The effect of opioid use on sick leave among patients with osteoarthritis, undergoing joint replacement: A propensity score adjustment approach

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Objectives

Estimating the causal impact of opioids on outcomes such as the number of sick leave days is associated with potentially substantial endogeneity issues. Individuals in pain, are less likely to work because they are in pain and opioids are used to treat pain.

In order to estimate the impact of opioids themselves, these endogeneity issues must be solved. One method to estimate causal effects in observational data is adjusting for the propensity score (PS), which is the probability of treatment assignment[1].

This study aims to estimate the impact of high-dose opioid use on sick leave among patients with osteoarthritis (OA) undergoing joint replacement, adjusting for endogeneity through PS.

Methods

This was a non-interventional observational study using the Swedish Patient, Prescription Drug and sick leave registers in patients with hip/knee OA and a hip/knee joint replacement between 2011 and 2014.

High-dose opioid use was defined as being dispensed ≥4500 oral morphine equivalents (OMEQ)[2] (binary variable) during the exposure period from one month to one year after surgery (see Figure 1 for a study schematic).

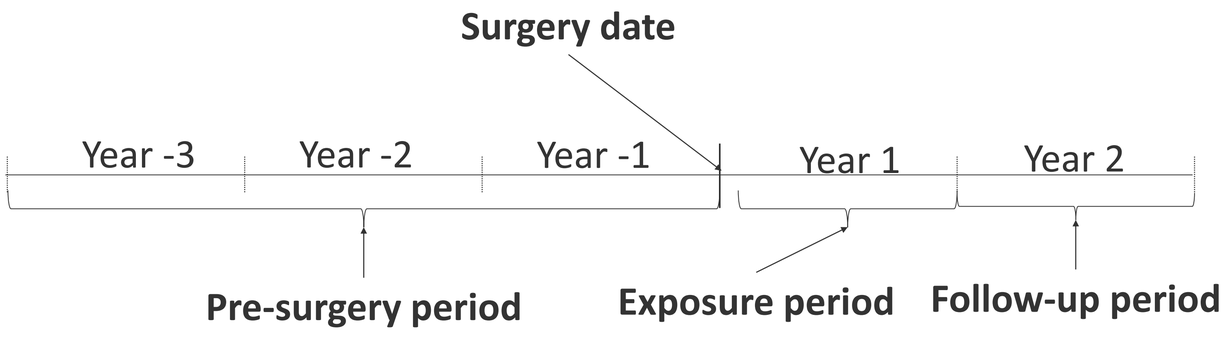

Figure 1. Study schematic

The outcome variable was the number of sick leave days in the year following the end of the exposure period.

A PS model was estimated including age and sex at surgery, comorbidities (Elixhauser index and chronic pain related diagnoses), NSAID and opioid use measured during three-year pre-surgery.

Two linear regression models were run to estimate treatment effects, one naïve model regressing sick leave on opioid use, and one model also including the PS.

Results

In total 19,901 patients were identified. The mean age at surgery was 53.6 years, 47% were male and 10% (N = 2,120) were dispensed ≥4500 OMEQs (cases) (Table 1). The cases also presented with more comorbidities, higher opioid use and lower NSAID use than controls. An individual-level propensity score was constructed based on the variables in Table 1.

Table 1. Patient characteristics at time of surgery

	All patients (N = 19,901)	Controls (N = 17,781)	Cases (N = 2,120)
Age at surgery*	53.6 (5.7)	53.6 (5.7)	54.1 (5.8)
Males^	9,415 (47%)	8,490 (48%)	925 (44%)
Elixhauser comorbidity score*	0.68 (1.05)	0.70 (1.07)	0.52 (0.88)
Chronic pain related diagnosis^	7,801 (39%)	7,153 (40%)	648 (31%)
Total DDD – NSAIDs*	177 (317)	177 (318)	179 (314)
Total OMEQ - opioids*	3,573 (12,896)	3,363 (11,826)	5,330 (19,617)

^ Categorical variable presented with n(%). * Continuous variable, presented with mean (SD)

In the naïve linear model without adjusting for the propensity score, (Table 2) opioid use was associated with 7.3 more sick leave days (95% CI: 5.2-9.4).

When adding the individual-level PS as a control variable in the regression, use of opioids was associated with 6.9 fewer days on sick leave (95% CI: -10 - -3.7).

Table 2. Treatment effects in linear model

Model	Naïve model		With PS	
	Beta	95% CI	Beta	95% CI
≥4500 OMEQ	7.3	5.2 – 9.4	-6.9	-10 - -3.7

Conclusion

Endogeneity when studying the impact of opioids on sick leave is a potential large issue as being in pain will led to higher sick leave as illustrated by the naïve model.

When attempting to control for these endogeneity issues to isolate the impact of opioids alone, the coefficient changed by 14.2 sick leave days and the treatment sign switched.

These results can be interpreted as there exists a group of patients in which opioid treatment is well-managed and increase the ability to work.

References

1. Rosenbaum, P. R., & Rubin, D. B. (1983). The Central Role of the Propensity Score in Observational Studies for Causal Effects. Biometrika, 70(1), 41–55.
2. Svendsen, K et. al, (2012). Differential patterns of opioid use: defining persistent opioid use in a prescription database. Eur J Pain, 16, 359-369

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