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Prescription patterns and costs of acne/rosacea medications in Medicare patients vary by prescriber specialty

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Abstract

Background—Prescription patterns for acne/rosacea medications have not been described in the Medicare population, and comparisons across specialties are lacking.

Objective—To describe the medications used for treating acne/rosacea in the Medicare population and evaluate differences in costs between specialties.

Methods—A cross-sectional study was performed of the Centers for Medicare & Medicaid Services 2008/2010 Prescription Drug Profiles, containing 100% of Medicare Part D claims.

Results—Topical antibiotics accounted for 63% of all prescriptions. Patients >65 years utilized more oral tetracycline-class antibiotics (TCA) and less topical retinoids. Specialist brand name usage for the most common topical retinoids and antibiotics was higher than family/internal medicine (FM/IM) by 6–7%. Topical retinoids by specialists were, on average, \$18–20 and \$2–3 more in total- and patient-cost than FM/IM per 30-day supply. Specialists and IM (60/56%) prescribed over twice the rate of branded doxycycline than FM (27%). TCA total/patient costs were higher for specialists (\$18/\$4) and IM (\$3/\$1) than FM.

Limitations—The data may contain rare prescriptions used for conditions other than acne/rosacea, and suppression algorithms may underestimate the number of specialist brand name prescriptions.

Conclusion—Costs of specialist prescriptions for acne/rosacea are higher than primary care prescriptions and could be reduced by choosing generic and less expensive options.

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Keywords

acne; rosacea; Medicare; prescription drug costs; cost of care; topical retinoids; antibiotics

INTRODUCTION

Sixty five to 72% of rosacea visits are with dermatologists, the remaining seen mostly by family physicians, internists, and ophthalmologists.^{1,2} Only 15% of acne patients are seen by specialties other than dermatology.³ The cost of acne and rosacea prescription medications in the United States totaled \$2 billion in 2004,⁴ suggesting that prescription choices for these diseases have a large impact on national healthcare expenditure. Previous studies examined prescription patterns^{1,5–7} and costs^{8–11} in acne and rosacea in populations primarily under age 65 years. Further, comparisons of prescription costs across different specialties are lacking. A recent investigation showed higher brand-name usage and a broader range of topical steroids prescribed by specialists than primary care, which were associated with increased costs.¹² We hypothesized that similar prescribing patterns occur for acne/rosacea treatments. Understanding the patterns and costs of prescription medications may offer insight into strategies to reduce healthcare costs. In this study, we analyze total and out-of-pocket costs, and prescribing patterns of acne/rosacea treatments across different specialties in the Medicare population.

METHODS**Data source and variables**

As described previously,¹² a cross-sectional study was performed of the 2008 and 2010 Prescription Drug Profiles (PDP) Public Use Files released by the Centers for Medicare & Medicaid Services (CMS),¹³ representing 100% of Medicare Part D prescription drug claims. Data are reported as profiles—aggregates of prescriptions with the same categorical variable values, with continuous variables reported as a mean. For example, a profile can represent 20 claims, all for the same drug, patient sex/age group, insurance plan type, and prescriber type. Topical retinoids, topical antibiotics indicated for acne/rosacea, 30 day courses of oral tetracycline-class-antibiotics (TCA), and oral isotretinoin were selected for this analysis. Specific drugs selected and other variables reported in the dataset are presented in Supplemental Table 1.

Prescriber taxonomy

Prescriber specialty was reported as one of six categories: family medicine (FM), internal medicine (IM), psychiatry/neurology, specialist, other, and suppressed (to protect patient confidentiality; algorithm detailed in Supplemental Table 1). We merged the “specialist” and “other” categories of the PDP into a single “specialist” category, with the assumption that the majority were dermatologists. This assumption was validated against prescriber distributions from the 2014 Medicare Provider Utilization and Payment Data (MPUPD),^{12,14} which includes dermatology as a specific specialty (Supplemental Table 2). Suppressed prescribers were considered in a separate category to avoid potential biases from the

suppression algorithm. The final provider designations compared in the analyses were: FM, IM, specialist, and suppressed.

Statistical analysis

Statistical analyses, as described previously,¹² were performed in MATLAB (version R2015b, MathWorks, Natick, Massachusetts). Primary outcomes examined were “total cost” (the sum of costs paid for ingredients, dispensing fee, and sales tax) and “patient cost” (non-reimbursed cost paid by the beneficiary) of prescriptions. Costs per prescription were normalized to a length of 30 days. 2008 costs were adjusted for inflation to 2010 prices using the Consumer Price Index from the US Bureau of Labor Statistics.¹⁵

Summary statistics were calculated for yearly aggregate cost, mean cost per prescription, and mean prescription length of each drug. Mean drug costs are presented for both generic and branded versions for comparison. Prescription frequencies and brand name usage were calculated and stratified by provider type.

Multivariable linear regression was used to model log-transformed costs in each drug class against prescriber specialty and covariates. This model was designed to reflect the effects of specialty-dependent differences in medication and brand choice on costs of treatments with similar efficacy/indications. Linear modeling produced residuals with positive skew, so costs were log-transformed. Total cost was modeled against specialty with covariates of sex, age, year, and prescription drug hierarchical conditional category (RxHCC: risk score that reflects health status). Patient cost was modeled against specialty, with covariates of sex, age, plan type, coverage, benefit phase, benefit structure, gap coverage, year, and RxHCC.

RESULTS

All-provider costs and patterns

The total cost of all acne/rosacea medications was \$65.2 million (M) in 2008 and \$73.5M in 2010 (Table 1). The distribution of prescriptions in both years was: 12–13% topical retinoids (\$11–12M), 63% topical antibiotics (\$44–48M), 24–25% TCA (\$9–12M), and 0.4–0.5% isotretinoin (\$1.3–2.1M). Females received 58% and patients over 65 received 71% of prescriptions. Topical antibiotics were the most commonly prescribed class for all sexes and age groups. Males and patients ≥65 years utilized more TCAs and less topical retinoids than females and patients <65 (Figure 1).

Tretinoin was the lowest cost and most commonly prescribed topical retinoid, accounting for 78% of prescriptions in 2008 and 84% in 2010. 14–17% of tretinoin prescriptions were brand name, which cost more than generics per 30-day prescription (total cost \$115–138 vs. \$65–72; patient cost \$28–37 vs. \$8–10).

The most common topical antibiotics were metronidazole (50% in 2008 and 2010) and clindamycin (26% in 2008 and 29% in 2010). 42% of topical metronidazole prescriptions in 2008 were brand name, which had mean total- and patient- cost of \$163 and \$43, compared to \$86 and \$10 for generic. Branded metronidazole usage decreased to 28% in 2010.

Branded clindamycin was less frequent (2–5%) but much more expensive than generic (total cost \$239–289 vs. \$35–38; patient cost \$44–49 vs. \$5).

Of TCA prescriptions, 48–49% were tetracycline, 41–42% were minocycline, and 10% were doxycycline. Brand name usage of tetracycline and minocycline were low (<2%), but 62–63% of doxycycline prescriptions were branded, resulting in higher total (\$191–334 vs. \$32–33) and patient (\$51–82 vs. \$8–10) costs.

From 2008 to 2010, all generic medications saw decreases or nominal (<\$3) increases in total- and patient-cost. Many brand name drugs, however, increased in cost. The mean total cost increased by 26–31% for branded adapalene, tazarotene, metronidazole, and minocycline, 43% for isotretinoin, and 74% for branded doxycycline. Mean patient costs for brand names increased by 18–19% for adapalene and tazarotene, 56% for combined clindamycin/tretinoin, 32–35% for metronidazole and sulfacetamide, 61–63% for doxycycline and minocycline, and 25% for isotretinoin. Brand name usage in 2010 decreased for all drugs except topical erythromycin (4% to 11%) and sulfacetamide/sulfur (41% to 49%).

Specialty differences

Prescription distributions and brand name usage stratified by provider specialty are presented in Table 2. Specialists prescribed a higher percentage of brand names than FM and IM for every medication except adapalene. IM generally prescribed brand names more often than FM. The most notable differences between specialties were for sulfacetamide/sulfur (36% brand name usage by specialists vs. <1% by FM/IM) and doxycycline (60% by specialists, 56% by IM, and 27% by FM). Topical tretinoin and metronidazole, the most commonly prescribed drugs in their respective class, were also prescribed more often as brand names by specialists than by FM/IM (14% vs. 8–11% for tretinoin; 35% vs. 29–32% for metronidazole).

Non-tretinoin topical retinoids were utilized more often by specialists (16%) than FM/IM (7–9%). Differences in topical antibiotics include lower metronidazole (49% vs. 56–61%) and higher azelaic acid (8% vs. 1%) usage by specialists than FM/IM. Of TCA, doxycycline was prescribed by specialists (16%) more frequently than FM/IM (<1%). As a class, specialists prescribed topical retinoids at a higher rate (14%) than FM/IM (7–8%), and FM/IM prescribed TCAs more often (32–33%) than specialists (23%).

Multivariable linear regression was used to model mean log-transformed total- and patient-costs per 30-day prescription against prescriber specialty and covariates (Table 3). Specialist prescriptions for topical retinoids were associated with total costs \$18–20 and patient costs \$2–3 higher than FM/IM. Patient costs for topical antibiotics were \$1 higher for specialist than FM/IM prescriptions, but differences in total cost (\$1–2) between specialties were not statistically significant. TCAs were associated with increased costs when prescribed by specialists (total/patient costs \$18/\$4 higher) and IM (total/patient costs \$3/\$1 higher) compared to FM.

DISCUSSION

This study found significant differences in cost between specialist and FM/IM prescriptions for acne/rosacea medications. Total costs for topical retinoids and TCA prescriptions were highest when written by specialists, which amounted to \$3–4 million per year more than FM/IM prescriptions from the same drug classes, or 5–6% of all Medicare acne/rosacea prescription costs. Given that acne/rosacea is most common in patients less than 65 years, this represents an opportunity for large savings in healthcare expenditures. The higher costs associated with specialist prescriptions are also seen by patients, with differences between specialists and FM/IM reaching 14–70% of mean out-of-pocket costs for each drug class.

The differences in cost between specialties can be attributed to differences in prescription patterns. Specialists prescribed a higher percentage of brand names for all drugs but adapalene, and the differences were often large—6–7% higher than FM for common medications such as topical tretinoin, metronidazole, and benzoyl peroxide. Specialists also prescribed a broader range of medications, utilizing more expensive options such as tazarotene, azelaic acid, and sulfacetamide more often than FM/IM.

There are numerous reasons for differences in prescription patterns across specialties. Specialists are expected to see more complex patients who may have failed less expensive or generic options. Specialists are also astute to subtle differences between medications of the same class, such as drug interactions, vehicle preference, and side effects. Patient preference/compliance is also an important consideration that may influence medication choice. While patients may be willing to pay more for a complete vs partial clearance of acne,¹⁶ prescription rates of branded drugs are also subject to external influences, such as interactions with pharmaceutical sales representatives,¹⁷ direct-to-consumer advertising,¹⁸ and provision of free samples.¹⁹ The former two influences may focus on tolerability and aesthetics of a vehicle without regard to the comparative effectiveness. Branded topical metronidazole was more than twice the total cost and five times the patient cost of generic versions, yet brand name usage was high across all specialties despite similar efficacy of branded gel vs cream and lotion vehicles.²⁰

A limitation of this study is that prescriptions in the dataset are not accompanied by a diagnosis. Therefore, some of the prescriptions analyzed, particularly the TCAs, could have been written for conditions other than acne/rosacea. To limit the number of prescriptions for infections, we only included prescription profiles with a mean duration ≤ 30 days, as guidelines for skin and soft tissue infections recommend oral antibiotics for no longer than 7–14 days.²¹ Another limitation of the dataset is the grouping of prescriptions into profiles and data suppression. The 30-day duration threshold used on TCA is likely to exclude some acne/rosacea prescriptions that are grouped with shorter ones that bring the mean length of the profile to <30 days. We believe the largest impact is on doxycycline, as it is the most common TCA for infections. To protect confidentiality of beneficiaries, certain variables, including prescriber specialty, were suppressed if ≤ 10 patients shared the same values for all categorical variables. Uncommon prescriptions—usually also more expensive—are likelier to be suppressed, which is reflected by suppressed prescribers being associated with the highest total costs. Since less common medications are more often prescribed by specialists,

it is likely that the true costs associated with specialists are higher than those presented, somewhere in between specialist and suppressed costs. In addition, lack of an explicit prescriber category for dermatology is a limitation. By validation with an external dataset, we found that 80–86% of specialist prescriptions for topical retinoids, 63–100% for topical antibiotics, and 48–65% for TCA 30 days were by dermatologists. These percentages would be even higher if including midlevel providers, who may be employed in dermatology practices but are categorized separately. Other specialist prescribers of TCA included ophthalmologists and dentists. Thus, the specialist category is largely representative of dermatologists, especially for topical retinoid and antibiotic prescriptions. Lastly, prescription costs and practices have likely changed in the past 7–9 years since this data was collected. Comparison with the 2017 National Average Drug Acquisition Cost²² shows similar current costs of generic topical retinoids (tretinoin the lowest, followed by adapalene) and topical antibiotics (benzoyl peroxide is now the lowest, followed by clindamycin, erythromycin, and metronidazole). The most notable change is a substantial increase in the cost of tetracycline, while generic doxycycline and minocycline are slightly lower than 2010. Brand name costs have increased for most medications since 2010. It is possible that practice patterns and formulary restrictions have changed as well, so further studies are needed to evaluate their impact on specialty-dependent prescription costs once new data is available.

In conclusion, we describe prescription patterns for acne/rosacea in the Medicare population. The most common drug class utilized was topical antibiotics, accounting for 63% of all prescriptions. Specialist prescriptions were associated with higher total- and patient- costs than FM/IM prescriptions for all drug classes except topical antibiotics (associated with higher patient but not total costs). Treatment costs could be reduced by prescribing more generics and less expensive options within drug classes. Use of higher-cost dermatology drugs should be backed by evidence of improved outcomes. Further research is needed to determine the comparative efficacy of different acne/rosacea treatments.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Abbreviations

PDP	Prescription Drug Profiles
CMS	Centers for Medicare & Medicaid Services
TCA	tetracycline-class-antibiotic
FM	family medicine
IM	internal medicine

MPUPD	Medicare Provider Utilization and Payment Data
RxHCC	prescription drug hierarchical conditional category
M	million

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Figure 1.
Frequency of acne/rosacea prescriptions by sex (A) and age group (B)

Table 1

Yearly aggregate and mean costs of acne/rosacea prescriptions

2008																			2010									
	N	BN [%]	Total Cost [\$]				Patient Cost [\$]				Avg Rx Len (SD) [days]	N	BN [%]	Total Cost [\$]			Patient Cost [\$]			Avg Rx Len (SD) [days]								
			Agg [M]	Avg Gen (SD) ^a	Avg BN (SD) ^a	Agg [M]	Avg Gen (SD) ^a	Avg BN (SD) ^a	Agg [M]	Avg Gen (SD) ^a				Avg BN (SD) ^a														
Topical Retinoids																												
All	123857	35.1	11.4	72.1 (9.7)	195 (70.7)	1.75	8.1 (12.0)	34.6 (39.7)	25.0 (3.9)	131838	27.1	12.0	67.8 (20.3)	222 (127)	1.89	10.1 (13.3)	35.0 (42.1)	25.7 (3.5)										
Tretinoin	96670	16.8	6.77	72.1 (9.7)	138 (31.5)	1.09	8.1 (12.0)	36.7 (34.3)	25.5 (3.7)	110304	14.4	6.88	65.4 (8.1)	115 (70.5)	1.22	9.9 (13.1)	28.0 (31.8)	26.0 (3.3)										
Tazarotene	15575	100	2.87		251 (66.8)	0.45		38.4 (48.3)	22.6 (4.5)	13290	100	3.33		329 (94.8)	0.48		45.4 (52.6)	23.3 (3.6)										
Adapalene	10836	100	1.58		190 (38.0)	0.23		25.5 (32.7)	23.6 (3.9)	7030	74.9	1.39	202 (28.8)	243 (40.3)	0.18	20.5 (22.8)	30.2 (34.5)	25.9 (3.9)										
Clindamycin/Tretinoin	776	100	0.19		321 (42.9)	0.02		31.5 (33.1)	22.8 (3.2)	1214	100	0.39		384 (51.3)	0.05		49.3 (53.3)	25.7 (2.9)										
Topical Antibiotics																												
All	614138	32.5	43.6	62.2 (30.8)	160 (53.8)	9.78	7.5 (12.3)	42.6 (37.4)	23.0 (4.3)	674981	22.5	47.7	56.3 (27.6)	194 (58.5)	10.6	7.7 (10.7)	53.1 (43.0)	24.2 (4.2)										
Metronidazole	308992	42.1	27.4	85.6 (20.6)	163 (55.8)	6.16	10.1 (15.9)	43.1 (38.3)	23.1 (4.9)	340611	27.7	29.8	70.5 (15.0)	209 (55.6)	6.67	9.8 (12.9)	56.7 (44.9)	24.6 (4.7)										
Clindamycin	161218	4.9	5.72	38.5 (7.9)	239 (44.5)	0.88	5.2 (6.8)	43.6 (46.6)	22.2 (3.1)	197075	1.9	6.02	35.2 (10.9)	289 (59.5)	0.98	5.4 (6.4)	49.5 (44.5)	23.1 (2.9)										
Erythromycin	37456	3.9	0.81	27.8 (7.1)	76.1 (18.4)	0.14	4.4 (4.6)	24.5 (18.7)	21.9 (3.6)	39157	10.9	0.93	23.3 (4.5)	80.5 (13.7)	0.17	4.8 (4.3)	10.3 (13.1)	23.1 (4.3)										
Azelaic Acid	36415	100	4.08		138 (28.3)	1.56		50.7 (32.8)	24.9 (3.9)	39474	100	5.87		170 (33.5)	1.94		54.8 (37.9)	26.7 (4.0)										
Benzoyl Peroxide	19581	13.2	0.63	35.2 (13.2)	87.6 (16.9)	0.09	3.5 (4.4)	18.5 (19.9)	23.1 (3.7)	11626	6.7	0.37	37.5 (13.9)	81.5 (31.9)	0.04	3.4 (3.6)	10.1 (8.2)	23.3 (3.5)										
Benzoyl Peroxide/Clindamycin	15482	100	2.09		173 (27.1)	0.32		24.9 (33.3)	23.8 (3.2)	14655	47.7	2.22	160 (17.9)	194 (27.8)	0.26	10.6 (18.0)	29.5 (36.2)	26.1 (3.0)										
Benzoyl Peroxide/Erythromycin	13834	2.9	1.08	98.6 (21.0)	156 (27.8)	0.04	3.1 (6.2)	14.7 (20.7)	23.9 (3.0)	16294	0.8	1.14	87.1 (13.7)	165 (29.0)	0.05	3.8 (6.6)	4.9 (3.9)	24.1 (2.8)										
Sulfacetamide	10852	8.5	1.01	117 (22.5)	149 (28.6)	0.14	12.5 (17.8)	44.2 (27.8)	24.1 (4.4)	11846	2.5	1.06	108 (19.3)	155 (18.9)	0.13	11.7 (16.0)	59.5 (22.6)	25.1 (4.2)										
Sulfacetamide/Sulfur	10308	40.9	0.75	82.8 (25.1)	102 (31.9)	0.16	12.9 (10.0)	25.6 (15.4)	24.6 (4.8)	4243	48.9	0.30	78.4 (24.0)	94.2 (27.0)	0.05	10.7 (6.9)	18.0 (12.2)	25.2 (4.7)										
Oral Tetracycline Class Antibiotics																												
All	234179	7.4	8.85	19.0 (16.8)	215 (77.6)	2.28	5.4 (4.4)	51.2 (40.0)	34.7 (4.2)	265907	6.8	11.7	17.3 (16.4)	341 (60.6)	3.17	5.6 (4.2)	82.2 (69.4)	35.1 (4.7)										
Tetracycline	114809	0.0	0.68	5.0 (0.8)		0.49	3.6 (0.9)		35.6 (4.6)	126783	0.0	0.74	4.9 (1.2)		0.56	3.7 (0.8)		36.3 (5.2)										
Minocycline	94942	2.0	4.53	34.9 (5.7)	410 (64.4)	0.86	7.3 (5.9)	52.3 (55.4)	33.9 (3.7)	111352	0.7	4.26	30.2 (10.9)	514 (104)	1.00	7.4 (5.0)	85.0 (64.2)	34.4 (3.9)										
Doxycycline	24428	63.1	3.63	32.7 (34.3)	191 (32.8)	0.95	8.1 (3.2)	51.1 (38.0)	33.1 (3.3)	27772	62.1	6.71	32.1 (34.7)	334 (45.5)	1.63	9.6 (7.9)	82.1 (69.6)	32.4 (3.4)										
Oral Retinoids																												

		2008								2010												
	N	BN [%]	Total Cost [\$]				Patient Cost [\$]				N	BN [%]	Total Cost [\$]				Patient Cost [\$]				Avg Rx Len (SD) [days]	Avg Rx Len (SD) [days]
			Agg [M]	Avg Gen (SD) ^a	Avg BN (SD) ^a	Agg [M]	Avg Gen (SD) ^a	Avg BN (SD) ^a	Agg [M]	Avg Gen (SD) ^a			Avg BN (SD) ^a	Agg [M]	Avg Gen (SD) ^a	Avg BN (SD) ^a	Agg [M]	Avg Gen (SD) ^a	Avg BN (SD) ^a			
Isotretinoin	4250	100	1.29		312 (71.4)	0.09		21.7 (37.0)	29.3 (0.9)	4862	100	2.12		445 (116)	0.13		27.2 (41.9)	29.4 (1.1)				

Abbreviations: N = frequency, BN = brand name, Agg = aggregate, M = Million, Avg = mean, Gen = generic, SD = standard deviation, Rx Len = prescription length

^aMean cost per prescription is normalized to a prescription length of 30 days

Table 2

Prescription distributions and brand name usage by prescriber specialty

	Family Medicine		Internal Medicine		Specialists		Suppressed	
	N (%)	BN [%]	N (%)	BN [%]	N (%)	BN [%]	N (%)	BN [%]
Topical Retinoids								
Tretinoin	25031 (91.0)	8.47	21349 (93.3)	11.4	131498 (84.3)	14.1	28943 (58.8)	31.4
Tazarotene ^a	1163 (4.23)	100	833 (3.64)	100	15249 (9.78)	100	11620 (23.6)	100
Adapalene ^b	1315 (4.78)	92.2	696 (3.04)	96.8	8593 (5.51)	93.8	7262 (14.8)	84.8
Clindamycin/Tretinoin ^a	0 (0.00)		0 (0.00)		632 (0.41)	100	1358 (2.76)	100
Topical Antibiotics								
Metronidazole	117457 (60.5)	28.8	107476 (55.5)	32.2	341475 (49.0)	35.4	83141 (40.8)	42.1
Clindamycin	49420 (25.5)	0.22	63364 (32.7)	0.28	210017 (30.2)	2.44	34543 (16.9)	18.3
Erythromycin	12370 (6.37)	2.45	11267 (5.82)	1.93	32075 (4.61)	3.76	20887 (10.2)	19.3
Azelaic Acid ^a	2746 (1.41)	100	2695 (1.39)	100	55861 (8.02)	100	14587 (7.15)	100
Benzoyl Peroxide	2961 (1.53)	0.00	2264 (1.17)	0.00	13975 (2.01)	5.54	12007 (5.89)	21.9
Benzoyl Peroxide/Clindamycin ^b	3076 (1.58)	68.5	2170 (1.12)	76.7	13945 (2.00)	78.5	10946 (5.37)	70.9
Benzoyl Peroxide/Erythromycin	5542 (2.85)	0.00	3879 (2.00)	0.00	11031 (1.58)	0.00	9676 (4.74)	5.54
Sulfacetamide	510 (0.26)	0.00	352 (0.18)	0.00	12677 (1.82)	1.34	9159 (4.49)	11.5
Sulfacetamide/Sulfur	45 (0.02)	0.00	140 (0.07)	0.00	5385 (0.77)	36.4	8981 (4.40)	48.3
Oral Antibiotics								
Tetracycline	62538 (61.0)	0.00	57805 (54.5)	0.00	113657 (43.7)	0.00	7563 (24.5)	0.00
Minocycline	39505 (38.6)	0.00	47579 (44.8)	0.00	104142 (40.1)	0.64	14533 (47.0)	13.4
Doxycycline	408 (0.40)	27.0	705 (0.66)	55.9	42101 (16.2)	59.9	8823 (28.5)	78.6
Oral Retinoids								
Isotretinoin ^a	0		0		39101 (100)	100	5202 (100)	100

Abbreviations: N = frequency, BN = brand name usage

^aNo generic available in 2008/2010^bNo generic available in 2008

Table 3

Total and patient costs by prescriber specialty^a

		Total Cost		Patient Cost	
Specialty	N	Mean (99% CI) [\$] ^b	P-value	Mean (99% CI) [\$] ^b	P-value
Topical Retinoids					
Family Medicine (ref)	27509	76.3		4.24	
Internal Medicine	22878	74.1 (66.3, 82.9)	0.51	3.99 (3.3, 4.8)	0.40
Specialist	155972	94.2 (86.8, 102.3)	< .001	6.47 (5.7, 7.4)	< .001
Suppressed	49183	148.3 (134.5, 163.5)	< .001	4.29 (2.9, 6.3)	0.94
Topical Antibiotics					
Family Medicine (ref)	194127	69.2		4.75	
Internal Medicine	193607	66.9 (64.0, 70.0)	0.053	4.67 (4.4, 5.0)	0.51
Specialist	696441	68.0 (65.7, 70.5)	0.20	5.78 (5.5, 6.1)	< .001
Suppressed	203927	87.5 (83.6, 91.6)	< .001	4.29 (3.5, 5.2)	0.17
Oral Antibiotics					
Family Medicine (ref)	102451	9.5		3.91	
Internal Medicine	106089	12.4 (10.1, 15.2)	< .001	4.89 (4.1, 5.9)	0.0021
Specialist	259900	27.6 (23.3, 32.6)	< .001	7.70 (6.6, 8.9)	< .001
Suppressed	30919	68.8 (50.8, 93.3)	< .001	5.48 (2.5, 12.0)	0.27

Abbreviations: N = frequency, CI = confidence interval, ref = reference variable

^a 30-day costs predicted by multivariable linear model with log-transformed cost as dependent variable and specialty and covariates as independent variables. Results for covariates not shown.

^b Mean 30-day cost predicted by model, relative to geometric mean cost of Family Medicine prescriptions (reference).