaluate postoperative opioid use in patients >65 years undergoing primary total hip and knee replacement over a ten-year period from 1 April 2006 to 31 March 2016, using linked de-identified Ontario administrative data.

Outcome Variable: Duration of postoperative opioid use

- Undocumented (0 days)
- Early opioids (1-90 days)
- Prolonged opioids (91-180 days)
- Chronic opioids (181-360 days)

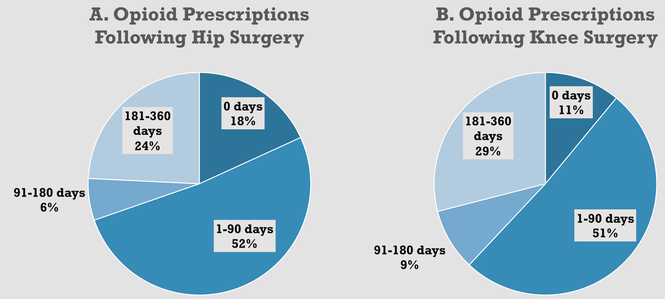
Statistical Analysis:

- Bivariate tests: comparing patients with vs. without chronic opioid prescriptions
- Multivariable logistic regression: relationship between exposure variables and outcome variable

Descriptive Analysis: Opioid prescriptions filled after surgery and population

Statistical Software: SAS (version 9.2)

Figure 1: Duration of opioid prescriptions following hip (A; N=49,638) and knee (B; N=85,558) arthroplasty



KEY FINDINGS

- Population characteristics:
  - Hip surgery (n=49,638): mean age of 75.0; 35% female
  - Knee surgery (n=85,558): mean age of 74.1; 36.3% female
- 17.8% of hip and 20.5% of knee surgery patients were non-opioid naive
- Preoperative opioid use was not predictive of chronic postoperative use
- Residence in a Long-Term Care (LTC) facility was the most predictive factor of chronic use (p<0.05)
  - Other predictors: female sex, living in urban areas, higher Charlson comorbidity index score, low-income quintile, COPD

Table 1: Predictors of chronic opioid prescriptions (181-360 days)

Variable	Hip surgery		Knee surgery	
	Odds Ratio (95% Confidence Interval)	P-value*	Odds Ratio (95% Confidence Interval)	P-value*
Residence in Long Term Care Facility	2.635 (1.933, 3.592)	<0.001	2.456 (1.751, 3.447)	<0.001
Female Sex (vs. Male Sex)	1.333 (1.273, 1.396)	<0.001	1.258 (1.217, 1.300)	<0.001
Urban (vs. Rural)	1.122 (1.050, 1.199)	0.001	1.139 (1.085, 1.196)	<0.001
Age at index	1.008 (1.004, 1.012)	<0.001	0.995 (0.992, 0.997)	<0.001
Teaching (vs. Community) Hospital	1.002 (0.951, 1.055)	0.946	0.993 (0.955, 1.032)	0.722
Socioeconomic Status**				
Income quintile 2 vs. 1	0.866 (0.805, 0.932)	<0.001	0.900 (0.855, 0.947)	<0.001
Income quintile 3 vs. 1	0.825 (0.767, 0.887)	<0.001	0.839 (0.797, 0.883)	<0.001
Income quintile 4 vs. 1	0.764 (0.710, 0.821)	<0.001	0.772 (0.733, 0.813)	<0.001
Income quintile 5 vs. 1	0.705 (0.656, 0.757)	<0.001	0.704 (0.669, 0.741)	<0.001
Charlson Comorbidity Index Score***				
Charlson score 1 vs 0	1.349 (1.269, 1.435)	<0.001	1.158 (1.110, 1.207)	<0.001
Charlson score 2 vs 0	1.445 (1.306, 1.597)	<0.001	1.301 (1.214, 1.394)	<0.001
Charlson score ≥3 vs 0	1.985 (1.717, 2.295)	<0.001	1.461 (1.306, 1.635)	<0.001
Other Comorbidities				
Diabetes	1.033 (0.935, 1.141)	0.525	1.058 (0.991, 1.128)	0.091
Chronic Obstructive Pulmonary Disease (COPD)	1.546 (1.389, 1.721)	<0.001	1.437 (1.322, 1.562)	<0.001
Peripheral Vascular Disease	1.156 (0.955, 1.399)	0.829	1.139 (0.908, 1.429)	0.260

*Odds ratio, 95% confidence intervals, and p-value reported from multivariable logistic regression with significance indicated when p<0.05
**Income quintile range: 1 (lowest) to 5 (highest)
***The Charlson Comorbidity Index Range: 0 (no comorbidities found) to 6 (highest likelihood that predicted outcome of comorbidity will result in mortality or higher resource use)

DISCUSSION

- Proportion of patients who had been prescribed opioids prior to hip and knee surgery has ranged between 6.2% - 87.1% in other studies vs. 19.5% in this study[3,6]
  - Other studies show variations in proportion of opioid-naive patients who became chronic users postoperatively[3, 5, 6, 7]
  - Variations likely due to different study designs and definitions
- Residence in LTC facility was the strongest predictor of chronic opioid use; however, LTC residents have higher likelihood of other risk factors (comorbidities, urban areas, female sex, etc.)[9]

Strengths:

- ICES databases → large sample size and inclusion of a variety potential risk factors for chronic postoperative opioid use
- Prescriptions filled as measure of opioid use → no measurement bias

Limitations:

- Cohort consists only of senior patients → results not generalizable to younger populations
- Prescription data collected → actual intake and dosing of prescribed preoperative opioids not known

CONCLUSION & FUTURE IMPLICATIONS

- This study shows multiple factors impact chronic opioid use in senior patients, with LTC residency being the greatest predictor
- Effective strategies should be used to reduce the long-term prescription of opioids in the postsurgical care of patients possessing these factors, especially LTC residents
  - Strategies include opioid reduction policies and education at the surgical care, primary physician, and LTC levels on patient factors that increase risk of chronic opioid use
  - This study forms the basis for prospective quality improvement research evaluating the effectiveness of these strategies

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