An Analysis of Treatment Patterns in Knee Osteoarthritis in a U.S. Administrative Claims Database

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Background

- Knee osteoarthritis (OA) is the most common type of OA; it is associated with aging and its prevalence will rise with the aging U.S. population[1]
- Knee OA results in damage to the articular cartilage and underlying bone of the knee[2] and is a leading cause of chronic pain and disability[3]
- Knee OA can be diagnosed by various medical providers; diagnosing physician type may impact treatment patterns among newly diagnosed patients
- The objective of this study was to describe the treatment patterns of newly diagnosed knee OA patients based on diagnosing provider type

Methods

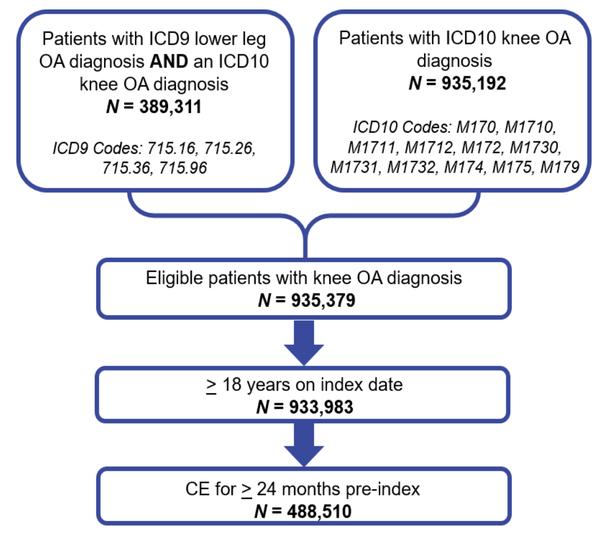
Data Source

- The IBM Watson Health MarketScan® Research Databases were used to identify knee OA patients from 2013-2018, the study period (**Figure 1**)

Study Design

- Knee OA patients ≥18 years of age were identified as "newly diagnosed" if they had continuous enrollment (CE) for 24 months prior to the index date (knee OA diagnosis) with no diagnosis of knee OA during the pre-index period (**Figure 1**). There was no CE requirement for the follow-up period
- Study outcomes were assessed in the variable-length follow-up period, defined as the time from index date to the first of inpatient death, end of continuous enrollment, or end of the study period
- The Deyo-Charlson Comorbidity Index (DCI), an aggregate measure of comorbid burden, assigning a weight of 1-6 points to select conditions[4], was used to assess patients' overall burden of disease
- Diagnosing physician was defined by the provider type on the first knee OA diagnosis claim; patient cohorts and subsequent knee-OA-related treatments were classified by diagnosing physician
- Number of patients prescribed knee-OA-related procedures (total knee replacement, ablation, articular repair, and stem cell therapy) or common pain alleviation medications (intra-articular [IA] corticosteroids, hyaluronic acid, NSAIDS, and longer-term [>30-day supply] opioids) and their costs were assessed in the follow-up period
- Categorical variables were summarized with counts and percentages; continuous variables were summarized with means and standard deviations

Figure 1. Patient Selection



Results

Table 1. Demographic and Clinical Characteristics

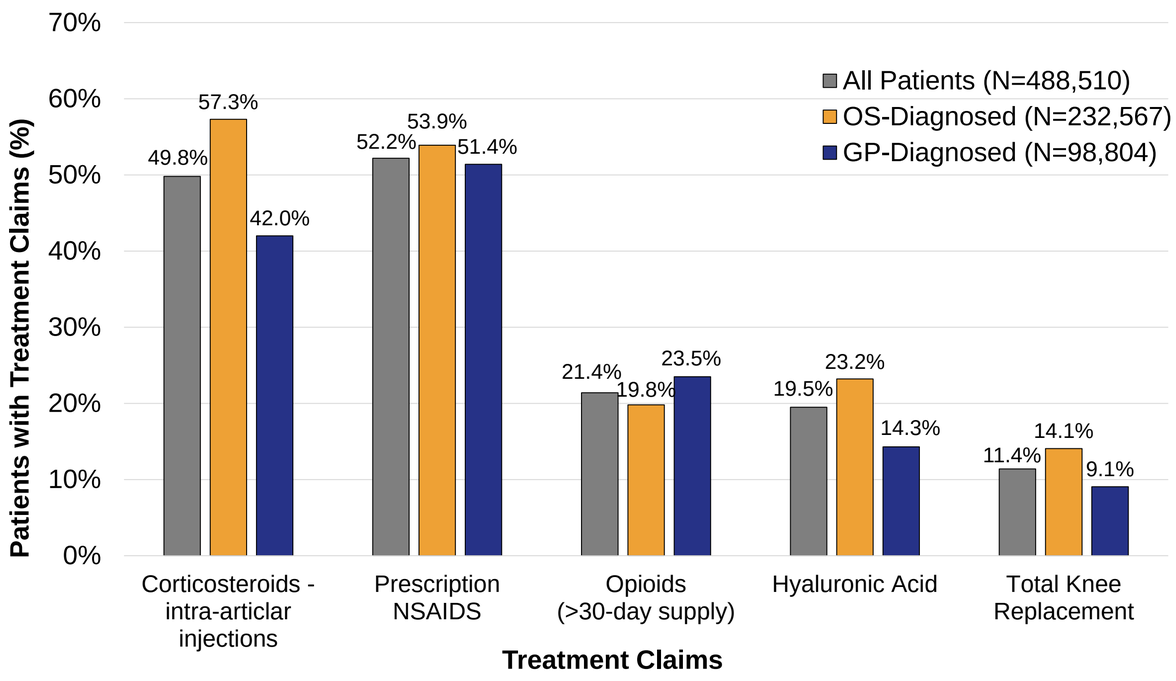
DEMOGRAPHIC CHARACTERISTICS	All Knee OA Patients N = 488,510	
	N/Mean	%/SD
Age		
Mean, SD	60.48	12.24
Median	60.00	
Minimum, Maximum	18.00	107.00
Sex (N, %)		
Male	195,836	40.1%
Female	292,674	59.9%
Primary Insurance (N, %)		
Commercial	339,269	69.4%
Medicare	149,225	30.5%
Unknown/Missing	16	0.0%

CLINICAL CHARACTERISTICS	All Knee OA Patients N = 488,510	
	N/Mean	%/SD
Deyo-Charlson Comorbidity Index (DCI)		
Mean, SD	0.92	1.57
Insurance Continuous Enrollment (N, %)		
12 months post-index CE	355,208	72.7%
24 months post-index CE	194,766	39.9%
36 months post-index CE	90,632	18.6%
Diagnosing Physician[1] (N, %)		
Orthopedist	232,567	47.6%
General Practitioner	98,804	20.2%
Rheumatologist	15,517	3.2%
Physical Medicine & Rehabilitation	15,496	3.2%

[1] Other types of diagnosing physicians accounted for <1% of each patient population. Examples include emergency medicine, pain medicine, chiropractors, and other non-traditional OA physicians

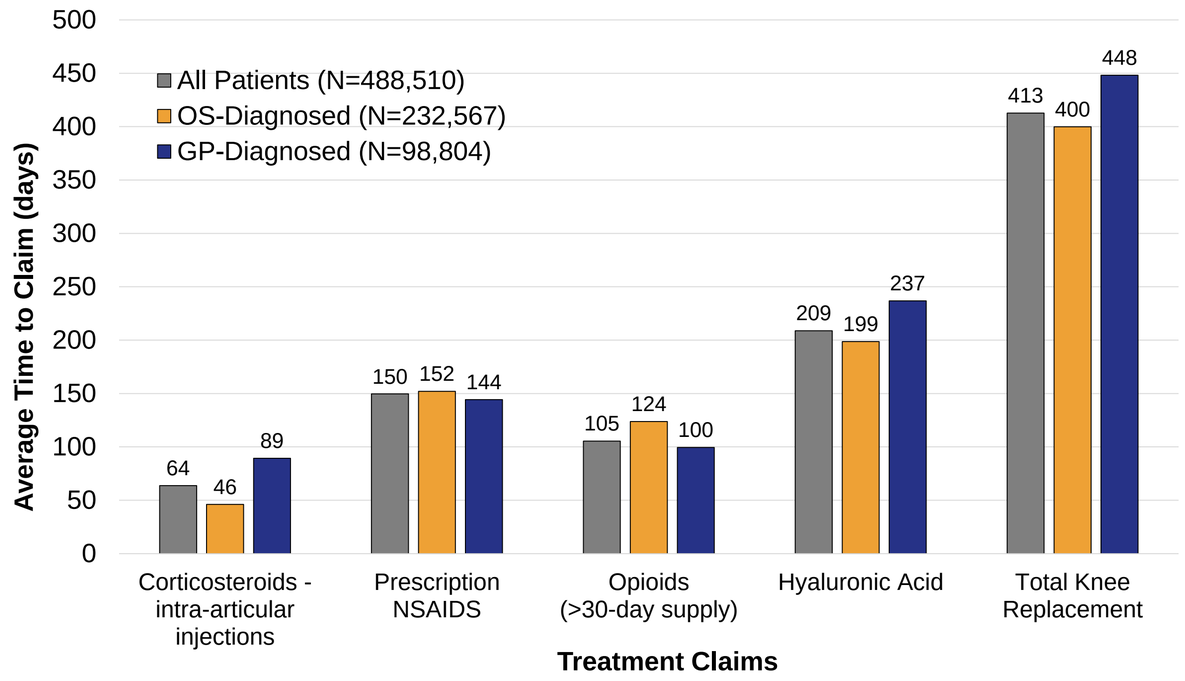
- 488,510 newly diagnosed knee OA patients were included in the study (**Figure 1**)
- Average age was 60.5 years (SD: 12.2, Range: 18-107); 59.9% were female
- 70% of adult knee OA patients were less than 65 years of age
- The average Deyo-Charlson Comorbidity Index (DCI) was 0.92 ± 1.6. Mild-to-moderate diabetes (0.18 ± 0.0) and chronic obstructive pulmonary disorder (COPD) (0.14 ± 0.0) contributed most to the comorbid burden of knee OA patients at baseline
- The two most common diagnosing physician types were orthopedists (OS, 47.6%) and general practitioners (GP, 20.2%); other specialty services accounted for 8.8% and 21.6% were other/unknown physician type (**Table 1**)
- Among newly diagnosed knee OA patients, 53.9% received any opioid claim in the variable-length follow-up period (one-year mean days supply = 74.7 days), 52.2% prescription NSAIDs, 49.8% intra-articular corticosteroid injections, and 19.5% IA hyaluronic acid
- Longer-term opioid use (>30-day supply) was seen in 21.4% of newly diagnosed knee OA patients, composing of 39.7% of total opioid claims

Figure 2. Knee-OA-Related Treatments in the Follow-Up Period by Diagnosing Provider[1]



[1] All treatments prescribed to knee OA patients were included, the knee OA diagnosis code was not required on each claim
[2] All prescribed treatments are reported; categories are ***not*** mutually exclusive. A patient may be included in multiple treatment categories

Figure 3. Time from Knee OA Diagnosis to Treatment by Diagnosing Provider*



* All prescribed treatments are reported; categories are ***not*** mutually exclusive. A patient may be included in multiple treatment categories

- During the variable-length follow-up period, 11.4% of patients ultimately went on to receive a total knee replacement (TKR) with a mean time to surgery of 412.7 days (SD: 375.8)
- OS-diagnosed patients were prescribed 1.62-fold more IA hyaluronic acid, 1.37-fold more intra-articular corticosteroid injections, 1.05-fold more NSAIDs, and 1.55-fold more total knee replacements compared to GP-diagnosed knee OA patients (**Figure 2**)
- However, GP-diagnosed patients were prescribed 1.19-fold more longer-term opioids (>30-day supply), suggestive of different treatment patterns based on diagnosing physician type
- Common pain alleviation medications were prescribed sooner, on average, than total knee replacement for all diagnosing provider types (**Figure 3**)

Conclusions

- This analysis demonstrated that multiple healthcare providers played a role in the diagnosis of knee OA in this patient cohort
- Prescription treatment was common among newly diagnosed knee OA patients, regardless of diagnosing physician type; 86.8% of patients had a medication claim
- OS-diagnosed patients received more medications and had shorter initiation times than GP-diagnosed patients; the greatest differences were observed for hyaluronic acid and IA corticosteroid injections
- OS-diagnosed patients were 1.55 times more likely to get a TKR and had a shorter mean time to procedure compared to GP-diagnosed patients
- Opioid and NSAID prescriptions were common regardless of diagnosing physician type
- Comorbid conditions can impact a patient's treatment options; comorbid burden of knee OA patients was substantial with mild-to-moderate diabetes and COPD contributing the most impact
- Future research should explore potential drivers of the variations in treatment patterns by diagnosing physician that were observed in this study

Limitations

- Patients with pain often seek over-the-counter therapies prior to seeing healthcare providers and/or receiving prescription medication; therefore, the full treatment pattern of patients with knee OA is likely to be underrepresented by claims data
- As with all claims data, there is a potential for misclassification from diagnostic coding errors, potentially resulting in misclassification of knee OA status, comorbid burden, and study outcomes

References

1. Turkiewicz A, et al. *Osteoarthritis and Cartilage.* 2014;22(11):1826-32.
2. Sinusas K. *Am Fam Physician.* 2012;85(1):49-56.
3. Cross M, et al. *Ann Rheum Dis.* 2014;73(7):1323-30.
4. Deyo RA, et al. *J Clin Epidemiol.* 1992;45(6):613-19.

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