Original Investigation

Trends in Sunscreen Recommendation Among US Physicians

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IMPORTANCE Sunscreen is an important part of sun protection to prevent skin cancer but may not be recommended as often as guidelines dictate.

OBJECTIVE To evaluate trends in sunscreen recommendation among physicians to determine whether they are following suggested patient-education guidelines regarding sun protection, and to assess data regarding physician sunscreen recommendations to determine the association with patient demographics, physician specialty, and physician diagnosis.

DESIGN, SETTING, AND PARTICIPANTS The National Ambulatory Medical Care Survey was queried to identify patient visits to nonfederal outpatient physician offices at US ambulatory care practices (January 1, 1989–December 26, 2010) during which sunscreen was recommended.

MAIN OUTCOMES AND MEASURES Frequency of sunscreen recommendation.

RESULTS According to the National Ambulatory Medical Care Survey, there were an estimated 18.30 billion patient visits nationwide. Physicians mentioned sunscreen at approximately 12.83 million visits (0.07%). Mention of sunscreen was reported by physicians at 0.9% of patient visits associated with a diagnosis of skin disease. Dermatologists recorded the mention of sunscreen the most (86.4% of all visits associated with sunscreen). However, dermatologists reported mentioning sunscreen at only 1.6% of all dermatology visits. Sunscreen was mentioned most frequently to white patients, particularly those in their eighth decade of life, and least frequently to children. Actinic keratosis was the most common diagnosis associated with sunscreen recommendation.

CONCLUSIONS AND RELEVANCE Despite encouragement to provide patient education regarding sunscreen use and sun-protective behaviors, the rate at which physicians are mentioning sunscreen at patient visits is quite low, even for patients with a history of skin cancer. The high incidence and morbidity of skin cancer can be greatly reduced with the implementation of sun-protective behaviors, which patients should be counseled about at outpatient visits.

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The incidence of skin cancer is on the rise.[1,2] Its primary cause is UV radiation, which accounts for up to 90% of melanoma and nonmelanoma skin cancers.[3] In addition, exposure to UV radiation is the only recognized modifiable risk factor for melanoma. Physicians play an important role in cancer prevention by counseling patients on modifiable lifestyle behaviors, such as smoking cessation to reduce the risk of lung cancer. However, sun-protection counseling ranks among the lowest topics of primary prevention discussed between physicians and patients.[4,5]

Acknowledging the importance of sun-protective behaviors in the prevention of skin cancer, multiple professional organizations, such as the American Academy of Dermatology, National Institutes of Health, American Cancer Society, American Academy of Pediatrics, American College of Gynecologists, and American Academy of Family Physicians, recommend physicians provide patient counseling regarding sun exposure and sun-protective behaviors.[6-11] The US Preventative Services Task Force concluded in 2012 that there was "moderate certainty of moderate benefit" from recommending patient counseling on sun protection for fair-skinned patients aged 10 to 24 years and that there was insufficient evidence to recommend for or against sun-protection counseling in patients older than 24 years.[12]

Major recommendations for sun-protective behaviors are similar among different health care organizations. Such rec-

ommendations include: (1) seeking shade and avoiding the sun, especially during the hours of 10 AM to 4 PM; (2) wearing sun-protective clothing, including long-sleeved shirts and wide-brimmed hats; (3) applying and reapplying sunscreen; and (4) avoiding artificial UV light.[1,7,10,13] Although avoiding exposure to UV radiation is a key component of sun-protective behavior, this is not always practical. Therefore, sunscreen is an important component of sun protection, as it prevents epidermal and dermal damage secondary to UV radiation exposure. As a result, sunscreen decreases the incidence of actinic keratoses, squamous cell carcinomas, and melanoma skin cancers.[14-17] In addition, sunscreen is recommended for a diversity of photosensitive skin conditions, such as actinic dermatitis, melasma, porphyria cutanea tarda, polymorphic light eruption, actinic prurigo, lupus erythematosus, and drug-induced photosensitivity as seen with acne medications.[18-20] Although physicians are encouraged to counsel patients on sunscreen use, no studies in the medical literature, to our knowledge, report how often US physicians are recommending sunscreen. Therefore, the primary objective of this study was to assess trends in sunscreen recommendations by different physician specialties to determine whether physicians are recommending sunscreen as their respective organizations advocate. Also, patient education alters patient practices; however, physicians often reserve such counseling for certain subsets of patients. Hence, data regarding physician diagnoses and patient demographics were evaluated to determine which subsets of patients were most likely to receive sunscreen recommendations.

Methods

Data were obtained from the National Ambulatory Medical Care Survey (NAMCS), which is an ongoing survey conducted by the National Center for Health Statistics. The survey was started in 1974 but was not conducted annually until 1989. The NAMCS collects descriptive data regarding ambulatory visits to nonfederal, office-based physicians in the United States. Sampling is stratified by sampling units (county, contiguous counties, and standard metropolitan areas), physician practices within the sampling units, and patient visits within the practice occurring within 52 weekly periods. Participating physicians are instructed to record information about patient visits for a 1-week period and include patient demographics, insurance status, reason for visit, diagnoses, procedures, therapeutics, and referrals made at that time. Data collected for the NAMCS are entered into a multistage probability sample to produce national estimates.

In the present study, the NAMCS database was queried to identify patient visits between January 1, 1989, and December 26, 2010, during which sunscreen was recorded. When a medication or over-the-counter product is recorded for a NAMCS patient visit, it indicates the product was currently being used by the patient, was dispensed in the office, or was prescribed or recommended by the physician at that particular visit. After these visits were identified, data regarding patient demographics, physician specialty, and physician diagnoses were assessed. In addition, we looked at patient visits associated with a diagnosis of skin disease (as previously defined by Fleischer et al[21]) and, more specifically, a history of skin cancer (*International Classification of Diseases, Ninth Revision, Clinical Modification* codes V10.82 and V10.83), actinic keratosis (702.0), and current skin cancer (172.x, 173.x, and 232.x). These visits were further characterized as visits to dermatologists, internists, pediatricians, general or family physicians, and other specialists. The top 10 diagnoses associated with the highest frequencies of sunscreen use by each specialty were determined. Linear regressions were performed to determine trends in use during this period. All data were analyzed using SAS statistical software (SAS Institute Inc). The study was declared exempt by the Wake Forest University Health Sciences institutional review board.

Results

From January 1, 1989, through December 26, 2010, there were an estimated 18.30 billion patient visits; of those, sunscreen was recommended at 12.83 million visits (0.07%) (**Table 1**). No differences in sunscreen recommendation were detected with respect to patient sex or ethnicity (Table 1). With regard to patient race, sunscreen was recommended in 237 visits annually for every 100 000 visits by white US residents compared with 26 visits annually for every 100 000 visits by black individuals. With data stratified by age groups of 10-year intervals, sunscreen was recommended the most for patients in their eighth decade of life (21.8% of visits associated with sunscreen recommendation). In contrast, sunscreen was recommended the least for children younger than 10 years.

The frequency of sunscreen recommendation was 12 times greater for patient visits associated with a diagnosis of skin disease compared with visits with no reported skin disease. Although sunscreen use was mentioned more frequently to patients with skin disease, such recommendations were made at less than 1% of visits involving patients with a reported skin disease diagnosis. There were no statistically significant differences in sunscreen mention among different races in patients with skin disease. However, sunscreen use was recommended more frequently for Hispanic compared with non-Hispanic patients (1.2% vs 0.9%; $P < .001$).

Analysis by physician specialty revealed that dermatology visits accounted for most of the appointments associated with sunscreen recommendation (86.4%), followed by visits with general and family practitioners (9.6%), pediatricians (1.4%), other specialists (1.4%), and internists (1.1%). Although sunscreen was most frequently recommended by dermatologists, the mention of sunscreen was recorded at 1.6% of all dermatology visits (**Table 2**). In addition, sunscreen was mentioned by dermatologists at 11.2% of visits associated with a diagnosis of active or remote history of skin cancer. This low frequency of sunscreen recommendation by dermatologists is concerning because dermatologists saw more than 20 times the number of patients with a history of skin cancer (7.1 million) compared with general/family physicians (320 000). Moreover, the frequency with which dermatologists recommended sunscreen to this

Table 1. Sunscreen Recommendation for All Visits vs Skin Disease Visits by All Physicians: NAMCS, 1989-2010

Patient Characteristic	Total No.	No. (%)[a] All Visits ($N = 1.83 \times 10^{10}$)	No. (%)[a] Skin Disease Visits ($n = 1.26 \times 10^{9}$)
Sex			
Female	10 900 000 000	7 610 000 (0.07)	6 470 000 (0.9)
Male	7 442 000 000	5 220 000 (0.07)	4 320 000 (0.8)
Race			
White	14 700 000 000	11 700 000 (0.08)	10 110 000 (1.0)
Black	1 680 000 000	200 000 (0.01)	150 000 (0.2)
Asian or Native Hawaiian/Other Pacific Islander	628 600 000	210 000 (0.03)	200 000 (0.5)
American Indian/Alaska Native	58 040 000	40 000 (0.07)	40 000 (1.2)
>1 Reported	27 760 000	0	0
Unknown	1 175 650 000	680 000 (0.06)	290 000 (0.4)
Ethnicity[a]			
Hispanic	1 529 000 000	1 140 000 (0.07)	1 030 000 (1.2)
Non-Hispanic	13 600 000 000	10 240 000 (0.08)	8 640 000 (0.9)
Unknown	2 404 000 000	990 000 (0.04)	670 000 (0.4)
Age group, y[b]			
0-9	2 469 000 000	230 000 (0.01)	200 000 (0.1)
10-19	1 474 000 000	820 000 (0.06)	650 000 (0.4)
20-29	1 678 000 000	630 000 (0.04)	580 000 (0.4)
30-39	2 192 000 000	1 090 000 (0.05)	950 000 (0.6)
40-49	2 439 000 000	1 810 000 (0.07)	1 630 000 (1.0)
50-59	2 409 000 000	2 120 000 (0.09)	1 670 000 (1.1)
60-69	2 276 000 000	2 290 000 (0.1)	1 820 000 (1.3)
70-79	2 135 000 000	2 800 000 (0.1)	2 380 000 (1.8)
80-89	1 094 000 000	860 000 (0.08)	800 000 (1.2)
≥90	140 500 000	170 000 (0.1)	110 000 (1.3)
Total	**18 300 000 000**	**12 830 000** (0.07)	**10 790 000** (0.9)

Abbreviation: NAMCS, National Ambulatory Medical Care Survey.

[a] Ethnicity was not included in the survey prior to 1993 and is thus not included in these totals.

[b] For all visits, numbers do not add to the total because of rounding.

Table 2. Sunscreen Recommendation by Physician Specialty: NAMCS, 1989-2010

Reason for Visit	Physician Specialty, No. or No. (%) Dermatology	FP/GP	Internal Medicine	Pediatrics	All Others
All visits	696 300 000	4 484 000 000	2 774 000 000	2 256 000 000	8 095 000 000
Sunscreen recommended	11 090 000 (1.6)	1 230 000 (0.03)	140 000 (0.01)	190 000 (0.01)	180 000 (0.002)
Skin disease	592 500 000	238 400 000	83 220 000	128 300 000	219 700 000
Sunscreen recommended	9 410 000 (1.6)	1 120 000 (0.5)	90 000 (0.1)	40 000 (0.03)	130 000 (0.06)
Skin disease with history of skin cancer	7 120 000	320 000	80 000	0	460 000
Sunscreen recommended	790 000 (11.2)	180 000 (55.5)	0	0	0
Actinic keratosis	91 360 000	5 380 000	1 540 000	0	2 100 000
Sunscreen recommended	3 130 000 (3.4)	470 000 (8.7)	0	0	20 000 (0.8)
Skin cancer	62 910 000	6 780 000	1 240 000	0	21 080 000
Sunscreen recommended	1 290 000 (2.1)	80 000 (1.1)	0	0	0

Abbreviations: FP, family practice; GP, general practice; NAMCS, National Ambulatory Medical Care Survey.

population of patients was significantly less than that of general/family physicians (11.2% vs 55.5%).

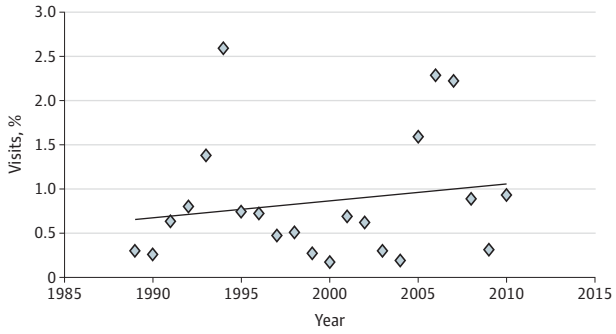
According to the NAMCS, internists recommended sunscreen at 0.01% of all patient visits and 0.1% of visits associated with a diagnosis of skin disease. Interestingly, internists did not record sunscreen recommendations at patient visits associated with a diagnosis of actinic keratosis. Furthermore, there was no mention of sunscreen by internists at visits involving patients with an active or remote history of skin cancer.

Pediatricians recommended sunscreen at a trivial number of all visits (0.01%) and to 0.03% of patients with skin disease. Pediatric visits for actinic keratosis or skin cancer were

not analyzed because these cutaneous conditions are extremely rare in children and adolescents. Analysis of sunscreen recommendations over time with the use of linear regression models demonstrated an annual increase of 0.02% (P = .02) in the frequency of sunscreen recommendation among all physicians, regardless of specialty, for patients with skin disease (**Figure**). Dermatologists demonstrated a greater increase in the rate of sunscreen recommendation to patients with skin disease (0.06% per year; P < .001). Conversely, the mention of sunscreen by general/family physicians declined 0.03% per year (P = .03). In addition, mention of sunscreen by a family physician decreased 0.1% per year for patient visits associated with a diagnosis of actinic keratosis (P = .01). However, no statistically significant changes in sunscreen recommendation patterns were seen for patients with a history of skin cancer (P = .50).

Among all specialists, actinic keratosis was the most common diagnosis reported at visits during which sunscreen was recommended, accounting for nearly a quarter (20.9%) of diagnoses (**Table 3**). This was followed by acne (8.1%), benign neoplasm of the skin (6.8%), other dermatitis due to solar radiation (5.6%), and malignant neoplasm of the skin (5.2%). The top 10 list of diagnoses associated with sunscreen recommendation was similar among all specialists.

Figure. Trend in Sunscreen Recommendations by All Physicians at Skin Disease Visits: National Ambulatory Medical Care Survey, 1989-2010



The solid line represents the linear regression fit over time (SAS PROC SURVEYREG; SAS Institute Inc), which demonstrates an annual increase of 0.02% (P = .02) in the frequency of sunscreen recommendation among all physicians for patients with skin disease.

Discussion

Although multiple professional health care organizations highly recommend that physicians educate patients on sun-protective behaviors, including proper sunscreen use, NAMCS data indicate that physicians are mentioning sunscreen at a very low percentage of all patient visits. Compared with black patients, white patients were 9 times more likely to be recommended sunscreen. Children and adolescents were recommended sunscreen the least compared with all patient age groups. Likewise, sunscreen was mentioned at a low number of pediatric visits. Patients aged 70 to 79 years were recommended sunscreen the most frequently compared with other age groups, likely resulting from the tendency of this patient population to have visible solar damage and/or actinic keratoses appreciated on physical examination.

The findings are concerning because children and adolescents get the most sun exposure of any age group, as they tend to spend much of their time playing outdoors. Up to 80% of sun damage is thought to occur before age 21 years, and sunburns in childhood greatly increase the risk for future melanoma.[1,22,23] The American Academy of Pediatrics recognizes the primary role pediatricians have in preventing skin cancer. New guidelines advise pediatricians to discuss sun protection at least yearly during health maintenance examinations and to familiarize themselves with medications with photosensitizing effects.[10] The American Academy of Pediatrics also recommends assuring parents of the low likelihood of developing vitamin D deficiency in association with sunscreen

Table 3. Top 10 Most Common Diagnoses Associated With Sunscreen Recommendation by Physician Specialty: NAMCS, 1989-2010

	Physician Specialty[a]		
Rank	All Specialties	Dermatology	Primary Care
1	Actinic keratosis (702.0)	Actinic keratosis (702.0)	Actinic keratosis (702.0)
2	Other acne (706.1)	Benign neoplasm of skin, site unspecified (216.9)	Unspecified disorder of skin and subcutaneous tissue (709.9)
3	Benign neoplasm of skin, site unspecified (216.9)	Other acne (706.1)	Other acne (706.1)
4	Other dermatitis due to solar radiation (692.79)	Other dermatitis due to solar radiation (692.79)	Keratoderma, acquired (701.1)
5	Malignant neoplasm of skin, site unspecified (173.9)	Malignant neoplasm of skin, site unspecified (173.9)	Unspecified essential hypertension (401.9)
6	Other seborrheic keratosis (702.19)	Other seborrheic keratosis (702.19)	Tietze disease (733.6)
7	Dermatitis or eczema, unspecified cause (692.9)	Dermatitis or eczema, unspecified cause (692.9)	Burn of upper limb, unspecified site, unspecified degree (943.00)
8	Unspecified disorder of skin and subcutaneous tissue (709.9)	Rosacea (695.3)	Sunburn (692.71)
9	Rosacea (695.3)	Dyschromia, unspecified (709.0)	Hirsutism (704.1)
10	Dyschromia, unspecified (709.0)	Other dyschromia (709.09)	Other enthesopathy of ankle and tarsus (726.79)

Abbreviation: NAMCS, National Ambulatory Medical Care Survey.

[a] Parenthetical numbers are diagnosis codes (*International Classification of Diseases, Ninth Revision, Clinical Modification*).

application, since adequate levels are maintained through diet and supplementation.[10] In addition, pediatricians are highly encouraged to be strong proponents of sun-protective policies, such as the SunWise program, which is similar to programs implemented in Australia.[10] Similarly, the American Cancer Society and Centers for Disease Control and Prevention emphasize the importance of educating children and adolescents regarding skin cancer. These health care organizations also advocate the implementation of school interventions, such as permitting the use of hats and encouraging sunscreen use when children are outside, to reduce their risk for skin cancer.[8]

There are several limitations to the present study. The NAMCS survey collects cross-sectional data; therefore, when prescription or over-the-counter medications are reported, one cannot determine if the product was currently being used by the patient, dispensed in the clinic, or prescribed or recommended at that visit. Hence, we could not determine whether the sunscreen reported was a newly recommended or previously used product. Data reporting is another potential limitation. Although physicians may have provided sun-protective counseling, including sunscreen recommendation, they may have failed to document sunscreen on the survey reports. Also, the data include both new and follow-up visits, and sunscreen may have been discussed at an earlier visit than the one sampled.

In summary, many variables affect the likelihood of sunscreen recommendation, including physician specialty, presence of skin disease, and patient demographics. Recommendation of sunscreen use by physicians is infrequent, even in the setting of skin cancer. The American Academy of Dermatology, National Institutes of Health, American Cancer Society, American College of Gynecologists, American Academy of Pediatrics, and American Academy of Family Physicians all recommend sun-protection counseling, including sunscreen use; however, only a small percentage of physicians are implementing these recommendations into their practice. The high incidence and morbidity of skin cancer can be greatly reduced with the implementation of sun-protective behaviors, which patients should be counseled about at outpatient visits.

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Analysis and interpretation of data: All authors.
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