Nonsteroidal Anti-Inflammatory Drug Use in Orthopaedic Surgery Practice is Increasing: A Review of Medicare Part D Claims from 2013 to 2021

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INTRODUCTION:

The ongoing opioid epidemic and public health crisis has led to multiple bodies endorsing safe and appropriate usage of opioid pain medications including the use of non-opioid alternatives such as nonsteroidal anti-inflammatory medications (NSAIDs). Historically, the use of NSAIDs has been limited in orthopaedic practice due to concerns that they impact bone healing by blocking osteoblastic function. The purpose of this study is to characterize national-level outpatient NSAIDs prescribing trends of practicing adult orthopaedic surgery providers in the United States. We hypothesized that the use of NSAIDs would increase over the study period.

METHODS:

A retrospective cross-sectional analysis of the Medicare Part D Prescriber Public Use File produced by the Centers for Medicare and Medicaid Services was conducted for the years 2013 to 2021. This publicly available database provides information on prescription drugs claims generated by individual physicians and healthcare professionals and paid for under the Medicare Part D Prescription Drug program. The primary outcome included total claims and total claims per 1000 prescribers for each NSAID. Secondarily, combined annual growth rate (CAGR) and percent growth was calculated for all medications using linear regression. Linear regression was performed for all trends using R software (Version 4.0.3, R Foundation for Statistical Computing, Vienna, Austria). A p-value less than 0.05 was considered statistically significant. Biases were not addressed a priori. A power analysis was not performed.

RESULTS:

NSAID claims increased during the study period from a low of 1,300,279 (21.81%) claims in 2013 to a high of 1,796,419 (31.18%) claims in 2021 (Table 1). The five most prescribed NSAIDs included meloxicam, diclofenac, celecoxib, ibuprofen, and naproxen (Table 1 / Figure 1). The use of ketorolac, meloxicam, diclofenac, celecoxib, and ibuprofen significantly increased with time while the use of naproxen, nabumetone, etodolac, sulindac, piroxicam, and indomethacin significantly decreased (Table 2).

DISCUSSION AND CONCLUSION:

Outpatient NSAID prescriptions by orthopaedic surgery providers increased between 2013 and 2021and is likely underestimated by these data as the majority of NSAIDs are available as over the counter medications. Further study is needed to identify if these practice patterns represent rising use in the setting of fracture surgery as historically this has been the subspecialty where their use was most limited.

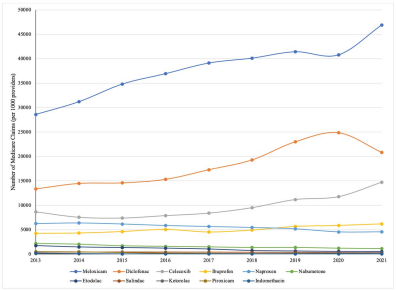

Table 1: Nonsteroidal anti-inflammatory (NSAID) medication claims from 2013 - 2021

	2013	2014	2015	2016	2017	2018	2019	2020	2021
NSAIDs	1,300,279	1,344,097	1,392,468	1,446,429	1,507,768	1,569,367	1,699,530	1,696,346	1,796,419
% of Claims	21.81%	22.56%	24.09%	24.94%	26.37%	28.35%	30.40%	31.52%	31.18%
Meloxicam	559,125	610,938	676,450	714,231	752,452	765,892	788,697	766,076	880,498
	43.00%	45.45%	48.58%	49.38%	49.91%	48.80%	46.41%	45.16%	49.01%
Diclofenac	261,287	283,486	283,720	296,213	332,565	368,395	438,060	466,736	391,304
	20.09%	21.09%	20.38%	20.48%	22.06%	23.47%	25.78%	27.51%	21.78%
Celecoxib	169,561	148,027	143,870	152,803	161,716	181,767	213,015	221,213	276,697
	13.04%	11.01%	10.33%	10.56%	10.73%	11.58%	12.53%	13.04%	15.40%
Ibuprofen	83,291	84,792	90,025	98,040	87,363	94,346	108,315	110,684	116,689
	6.41%	6.31%	6.47%	6.78%	5.79%	6.01%	6.37%	6.52%	6.50%
Naproxen	122,503	125,049	119,988	113,457	108,944	104,344	98,781	85,695	85,807
	9.42%	9.30%	8.62%	7.84%	7.23%	6.65%	5.81%	5.05%	4.78%
Nabumetone	43,030	39,896	33,505	31,166	28,819	26,259	26,322	23,277	21,792
	3.31%	2.97%	2.41%	2.15%	1.91%	1.67%	1.55%	1.37%	1.21%
Etodolac	34,359	29,099	26,521	24,079	20,662	14,599	12,745	10,878	10,491
	2.64%	2.16%	1.90%	1.66%	1.37%	0.93%	0.75%	0.64%	0.58%
Sulindac	9,242	8,564	8,772	8,544	8,094	7,540	7,077	5,738	5,639
	0.71%	0.64%	0.63%	0.59%	0.54%	0.48%	0.42%	0.34%	0.31%
Ketorolac	2,423	2,316	1,461	2,149	2,533	2,145	3,007	3,354	4,561
	0.19%	0.17%	0.10%	0.15%	0.17%	0.14%	0.18%	0.20%	0.25%
Piroxicam	10,178	9,550	6,727	4,522	3,268	2,831	2,316	1,530	1,655
	0.78%	0.71%	0.48%	0.31%	0.22%	0.18%	0.14%	0.09%	0.09%
Indomethacin	5,280	2,380	1,429	1,225	1,352	1,249	1,195	1,165	1,286
	0.41%	0.18%	0.10%	0.08%	0.09%	0.08%	0.07%	0.07%	0.07%

Table 2: Nonsteroidal anti-inflammatory (NSAID) medication growth from 2013 - 2021

	Medication	CAGR	% Growth	p
Claims	Meloxicam	5.18%	57.5%	< 0.001
	Diclofenac	4.59%	49.8%	< 0.001
	Celecoxib	5.59%	63.2%	0.004
	Ibuprofen	3.82%	40.1%	< 0.001
	Naproxen	-3.88%	-30.0%	< 0.001
	Nabumetone	-7.28%	-49.4%	< 0.001
	Etodolac	-12.35%	-69.5%	< 0.001
	Sulindac	-5.34%	-39.0%	< 0.001
	Ketorolac	7.28%	88.2%	0.019
	Piroxicam	-18.28%	-83.7%	< 0.001
	Indomethacin	-14.52%	-75.6%	0.043
Per 1000 Prescribers	Meloxicam	5.65%	63.9%	< 0.001
	Diclofenac	5.06%	55.9%	< 0.001
	Celecoxib	6.06%	69.9%	0.003
	Ibuprofen	4.28%	45.8%	< 0.001
	Naproxen	-3.45%	-27.1%	< 0.001
	Nabumetone	-6.87%	-47.3%	< 0.001
	Etodolac	-11.96%	-68.2%	< 0.001
	Sulindac	-4.92%	-36.5%	< 0.001
	Ketorolac	7.76%	96.0%	0.0149
	Piroxicam	-17.91%	-83.1%	< 0.001
	Indomethacin	-14.14%	-74.6%	0.047

* Combined Annual Growth Rate (CAGR)