

# Analysis of Utilization, Cost, and Prescription Trends of Common Immunosuppressive Medications Among Medicare Patients 2013 to 2019

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## INTRODUCTION

Immunosuppressive medications are commonly used to manage dermatological conditions, including atopic dermatitis, psoriasis, and bullous diseases. However, cost and adverse effect profile, including increased risk of infections, are important considerations.<sup>1</sup> Despite their widespread use, literature on the cost and utilization trends of common immunosuppressives used for dermatological treatment is sparse. A comprehensive understanding of these trends is essential for dermatologists, patients, and policymakers when deciding upon treatment options. Therefore, we sought to analyze the utilization, cost, and prescription trends of common immunosuppressive medications used in dermatology in the Medicare population.

We performed a cross-sectional analysis of the 2013 to 2019 Medicare Part D Provider utilization and payment data sets to identify prescription claims filed by dermatologists for azathioprine, cyclosporine, methotrexate, prednisone, hydroxychloroquine, mycophenolate, and methylprednisolone. Other provider types were excluded. Statistical Package for the Social Sciences (SPSS) was used to perform data analysis. Primary outcomes were total annual claims, cost, and supply days per 100,000 Medicare Part D beneficiaries for each immunosuppressive agent. The total cost per supply day was calculated by dividing the total drug cost by the total drug supply days.

Prednisone claims increased by 6.6% (Table 2), in conjunction with a 25.7% increase in cost per supply day (Table 1), with total spending increasing by 53.5%. Methylprednisolone total spending decreased by 55.7% during the study period, corresponding with a 45.6% decrease in cost per supply day (Table 1), and a 15.1% decrease in the total number of claims (Table 2). Methotrexate claims increased by 13.4%, with total spending decreasing by 25.8% in 2013-2019 (Table 2). The decrease in cost per supply day (\$1.48 to \$0.88) (Table 1) outpaced the corresponding increase in prescription claims.

Azathioprine claims increased by 45.0% with total spending increasing by 125.2% (Table 2). Cyclosporine claims increased by 52.6% with total spending increasing by 92.9% since 2013 (Table 2). Although the cost per supply day increased at a faster rate for azathioprine compared with cyclosporine, cyclosporine was more than 10 times more expensive than azathioprine (\$1.30 vs \$16.22) (Table 1).

Overall, there was an increase in total claims for immunosuppressives prescribed by dermatologists over the study period. This might be because some insurance companies have established fourth-tier plans, with coinsurance payments of up to 40% rather than a fixed copayment for high-cost specialty medications (such as biologic medications), causing significant financial burdens for patients with complex chronic illnesses, and forcing dermatologists to prescribe cheaper alternatives.<sup>2</sup>

TABLE 1.

Cost Per Supply Day of Non-Biologic Immunosuppressive Therapy

Year	Prednisone	Methyl-Prednisolone	Methotrexate	Hydroxy-Chloroquine	Myco-Phenolate	Azathioprine	Cyclosporine
2013	0.25	3.33	1.48	0.49	5.20	0.85	13.62
2014	0.38	3.12	1.65	0.76	4.61	0.89	9.30
2015	0.38	2.86	1.59	3.70	3.08	1.21	10.84
2016	0.36	2.51	1.24	3.34	2.69	1.07	11.48
2017	0.36	2.13	1.35	3.25	3.04	1.40	15.44
2018	0.35	1.94	1.16	2.50	3.11	1.32	19.21
2019	0.34	1.81	0.88	1.96	3.34	1.30	16.22

TABLE 2.

Total Number of Claims, Drug Supply Days, and Cost of Non-Biologic Immunosuppressive Therapy							
Year	Prednisone	Methyl-Prednisolone	Methotrexate	Hydroxy-Chloroquine	Myco-Phenolate	Azathioprine	Cyclosporine
<b>Total Number of Claims</b>							
2013	27.49	26.49	32.34	21.16	21.69	18.48	14.80
2014	28.19	25.93	32.06	22.72	21.90	18.75	17.38
2015	29.08	26.44	33.2	22.74	22.86	19.97	18.25
2016	28.84	27.24	35.18	23.37	22.66	19.69	16.63
2017	29.38	25.63	35.20	22.95	22.55	21.44	16.67
2018	30.13	24.62	36.53	22.97	22.65	22.93	15.11
2019	30.08	22.50	36.77	23.03	23.64	24.23	22.58
<b>Total Drug Supply Days</b>							
2013	641.16	254.36	1165.16	858.48	751.04	680.41	456.80
2014	674.24	227.84	1168.85	878.87	756.23	693.99	565.63
2015	698.73	230.33	1225.47	883.99	812.11	736.62	605.00
2016	697.63	249.96	1280.84	926.93	806.22	716.61	498.88
2017	711.79	232.66	1301.34	933.49	826.55	796.88	500.44
2018	724.90	218.87	1397.77	982.48	856.42	885.53	447.11
2019	725.50	187.56	1461.64	1065.60	907.63	978.54	713.0
<b>Total Cost, \$</b>							
2013	144.47	715.86	1696.58	407.04	3291.80	547.40	5885.64
2014	228.68	608.65	1927.28	659.81	2816.11	582.59	5738.40
2015	234.10	559.03	1920.15	3183.17	2445.66	866.49	6938.35
2016	224.79	567.06	1574.78	3019.43	2179.89	780.01	6182.01
2017	231.46	449.16	1728.39	2976.96	2297.52	1070.85	7872.21
2018	228.29	408.64	1586.52	2412.10	2481.04	1187.94	8476.09
2019	221.81	317.18	1259.03	2007.09	2889.38	1232.91	11356.54

Methotrexate claims increased over the study period. In a cost modeling study analyzing annual trends in Average Wholesale Prices (AWP) for psoriasis medications from 2000 to 2008, annual costs ranged from \$1197 for methotrexate to \$27,577 for alefacept, with an average AWP increase of 66% for all psoriasis therapies.<sup>3</sup> A 2017 cross-sectional comparative policy study found that in 2013, the United States, in comparison to other countries, had historically low generic drug prices and high rates of generic drug use (84%), which may have led to increased competition among generic and brand-name drug manufacturers.<sup>4</sup> Therefore, the increase in methotrexate claims that we observed might be because methotrexate is the most cost-effective psoriasis treatment, in addition to heightened drug manufacturer competition lowering methotrexate costs.

The total number of claims and price of methylprednisolone decreased over the study period, which might be due to the approval of alternative treatments, such as dupilumab for atopic dermatitis in 2017<sup>5</sup> and rituximab for pemphigus vulgaris in 2018.<sup>6</sup> In contrast, prednisone claims increased likely

because it is used more extensively across a broader range of dermatological conditions.

Limitations include retrospective design and including only Medicare patients. This cohort may not be representative of the general population and other time periods, preventing the generalizability of results. Furthermore, our analysis focused on prescription claims data, which may not represent medication utilization due to non-adherence or medications obtained through alternative sources.

In sum, we found an overall increase in total claims for non-biologic immunosuppressive therapies prescribed by dermatologists among Medicare beneficiaries from 2013 to 2019, which might be due to insurance plan restrictions and the financial burdens of newer, more expensive treatments. Since costs and claims of immunosuppressants vary over time, dermatologists, patients, and policymakers must stay updated on these trends to make informed decisions that will ultimately optimize resource allocation and improve patient outcomes.

**DISCLOSURES**

Mr Desai, Mr Kodali, and Mrs Ahmad have no conflicts of interest. Dr Lipner has served as a consultant for Ortho-Dermatologics, Hoth Therapeutics, Moberg Pharmaceuticals, and BelleTorus Corporation.

**REFERENCES**

1. Fireman M, DiMartini AF, Armstrong SC, Cozza KL. Immunosuppressants. *Psychosomatics*. 2004;45(4):354-360. doi:10.1176/appi.psy.45.4.354
2. Carroll J. When new drugs are costly, how high to raise copays? *Manag Care*. 2006;15(6):20-30.
3. Beyer V, Wolverton SE. Recent trends in systemic psoriasis treatment costs. *Arch Dermatol*. 2010;146(1):46-54. doi:10.1001/archdermatol.2009.319
4. Wouters OJ, Kanavos PG, McKEE M. Comparing generic drug markets in Europe and the United States: prices, volumes, and spending. *Milbank Q*. 2017;95(3):554-601. doi:10.1111/1468-0009.12279
5. Bieber T. Atopic dermatitis: an expanding therapeutic pipeline for a complex disease. *Nat Rev Drug Discov*. 2022;21(1):21-40. doi:10.1038/s41573-021-00266-6
6. Hebert V, Joly P. Rituximab in pemphigus. *Immunotherapy*. 2018;10(1):27-37. doi:10.2217/imt-2017-0104

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