

Understanding the cost of dermatologic care: A survey study of dermatology providers, residents, and patients

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Background: The American Academy of Dermatology recommends dermatologists understand the costs of dermatologic care.

Objective: This study sought to measure dermatology providers' understanding of the cost of dermatologic care and how those costs are communicated to patients. We also aimed to understand the perspectives of patients and dermatological trainees on how cost information enters into the care they receive or provide.

Methods: Surveys were systematically developed and distributed to 3 study populations: dermatology providers, residents, and patients.

Results: Response rates were over 95% in all 3 populations. Dermatology providers and residents consistently underestimated the costs of commonly recommended dermatologic medications but accurately predicted the cost of common dermatologic procedures. Dermatology patients preferred to know the cost of procedures and medications, even when covered by insurance. In this population, the costs of dermatologic medications frequently interfered with patients' ability to properly adhere to prescribed regimens.

Limitations: The surveyed population was limited to the northwestern United States and findings may not be generalizable. Cost estimations were based on average reimbursement rates, which vary by insurer.

Conclusion: Improving dermatology providers' awareness and communication of the costs of dermatologic care might enhance medical decision-making, improve adherence and outcomes, and potentially reduce overall health care expenditures. (J Am Acad Dermatol <http://dx.doi.org/10.1016/j.jaad.2016.11.049>.)

Key words: cost awareness; cost estimation; cost of care; high-value healthcare.

Ongoing US health care reform emphasizes the practice of high-value health care,¹⁻³ High-value health care can be defined as health care that maximizes the ratio of health outcomes per dollar spent.² While physicians have typically been uncomfortable with financial considerations entering into patient-care decisions, physicians play a clear role managing the outcome-to-cost ratio.^{4,5} A position paper by the

Abbreviations used:

KOH: potassium hydroxide
 OHSU: Oregon Health & Science University

American Academy of Dermatology on controlling the cost of medications states that "it is the responsibility of every physician to be aware of the

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relative cost of prescriptions and/or over-the-counter products that are recommended to our patients.”⁶

Studies have shown that physician behavior is influenced by the cost of care, but physicians rarely know the true costs patients incur.^{7,8} Recently published studies in family medicine,⁹ internal medicine,¹⁰ pediatrics,¹¹ and intensive care¹² suggest most physicians are unaware of the costs to patients of commonly recommended medications¹³ and diagnostic studies.¹⁴ Failure to understand and properly communicate costs to patients can contribute to poor patient adherence, inferior clinical outcomes, and increased expenditures.¹⁵ In addition, discussing costs with patients might help reduce overall expenditures because patients often prefer the less expensive treatment options.¹⁶

The objective of this study was to evaluate dermatology providers' understanding of the cost of dermatologic care and how those costs are communicated to patients. We also sought to evaluate the patient perspective regarding the cost of dermatologic care. Last, we surveyed dermatology residents regarding their training in the cost of care for dermatologic services.

METHODS

Three surveys were developed for each of the 3 study populations: dermatology providers, dermatology residents, and dermatology patients. Survey design followed published recommendations to maximize response rate and minimize bias.^{17,18} The surveys were peer-reviewed and optimized before distribution and primarily used a 4 or 5 option Likert scale. Strongly agree, agree, always, frequently, and sometimes were considered affirmative responses, while strongly disagree, disagree, and never were considered negative responses for analyses. The surveys took approximately 5 minutes to complete.

The 3 study populations were recruited from October 2010 to March 2011 in Portland, Oregon. Providers were recruited during the Storrs Lectureship in October 2010 and the January 2011 Oregon Dermatology Society Meeting and included a mix of MD, DO, NP, and PA dermatology providers in academic and private practices.

Resident participants representing the Departments of Dermatology from Oregon Health &

Science University (OHSU), University of Washington, University of California-San Francisco, and Stanford University were recruited by contacting the chief residents at those institutions. Surveys and self-addressed, stamped return envelopes were mailed to the chief residents at each institution, and Starbucks gift cards were given to resident participants who completed the surveys.

Patients were randomly recruited from the OHSU general dermatology clinic and from local private practices. Six private practices were randomly selected from a list of all Oregon Dermatologic Society and American Academy of Dermatology members that had practices within a 1-hour drive of Portland, Oregon. Approximately half of patient surveys were distributed to OHSU patients and the other half to patients in private practices. Surveys were administered in person to patients in the waiting room and collected by either study investigators or nursing staff

once they had been completed.

Data were analyzed using SPSS (version 19, Armonk, NY) and Microsoft Excel for Mac 2011 (version 14). Figures were generated using R (version 3.2.2). Cost accuracy was calculated by asking providers to estimate the cost to an uninsured patient for the specified medication, procedure, or diagnostic lab test. Consistent with previous studies of cost prediction accuracy, provider and resident cost estimations within 25% of the actual cost were considered accurate.^{13,14} Mean accuracy was calculated per medication, procedure, or lab by dividing the number of providers who were accurate by the total number of responding physicians. Overall mean accuracy was then calculated as an average of averages. Percent error was calculated and reported as absolute values to avoid high and low values cancelling each other out and thus falsely accurate mean estimates. The significance of independent demographic variables on estimate accuracy was assessed by dividing providers and residents into 3 groups (inaccurate, average, and accurate) on the basis of the number of accurate estimations. Providers and residents with the median number of accurate estimations ± 1 were designated average. The providers and residents who estimated more accurately than the average

CAPSULE SUMMARY

- Studies in other fields of medicine have shown that providers rarely know the costs of care, but this has not been studied in dermatology.
- This study demonstrates that dermatologists, similar to physicians in other fields, often are unable to accurately estimate the costs of care; furthermore, dermatology patients care about the cost of medications and procedures.
- Increased awareness of the cost of dermatologic care might improve patient outcomes and reduce overall health care expenditures.

Table I. Dermatology provider (n = 54) survey demographics

Characteristic	%	(n)
Title		
MD	87	(46)
DO	2	(1)
PA/NP	11	(6)
No response		(1)
Sex		
Female	54	(28)
No response		(2)
Age		
<50	53	(20)
≥50	47	(18)
No response		(16)
Years in practice		
≤15	64	(34)
>15	36	(19)
No response		(1)
Medicaid		
Accepts	81	(42)
No response		(2)
Practice type*		
Academic	30	(16)
Private practice	57	(30)
General dermatology	81	(43)
Surgical/cosmetic	19	(10)
Pediatric dermatology	13	(7)
No response		(1)

*Providers were encouraged to choose all appropriate practice-type options, so percentages do not add up to 100%.

group were designated accurate, and those who estimated less accurately designated inaccurate. Multivariate analysis of variance and chi-squared tests were used to determine the significance of independent variables among accurate, average, and inaccurate providers and residents.

Medication costs were obtained using the [Drugs.com](#) Drug Price Database. The drug prices reported included the discount provided by the [Drugs.com](#) drug discount card, a free and universal prescription discount card accepted by nearly all pharmacies, to purchase medications. We defined the cost of a procedure as an average private insurance reimbursement for that particular procedure at OHSU excluding any facility fees. Some previous studies in this field used hospital charges as a proxy for cost, however, reimbursement rates are on average 60% of hospital charges. Thus, average private insurance reimbursement for a procedure represents a better estimation of the true cost to the health care system for a procedure.

RESULTS

In total, 233 of 244 (96%) patient surveys, 54 of 55 (98%) provider surveys, and 48 of 48 (100%) resident

Table II. Dermatology residents (n = 48) survey demographics

Characteristic	%	(n)
Sex		
Female	70	(33)
No response		(1)
Age		
<30	26	(11)
30-33	67	(29)
>33	7	(3)
PG year		
2	29	(14)
3	36	(17)
4	31	(15)
Fellow	4	(2)
Program		
OHSU	29	(14)
Stanford	33	(16)
UCSF	21	(10)
UW	17	(8)

OHSU, Oregon Health & Science University; PG, post-graduate; UCSF, University of California-San Francisco; UW, University of Washington.

surveys that were distributed were collected. Responder demographics are displayed in [Tables I–III](#).

Provider survey

Most providers significantly underestimated the cost of commonly used dermatologic medications ([Table IV](#)). Average absolute percent error of provider medication cost estimates was 52%. Responding providers were on average 4.5 times more likely (449 underestimates vs 101 overestimates) to underestimate than overestimate the cost of medications in this study. On average, only 20% of dermatology providers were accurate to within 25% of the actual cost of medications. Years in practice, practice setting, practitioner type (ie, MD, DO, NP, PA), medication cost, medication type (branded vs generic), acceptance of Medicaid, and practitioner age were statistically unrelated to provider accuracy regarding medication costs (data not shown).

Providers were more accurate estimating the costs of procedures than medications ([Table V](#)). Average absolute percent error of provider procedure estimates was 63%; however, after removing the outlying overestimation for the cost of potassium hydroxide (KOH), the average error fell to 34%. Providers were 1.3 times more likely to underestimate than overestimate (140 underestimates vs 107 overestimates) procedural costs, and on average 36% of providers were accurate to within 25% of actual procedure costs.

Table III. Dermatology patient (n = 233) survey demographics

Characteristic	%	(n)
Sex		
Female	53	(110)
No response		(22)
Age		
≤29	14	(26)
30-49	32	(65)
50-69	36	(73)
≥70	18	(36)
No response		(31)
Ethnicity		
White	82	(189)
Black	0	(1)
Asian	3	(8)
Hispanic	4	(9)
Other	1	(2)
No response		(20)
Education		
Some high school	3	(8)
High school graduate	12	(25)
Some college	20	(42)
Bachelor's degree	35	(73)
Advanced degree	30	(63)
No response		(22)
Household income, USD		
<\$25,000	9	(17)
\$25,000-50,000	21	(43)
>\$50,000	70	(141)
No response		(32)
Yearly deductible, USD		
≤\$1000	62	(65)
>\$1000	38	(40)
No response		(128)

USD, US dollar.

Regarding the communication of costs, 45% of dermatology providers report that they only discussed the cost of medications if the medications were unlikely to be covered by insurance. Almost all providers (94%) reported they discuss the cost of procedures when the procedure is not covered by insurance, whereas only 15% of providers reported discussing the cost of procedures they know are routinely covered by insurance (Fig 1).

Resident survey

Residents, similar to providers, underestimated the costs of commonly used medications (Table IV). Dermatology trainees fared more poorly than dermatology providers with respect to accuracy: only 14% and 27% of dermatology residents were within 25% of actual costs for medications and procedures, respectively. The average absolute percent error for medications was 60%. When

estimating the cost of procedures, residents averaged an absolute percent error of 130%, with KOH again being an outlying value. Removing KOH dropped the average absolute percent error to 48%. Residents were similarly 3.4 times more likely to underestimate than overestimate medication costs, while 1.1 times more likely to overestimate procedure costs. Demographic factors, including age, post-graduate year, residency program, medication cost, and medication type (branded vs generic) were statistically unrelated to resident accuracy (data not shown).

Residents reported very little formal training regarding cost, with only 12.5% receiving any lectures within the past year on this topic. Of the 6 residents who did report receiving a lecture on cost over the past year, only 1 reported having >1 lecture. Twenty-one percent of residents reported never receiving informal cost training in the clinic, and most residents (73%) responded that they sometimes received informal cost training in the clinic. Residents were less likely than providers to strongly agree or agree (27% vs 70%, respectively) that attending physicians discuss the cost of covered medications (Fig 1). The resident responders were more likely than providers to strongly agree or agree (81% vs 45%) that attending physicians discuss the cost of only uncovered medications (Fig 1). Further supporting this discrepancy, 73% of resident responders had at least once been asked by patients to discuss expected costs after the attending physician left the exam room without discussing costs.

Patient survey

Patients were in strong agreement that discussing the cost of medications and procedures was important to them (Fig 2). Most patients reported that knowing the cost of uncovered procedures (92% of patients) and out-of-pocket medication expenses (84% of patients) was important or very important. Likewise, most patients (70%) also reported that it was important or very important to know the cost of procedures that were covered by insurance. Despite patient interest in discussions of cost, less than half of the patients reported actually receiving information regarding medication or procedure costs from their dermatology provider (Fig 1).

Over a quarter of patients reported not filling prescriptions written by their dermatology provider due to cost concerns, using less than the prescribed amount, or delaying appointments until a deductible was met (Figs 2 and 3). A patient's self-reported income was statistically unrelated to the likelihood of not filling prescriptions or using less than the

Table IV. Provider and resident cost estimations of medications

Drug name	Actual price, USD	Provider estimate, % error	Resident estimate, % error	Providers within 25% of actual cost, %	Residents within 25% of actual cost, %
Minocycline	\$149.84	65.3	61.1	6	1
Solodyn	\$475.28	50.9	56.1	10	14
Tretinoin	\$75.92	39.4	56.9	31	23
Ziana	\$423.38	52.2	59.2	8	4
Benzoyl peroxide	\$39.71	56.3	52.3	24	15
Clindamycin	\$39.70	47.8	54.0	36	23
Duac	\$167.39	35.1	49.9	41	28
Vanos	\$281.25	41.5	51.2	23	13
Clobetasol	\$87.00	53.6	54.2	16	23
Methotrexate	\$84.84	71.7	93.2	14	4
Acitretin	\$680.82	55.8	67.9	8	7
Aggregate	—	52	60	20	14

Actual drug prices were obtained from www.drugs.com based on self-pay parameters.

All price estimations of the following drugs were based on charges to an uninsured patient: minocycline 100-mg tab; Solodyn (extended-release minocycline) 90-mg tab; tretinoin 0.05% cream, 45 g; Ziana gel (1.2% clindamycin-0.025% tretinoin), 60 g; benzoyl peroxide 5% gel, 50 g; clindamycin 1% solution, 60 mL; Duac gel (1% clindamycin-5% benzoyl peroxide), 45 g; Vanos cream (0.1% fluocinonide, 60 g); clobetasol propionate 0.05% cream, 60 g); methotrexate 2.5-mg tab; and acitretin 25-mg tab.

Percent error values are calculated and reported as average absolute distances from zero.

USD, US dollar.

Table V. Provider and resident procedure cost estimations

Procedure	Adjusted actual cost, USD	Provider estimate, % error	Resident estimate, % error	Providers within 25% of actual cost, %	Residents within 25% of actual cost, %
Actinic	\$365.78	41.8	39.3	16	34
Seborrheic	\$171.84	32.2	54.7	49	41
BCC	\$294.67	24.2	58.2	60	19
Mohs	\$1902.18	35.6	38.5	39	38
KOH	\$9.89	182.0	459.9	16	4
Aggregate	—	63	130	36	27
w/o KOH	—	34	48	41	33

Cost estimations were made on the following procedures: liquid nitrogen treatment of 8 actinic keratoses; liquid nitrogen treatment of 3 noninflamed seborrheic keratoses; C+D of 0.9-cm BCC on the temple; Mohs surgery for 0.9-cm BCC, 1 stage; and KOH preparation and interpretation.

Actual prices for procedures were provided by the Oregon Health & Science University managed care team as quotations for self-pay patients.

Percent error values were calculated and reported as average absolute distances from zero.

BCC, Basal cell carcinoma; KOH, potassium hydroxide; USD, US dollar.

prescribed amount (data not shown). Most patients (79%) disagreed that branded medications were more effective than generic medications, and most (86%) responded that they preferred generic medications (Fig 2).

DISCUSSION

Our survey data reveal that dermatology providers consistently underestimated the cost of medications commonly prescribed for dermatologic conditions but were more accurate estimating the cost of procedures. Dermatology residents inaccurately estimated costs of both commonly used medications and procedures in dermatology, which was likely caused by the reported paucity of

formal training on these topics. Patients reported receiving little information regarding medication or procedure costs even though they rated this information to be important to them even if the procedures or medications were covered by insurance.

Our finding of poor medication cost estimation amongst providers (20% were accurate in our sample) is consistent with the findings of a 2007 review that found only 31% of physicians across specialties estimated medication costs within 20%-25% of their actual cost.¹³ That study did not find a systemic underestimation of costs as we have found, but rather a pattern of overestimating inexpensive medications while underestimating

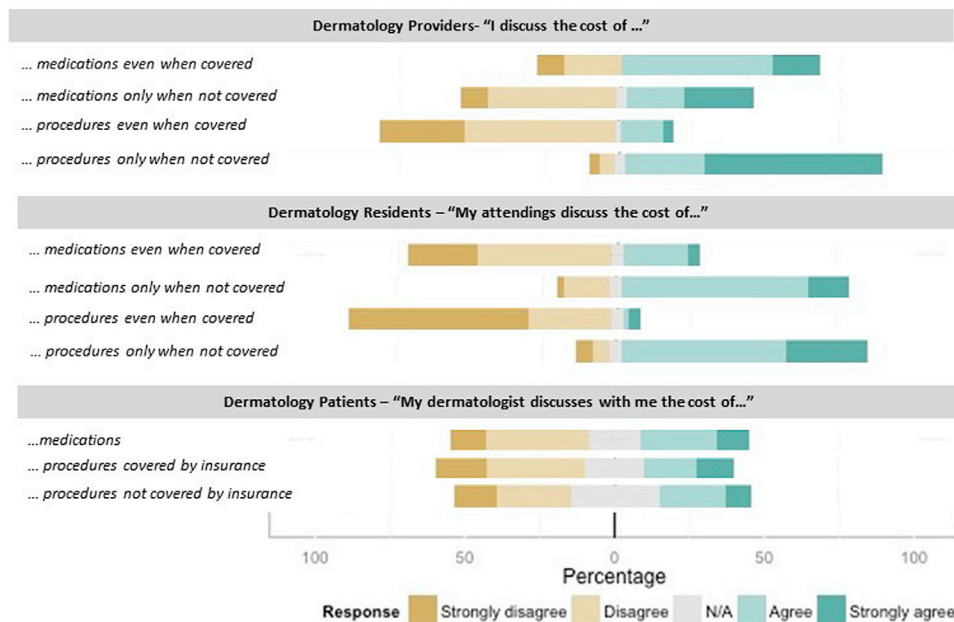


Fig 1. Communication around costs of care. The percent negative and positive responses to survey questions are shown. Negative responses (strongly disagree, disagree) appear to the left of midline, and positive responses (strongly agree, agree) appear right of midline. Nonresponders are labeled N/A and fall directly on the midline.

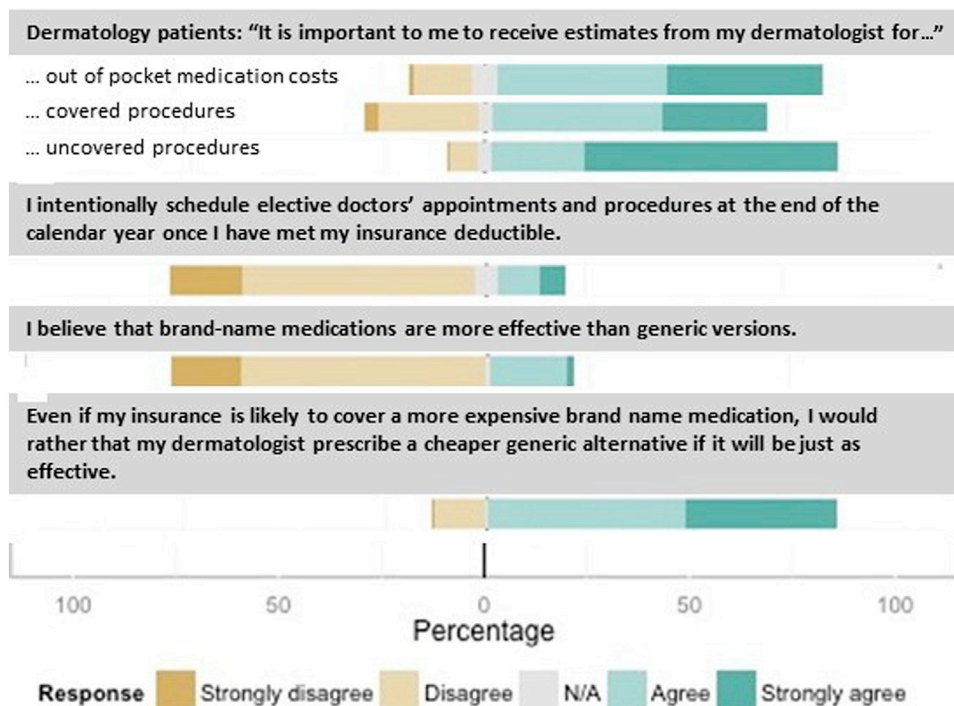


Fig 2. Patient preferences and experiences with dermatological health care costs. The percent negative and positive responses to survey questions are shown. Negative responses (strongly disagree, disagree) appear to the left of midline, and positive responses (strongly agree, agree) appear right of midline. Nonresponders are labeled N/A and fall directly on the midline.

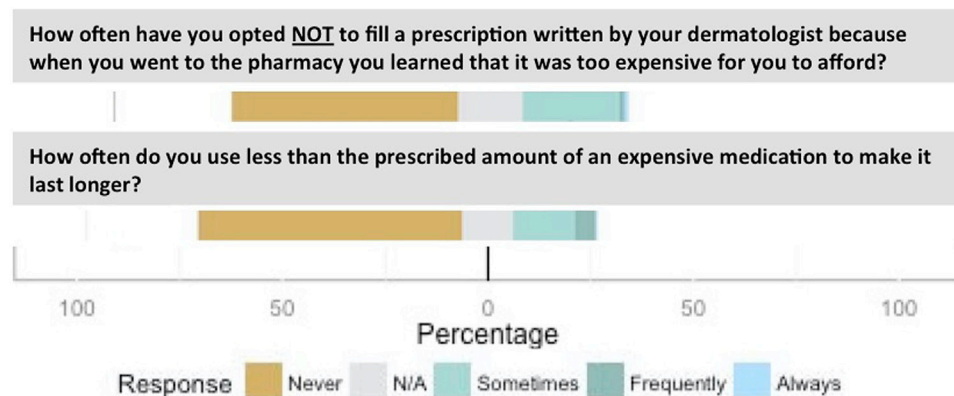


Fig 3. Cost influence on patient behaviors. Patient perspectives on generic medications. The percent negative and positive responses to survey questions are shown. Negative responses (never, strongly disagree, disagree) appear to the left of midline, and positive responses (strongly agree, agree, sometimes, frequently, always) appear right of midline. Nonresponders are labeled N/A and fall directly on the midline.

expensive medications.¹³ This cost underestimation is particularly relevant to clinical dermatology, especially regarding expensive medications or procedures; the 25% accuracy benchmark allows for a potentially large discrepancy between estimated and actual cost. Patient adherence, satisfaction, and decision-making might be affected by a large expected-to-actual cost discrepancy. A 2008 review by the same authors covering nonmedication health care costs (diagnostic and therapeutic items) found an overall cost accuracy of 33%, with no preference toward under- or overestimation.¹⁴ Similar to the surveyed providers in the 2008 studies, dermatology providers in our study were more accurate in estimating procedure costs than estimating medication costs. Providers receive direct compensation for procedures likely explaining their better estimation of these costs compared with medications.

Providers reported that insurance coverage strongly influenced their decision to discuss costs with patients, and providers rarely did so if the procedure or medication was covered by insurance. This decision at least partially explains why only 44% of patients report receiving information from their dermatologists about cost. The relatively high frequency of dermatologist-reported discussions of cost compared with the relatively low resident- or patient-reported discussions of cost also strongly suggest that these conversations might be ineffective, underreported by residents and patients, or overreported by dermatologists.

Most patients reported that knowing the cost of medications and procedures was important to them regardless of insurance coverage. One possibility for the observed patient sensitivity to cost comes from

the rise in high-deductible health plans. A 2009 cohort study of patients with high-deductible health plans found that confusion over benefits and increased out-of-pocket expenses contributed to patients' heightened awareness of health care costs. Patients with high-deductible health care plans were more likely to attempt cost management strategies like information gathering, delaying care, or avoiding care.¹⁹ The average reported insurance deductible among our participants was \$1176, but only 53% of respondents included their deductible value. Another explanation for patients' interest in the cost of care might be that the emphasis on high-value health care has extended beyond industry professionals. Increased media attention on health care reform and public awareness programs around topics like antibiotic stewardship and low-value diagnostic procedures have potentially increased the public's interest in high-value health care.²⁰

Our data support patient cost-consciousness in several additional ways. Patients reported an overwhelming preference for generic medications over branded medications. Only a minority of the patients in our study believed generics to be inferior, which corroborates a large survey study from 2009.²¹ Eighty-six percent of patients in our study preferred generics as compared with only 38% in the 2009 study. While a direct comparison between the data from the 2 studies cannot be done because of differing data collection tools and methods, we believe the trend favoring the increased popularity of generics is significant and supports the idea that patients increasingly care about costs.

Patients in our study elaborated several ways on how the high cost of care contributed to poor

adherence. Notably, over a quarter of patients elected not to fill a prescription written by their dermatology provider due to cost, 21% reported underusing medications to delay getting refills, and 17% waited to meet deductibles before making office appointments. This inverse relationship between cost and patient adherence is well established.²²⁻²⁴ Patient nonadherence is a source of inefficiency that contributes to increased health care utilization and expenditures^{25,26} and is the most common cause of poor response to appropriate therapy.²⁷

The current lack of emphasis of cost training during residency was apparent in our study; only 12% of responding residents received a formal lecture on the costs of dermatologic care within the prior year. A variety of studies suggest resident-focused educational interventions aimed at improving high-value care can be effective.²⁸⁻³⁰ However, a randomized control trial of a brief educational intervention among internal medicine residents showed no statistical reduction in costs per admission over the control group.³¹ The length of the educational intervention appears to determine whether or not these resident education programs are effective. One study suggests that the benefit from the educational intervention fades within months of the end of the intervention.²⁸

Our study has limitations. Our surveyed patient, provider, and resident populations were limited to the Northwest region of the United States. In particular, the surveyed population lacked racial (82% white) and socioeconomic (70% over \$50,000 yearly income) diversity. In comparison, the 2010 US Census data reported that 72.4% of the national population identifies as white, and the median household income was \$50,046.^{32,33} The cost estimations and practice habits of a geographically-restricted set of dermatologists similarly does not necessarily reflect the estimations and habits of the national population of dermatologists. Therefore, our conclusions might not be generalizable to the national population of dermatologists. Another limitation was that providers were asked to estimate costs for uninsured patients, however 97% of our responding patient population had insurance coverage. The surveyed providers are thus more likely to know insurance-adjusted costs than costs to uninsured patients. Actual costs are also highly variable over time, geographic distributions, and insurance coverage, making cost estimation predictably difficult.

In conclusion, our study demonstrates that, similarly to practitioners in other fields, dermatology providers rarely know the costs of commonly used medications. Dermatology providers are much more

likely to discuss the costs of care if they believe the care will not be covered by insurance. Patients, however, express interest in knowing all costs including those that will be covered by insurance. The data also show that costs of care influence patient behavior, and nonadherence due to cost might be contributing to poorer outcomes and increased overall health care expenditures. Further research is needed to determine whether improved knowledge and discussions regarding cost by patients and providers lead to more cost-efficient and effective care by dermatology providers.

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