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Risk of and Risk Factors for Chronic Opioid Use Among Opioid-Naïve Patients with Newly Diagnosed Musculoskeletal Pain in the Neck, Shoulder, Knee, and/or Low Back

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Abstract

Background.—Musculoskeletal pain is a common condition, raising the concern these patients may transition to chronic opioid use. However, the incidence of and risk factors for chronic opioid use among patients with new musculoskeletal pain are not fully understood.

Objective.—To characterize the incidence and risk factors of chronic opioid use among opioid-naïve patients with newly diagnosed musculoskeletal pain in the knee, neck, low back, and/or shoulder.

Methods and Findings.—The IBM® MarketScan® database provide health care utilization data for patients receiving private insurance through a participating employer or government organization. Compared to the general United States (US) population, the MarketScan® population is slightly more female and from the southern US, and less likely to come from the western US.(1) Using this data, we identified 518,195 privately insured, cancer-free, and opioid-naïve (no filled opioid prescriptions in the year prior to diagnosis) adults ages 18–64 diagnosed with non-trauma related musculoskeletal pain between January 1, 2008 and December 31, 2014 and who remained

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Data sharing: The study protocol and computer code used for analysis are available from the authors on request. As an alternative to providing a de-identified data set to the public domain, we currently allow access for the purpose of re-analyses or appropriate follow-up analyses by any qualified investigator willing to sign a contract with the host institution limiting use of data without direct PHI/PII identifiers, in accordance to HIPAA regulations, and with a 15-day manuscript review for compliance purposes. For access to the data, interested parties can contact the study PI, Dr. Mark Cullen, at mrcullen@stanford.edu.

continuously enrolled for the year before and after the initial diagnosis. Since musculoskeletal pain can have varying levels of severity, we restricted our analysis to patients with pain severe enough to result in a second outpatient visit or emergency room visit for musculoskeletal pain within 30 days of the initial diagnosis date.(2) We excluded 6,036 patients with missing opioid data and 100,138 patients with conditions that could be confused for musculoskeletal low back pain (nephrolithiasis, urinary tract infection, osteomyelitis, cholecystitis, osteoporosis, cauda equina syndrome, and osseous defect), resulting in a final sample of 412,021 patients.

We defined chronic opioid use as filling 10 prescriptions or 120 days supply of the following opioids between 91–365 days after the initial diagnosis: hydrocodone, hydromorphone, methadone, morphine, oxycodone, and oxycodone. We then estimated the annual incidence of chronic opioid use and used multivariable logistic regression to characterize the association between chronic opioid use and the following risk factors: pain region or multiple sites (pain in >1 region), age, sex, medical comorbidity severity using the van Walraven score (3), opioid use in the 90 days following diagnosis, and use of benzodiazepines, antidepressants, antipsychotics, or gabapentin/pregabalin in the year prior to diagnosis. Our choice of risk factors and definition of chronic opioid use were based on previous work (4).

Our sample had 209,391 (51%) males and the average age was 45 (s.d. 12) years. For the entire sample period, the annual unadjusted risk of chronic opioid use was: 0.43% neck, 0.3% (shoulder), 0.3% (knee), 1.4% (low back), and 1.5% (multiple sites), with knee pain, low back pain, and multiple-site pain decreasing during the sample period ($p<0.001$; Figure 1). The adjusted absolute risk (AAR) for chronic opioid use across our sample was 0.31% (95%CI 0.29 to 0.33). We identified several risk factors, most notably anatomical location (e.g., low back and multiple site pain) and opioid use within 90 days of diagnosis (Table 2).

Discussion.

The risk of chronic opioid use ranged from 0.3% for knee pain to 1.5% for multiple site pain and decreased for some anatomical regions between 2008 – 2014, suggesting recent efforts to reduce opioid use have had some success. However, other studies have found increases in opioid use (5), albeit using alternative populations, time periods, and outcomes (e.g., overdose deaths). Study limitations include: (1) being restricted to privately insured patients, thereby excluding other policy-relevant populations (e.g. Medicaid), (2) “opioid-naïve” patients may have used opioids in ways not captured in the data (e.g., illegal use or use prior to the year before diagnosis), (3) while we assumed that a second visit for pain indicates severity, it could also indicate anxiety or patient dissatisfaction, and (4) patients may have experienced musculoskeletal pain for a long period prior to diagnosis. In sum, our data suggest the risk for chronic opioid use among musculoskeletal pain patients has declined, and point to some measures (i.e., avoiding early opioid use post-diagnosis) to further reduce this risk, particularly among patients with the risk factors identified here (e.g. low back and multiple pain sites). Patients with these risk factors should be closely followed and may benefit from involvement of a non-pharmacological provider such as a physical therapist or chiropractor.

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Figure 1.

Risk of Chronic Opioid Use Among Opioid-Naïve Patients with Newly Diagnosed Musculoskeletal Pain, 2008–2014

Data Source: IBM® MarketScan® databases, January 1, 2007–December 31, 2015. The study sample consisted of 412,021 cancer-free adults ages 18–64 who presented to an outpatient clinic or emergency room with a new diagnosis of musculoskeletal neck, shoulder, knee, low back or multiple site pain twice within 30 days). Chronic opioid use was defined as having filled 10 or more prescriptions or 120 or more days supply between 91–365 days following the initial diagnosis date. 95% confidence intervals for neck pain are within $\pm 0.13\%$ for neck pain, $\pm 0.11\%$ for knee pain, $\pm 0.2\%$ per for shoulder and low back pain, and $\pm 0.22\%$ for pain in multiple sites.

Table 1.

Risk of Chronic Opioid Use Following a New Diagnosis of Musculoskeletal Neck, Shoulder, Knee, and/or Low Back Pain by Risk Factors

	Adjusted Absolute Risk of Chronic Opioid Use, % (95%CI)
Overall	0.31 (0.29–0.33)
Patient Demographics	
Female	0.26 (0.24–0.28)
Male	0.36 (0.34–0.39)
Age 18–22 years	0.24 (0.19–0.29)
Age 23–27 years	0.35 (0.29–0.41)
Age 28–32 years	0.39 (0.34–0.44)
Age 33–37 years	0.35 (0.31–0.39)
Age 38–42 years	0.30 (0.27–0.33)
Age 43–47 years	0.38 (0.29–0.48)
Age 48–52 years	0.40 (0.30–0.50)
Age 53–57 years	0.40 (0.30–0.50)
Age 58–62 years	0.36 (0.27–0.45)
Age 63–64 years	0.25 (0.14–0.35)
Patient Comorbidities	
Van Walraven Score=0	0.31 (0.29–0.33)
Van Walraven Score=6	0.36 (0.32–0.38)
Van Walraven Score=30	0.59 (0.36–0.82)
Pain Site	
Neck	0.24 (0.21–0.27)
Shoulder	0.11 (0.00–0.14)
Knee	0.14 (0.12–0.16)
Low Back	0.50 (0.46–0.54)
Multiple Sites	0.62 (0.57–0.67)
Opioid Use within 90 Days after Diagnosis	1.9 (1.8–2.0)
Prior Drug Use	
Benzodiazepines	0.58 (0.52–0.64)
Gabapentin/Pregabalin	0.73 (0.61–0.86)
Antidepressants	0.47 (0.42–0.51)
Antipsychotics	0.57 (0.46–0.69)

Data Source: IBM® MarketScan® databases, January 1, 2007–December 31, 2015. The study sample consisted of 412,021 cancer-free adults ages 18–64 who presented to an outpatient clinic or emergency room with a new diagnosis of musculoskeletal neck, shoulder, knee, or low back pain twice within 30 days). Chronic opioid use was defined as having filled 10 or more prescriptions or 120 or more days supply between 91–365 days following the initial diagnosis date. The van Walraven score (3) assigns points to the various Elixhauser comorbidities (e.g., –1 point for valvular disease, 7 points for congestive heart failure), and ranges from –19 to 89. Scores of 0 or less are associated with a very low risk of in-hospital mortality, while a score of 6 is associated with a ~5% risk of mortality, and a score of 30 is associated with a ~30% mortality risk. The adjusted absolute risks shown in the table are predictive margins from the multivariable logistic regression model that included all of the risk factors listed in the table as well as year of diagnosis, and were estimated using the *margins* command in STATA 14.0 (STATA Corp, College Station, TX).