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Curricular factors associated with medical students' practice of the skin cancer examination: an educational enhancement initiative by the integrated skin exam consortium

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Original Investigation

Curricular Factors Associated With Medical Students' Practice of the Skin Cancer Examination
An Educational Enhancement Initiative by the Integrated Skin Exam Consortium

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IMPORTANCE As medical school curricula become progressively integrated, a need exists to optimize education related to the skin cancer examination (SCE) for melanoma, a relevant competency gap that influences secondary prevention efforts.

OBJECTIVES To identify curricular factors associated with medical students' confidence, intent, and performance regarding the SCE.

DESIGN, SETTING, AND PARTICIPANTS Survey-based cross-sectional study from the Integrated Skin Exam Consortium at accredited US medical schools among a volunteer sample of second-year students representing 8 geographically varied public and private institutions. Students were administered a questionnaire to assess characteristics, curricular exposures, and educational and practical experiences related to skin cancer, as well as knowledge of melanoma risk and a detection method.

MAIN OUTCOMES AND MEASURES Primary outcomes were confidence in performing the SCE, intent to perform an integrated skin examination, and actual performance of the SCE.

RESULTS Physical diagnosis session and clinical encounter were most predictive of confidence in performance of the SCE (odds ratios [ORs], 15.35 and 11.48, respectively). Other curricular factors associated with confidence included instruction time of at least 60 minutes on skin cancer (OR, 6.35), lecture on the SCE (OR, 7.54), knowledge of melanoma risk (OR, 3.71), and at least 1 opportunity to observe the SCE (OR, 2.70). Physical diagnosis session and at least 4 opportunities to observe the SCE were most predictive of intent to perform an integrated skin examination (ORs, 4.84 and 4.72, respectively). Other curricular factors associated with intent included knowledge of melanoma risk (OR, 1.83), clinical encounter (OR, 2.39), and at least 1 opportunity to observe the SCE (OR, 1.95). Clinical encounter, physical diagnosis session, and at least 1 opportunity to observe the SCE were most predictive of performance of the SCE (ORs, 21.67, 15.48, and 9.92, respectively). Other curricular factors associated with performance included instruction time of at least 60 minutes on skin cancer (OR, 2.42) and lecture on the SCE (OR, 5.04).

CONCLUSIONS AND RELEVANCE To augment the practice of the SCE among medical students, course directors may design an integrated curriculum that includes at least 60 minutes of instruction related to melanoma and the SCE, a description of the integrated skin examination as part of the physical diagnosis course, and education on high-risk demographic groups and anatomic sites specific to men and women and on the ABCDEs of melanoma, and at least 1 opportunity to observe the SCE.

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Primary care physicians (PCPs) have the most frequent opportunities to detect skin cancer among high-risk patients,[1] and their ability to detect thin melanomas has the potential for significant public health influence.[2-4] However, most PCPs do not routinely screen high-risk patients for skin cancer,[5,6] and the frequency of the skin cancer examination (SCE) among PCPs is significantly less than that for other cancer examinations.[7] As such, the opportunity for early detection of melanoma is frequently missed. Lack of confidence, absence of training, and poor accuracy are cited among the limitations to this practice.[8,9] Notably, the influence of medical training is an important facilitative factor among PCPs who report performing the SCE.[6] Therefore, identifying factors in medical school that augment confidence and intent regarding performance of the SCE may improve secondary prevention efforts for melanoma among the newest physicians.

Efforts to assess medical students' recognition of melanoma and experiences with the SCE[10-17] have not occurred in concert with the recent introduction of clinical exposures into the first 2 years of medical school. As clinical and preclinical curricula become progressively integrated, a compelling need exists to optimize training related to the practice of the SCE, a relevant competency gap.[14,16,18] The Integrated Skin Exam Consortium, composed of a group of educators at 8 US medical schools, was created to narrow this gap through educational interventions aimed at increasing awareness of high-risk groups and anatomic sites, promoting integration of the SCE into the routine physical examination, and enabling identification of suspicious pigmented lesions. These concepts germane to the integrated skin examination (ISE) have been discussed elsewhere,[19-21] and the ISE instructional film for medical students is available through the American Academy of Dermatology's Medical Student Core Curriculum (http://aad.org/education/medical-student-core-curriculum/dermatology-skills-videos/the-integrated-skin-exam).

The objective of this study was to identify curricular factors associated with medical students' confidence, intent, and performance regarding the SCE. Our goal is to facilitate the design of curricula that best promote SCEs and, subsequently, effective secondary prevention practices.

Methods

Settings and Participants

The institutional review boards from each medical school in the Integrated Skin Exam Consortium approved this study. Participation was voluntary, and informed consent was obtained via a study information sheet. In total, 1138 second-year medical students representing 8 geographically varied public and private institutions qualified for the study, with 72.6% (826 of 1138) of them responding to the survey. We recruited schools nationwide based on their ability to incorporate all components of a 2-year ISE study protocol. The **Figure** shows the number of eligible students at these institutions and the number who completed surveys. Sex distribution by school is also shown. Self-identification of sex was optional, and 2 schools (Boston University School of Medicine and Ohio State University College of Medicine) elected to eliminate this question from the survey.

Measures

We administered surveys to students in person or via an online content management system before the start of the second-year dermatology curriculum between July 1, 2011, and June 30, 2012. The median month of administration was April 2012.

Baseline respondent characteristics were assessed for each student. We asked students to identify their intended career choice. We also evaluated students on their knowledge of high-risk demographic groups, high-risk anatomic sites for melanoma in women and men, and the ABCDE detection method for melanoma. These melanoma knowledge questions were combined into one variable of melanoma risk to assess the influence of overall knowledge. We also asked students to describe their educational experiences related to skin cancer, including the total amount of time spent in structured learning, the methods by which they had been instructed to perform an SCE, and the number of patients for whom they had observed and performed SCEs.

The 3 primary outcomes in the study were confidence in performing the SCE, intent to perform an ISE, and actual performance of the SCE. Students were asked to rate their confidence in performing an SCE on a 4-point Likert-type scale that included (1) very confident, (2) moderately confident, (3) slightly confident, and (4) not at all confident. These categories were collapsed to dichotomize the measure (very or moderately confident vs slightly or not at all confident). Students were also asked to rate their likelihood of integrating a careful SCE into patients' routine physical examinations on a 4-point Likert-type scale that included (1) very likely, (2) somewhat likely, (3) unlikely, and (4) only if the patient had a concern about his or her skin. We also collapsed these categories to dichotomize the measure (very or somewhat likely vs unlikely or only if the patient expressed concern). Finally, we asked students to select the number of times they had performed an SCE from the choices of (1) none, (2) 1 to 3 times, and (3) at least 4 times.

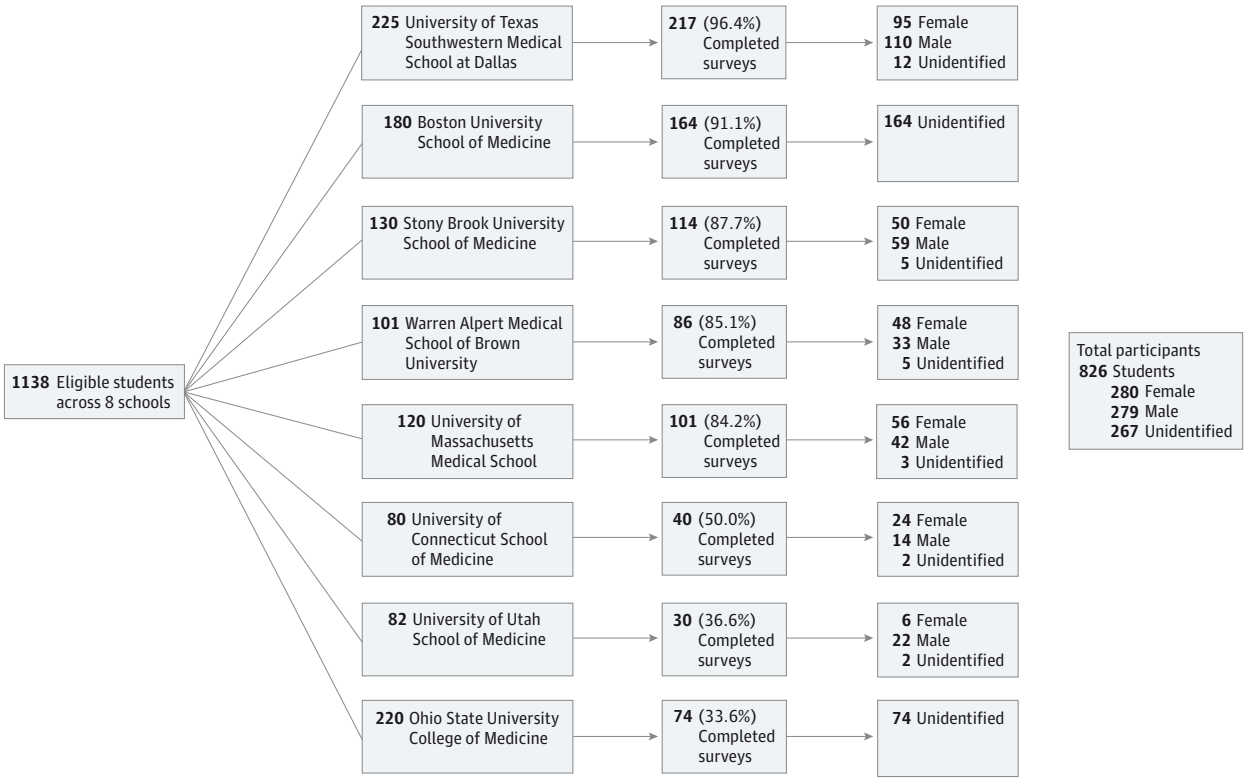
Statistical Analysis

We calculated the frequencies for students' participation and for responses to questions related to career interest, knowledge, and curricular experiences. We developed a series of logistic regression models to examine factors associated with the primary outcomes. To account for potential clustering within schools, the regressions were estimated using generalized estimating equations. This provides an extension of regression analysis to the case of correlated observations when such observations are correlated because of clustering.[22] Unadjusted models did not meaningfully differ from models adjusting for age and sex. Therefore, only adjusted models are reported. Odds ratios, 95% CIs, and *P* values are reported. All analyses were performed using statistical software (SAS version 9.3; SAS Institute Inc).

Results

The frequencies of responses to questions related to students' interests, experiences, and curricular factors are listed

Figure. Participation, Student Enrollment, and Sex Distribution by School



Shown is a Consolidated Standards of Reporting Trials study flow diagram of student enrollment for each school, percentage survey completion for each school, and sex of students completing the survey at each school.

in **Table 1**. Notably, 41.2% of second-year students reported having had a physical diagnosis session or clinical encounter related to the skin examination, 42.1% of students had had an opportunity to observe an SCE, and 40.9% (range, 12.4%-78.2%) reported having received at least 60 minutes of structured education on skin cancer. The frequencies of confidence, intent, and performance were 13.7%, 83.9%, and 16.5%, respectively. Confidence was highly associated with intent ($\chi^2 = 12.4$, $P < .001$) and performance ($\chi^2 = 58.0$, $P < .001$). However, intent and performance were not associated ($\chi^2 = 2.6$, $P = .11$).

Confidence in Performing the SCE

Adjusted odds ratios (ORs) for confidence in performing the SCE are listed in **Table 2**. Instruction time of at least 60 minutes was associated with a 6-fold higher likelihood of having confidence in performing an SCE (OR, 6.35; 95% CI, 4.05-9.98). Knowledge of melanoma risk was associated with a higher likelihood of students' confidence in performing an SCE (OR, 3.71; 95% CI, 2.27-6.06.). Instruction in the form of a lecture, physical diagnosis session, or practice through a clinical encounter with a patient was associated with higher likelihood of students' confidence in performing an SCE compared with no instruction. Observation of an SCE was related to increased confidence in performing an SCE. Compared with no opportunities to observe an SCE, 1 to 3 observations (OR, 2.70; 95% CI, 1.81-4.05) and at least 4 observations (OR, 3.03; 95% CI, 1.38-6.68) were associated with higher likelihood of students' confidence in performing an SCE.

Intent to Perform an ISE

Adjusted ORs for intent to practice the ISE are listed in Table 2. Teaching time of at least 60 minutes was marginally associated with intent. Knowledge of melanoma risk was also associated with intent (OR, 1.83; 95% CI, 1.33-2.50). Compared with no instruction, lectures were modestly associated with intent, whereas stronger associations were noted with a physical diagnosis session or practice through a clinical encounter. Having 1 to 3 opportunities to observe (OR, 1.95; 95% CI, 1.06-3.60) improved intent, whereas determining the significance of at least 4 observations was limited because of fewer students' reporting this exposure.

Actual Performance of the SCE

Adjusted ORs for performance of the SCE are listed in Table 2. As with intent and confidence, at least 60 minutes of instruction on the SCE was associated with performance of the SCE. Knowledge was marginally associated with performance, and compared with students having no instruction, those having instruction in the form of a lecture, physical diagnosis session, or practice through a clinical encounter reported higher rates of performance. Higher likelihood of performance was

reported by students with 1 to 3 or at least 4 opportunities to observe the SCE.

Discussion

With limited time allocated to dermatology in medical school, developing curricula that will have the most significant influence on students' practice of the SCE, while being time efficient, is essential. Our data characterize trends in curricular integration of clinical experiences and highlight important associations among confidence, intent, and performance regarding the SCE and the modifiable factors that may influence them.

Several key points emerge from our findings. Foremost, with approximately 40% of second-year students reporting having had a physical diagnosis session, a clinical encounter with a patient, or an opportunity to observe an SCE, a trend seems to exist toward earlier penetration of clinically oriented teaching exposures related to dermatology. Herein lies an important opportunity to develop a coordinated and comprehensive clinical educational program related to the SCE that potentially has high influence for students, as well as to expand the outreach beyond the students already receiving this education.

It is reassuring that anticipated career choice seems to have a minimal role in how the student approaches an SCE. Specialty physicians also have a unique surveillance opportunity for high-risk patients. Although seemingly far-fetched, the scenario is imaginable in which a cardiologist, trained in the ISE during medical school, briefly inspects the skin of the chest and back when auscultating heart and lung sounds and finds an ugly duckling on a 65-year-old man with congestive heart failure. The success of performing an integrated examination presupposes intent to practice it. As such, curricula in dermatology should explain the rationale for the ISE and provide multiple opportunities for practicing the examination in diverse settings, while emphasizing the secondary prevention opportunities for all types of physicians, including medical subspecialists and surgeons.

The median instruction time allotted for preclinical and clinical dermatology content together is less than 10 hours across institutions nationwide.[23] It is likely that most second-year curricula address melanoma, albeit in a nonstandardized format. However, it is unclear how much emphasis is placed on teaching the skin examination for suspicious lesions. Our results suggest that a commitment of at least 60 minutes in the preclinical years related to an SCE can increase the likelihood of students' confidence, intent, and actual performance regarding the SCE.

Students' knowledge of melanoma risk was associated with higher likelihood of confidence, intent, and actual performance regarding the SCE. The shortage of PCPs, coupled with a health care overhaul that has provided first-time health care for millions of newly insured patients, makes finding additional time for skin cancer screening by PCPs seem daunting. Providing the newest physicians with knowledge of the highest-risk demographic groups and anatomic sites for melanoma, as well as a clinical tool useful in the evaluation of suspicious pigmented lesions, may facilitate an efficient and effective practice of the ISE, particularly if students receive multiple opportunities for practicing the examination with expert guidance.

In general, the 3 methods of instruction assessed improved students' confidence, intent, and performance regarding the SCE. Overall, demonstration of the physical examination and practice through a clinical encounter have the greatest influence. Physical examination augments students' confidence and performance regarding the SCE 3-fold over intent to practice it. Similarly, practice through a clinical encounter increases students' confidence and performance regarding the SCE 4-fold to 8-fold over intent to practice it. While lecture also improves confidence and performance regarding the SCE, this method of instruction seems to have only modest influence on intent to practice. Therefore, our data indicate that interventions teaching how to perform an SCE (ie, clinical competence) are likely to increase confidence and performance regarding the SCE more so than intent to practice it. Although the relationship between having confidence and having intent is likely complex and requires further qualitative study and exploration of parallels in other disciplines, it is reasonable to consider them as 2 independent curricular outcomes that work synergistically to achieve the greatest practice effect.[24,25] To influence stu-

Table 1. Baseline Medical Students' Interests, Knowledge, and Curricular Experiences Regarding SCEs[a]

Characteristic	No. (%)
Intended Career Choice (n = 824)	
Primary care	226 (27.4)
Specialty	414 (50.2)
Research or industry	12 (1.5)
Undetermined	172 (20.9)
Knowledge of Melanoma Risk (n = 818)	
No	744 (91.0)
Yes	74 (9.0)
Total Time Spent in Some Form of Structured Learning for Skin Cancer (n = 815)	
<60 min	482 (59.1)
≥60 min	333 (40.9)
Methods by Which You Have Been Instructed to Perform an SCE (n = 797)	
No instruction	364 (45.7)
Lecture	105 (13.2)
Physical diagnosis	164 (20.6)
Clinical encounter	164 (20.6)
No. of Patients for Whom You Have Observed an SCE (n = 812)	
None	470 (57.9)
1-3 times	269 (33.1)
≥4 times	73 (9.0)
No. of Patients for Whom You Have Performed an SCE (n = 814)	
None	680 (83.5)
1-3 times	123 (15.1)
≥4 times	11 (1.4)

Abbreviation: SCE, skin cancer examination.

[a] Participation in any part of the survey was voluntary, and this resulted in minor variances of the maximum response number of 826 for each question.

Table 2. Odds for Confidence in Performing the SCE, Intent to Practice the SCE, and Actual Performance of the SCE[a]

Predictor	Confidence OR (95% CI)	*P* Value	Intent OR (95% CI)	*P* Value	Performance OR (95% CI)	*P* Value
Intended Career Choice						
Primary care	1 [Reference]	...	1 [Reference]	...	1 [Reference]	...
Specialty	1.03 (0.79-1.34)	.82	0.73 (0.28-1.91)	.53	1.02 (0.80-1.31)	.84
Research or industry	2.77 (1.02-7.51)	.05	1.31 (0.34-4.97)	.70	1.44 (0.10-21.66)	.79
Undetermined	0.63 (0.42-0.95)	.03	0.78 (0.39-1.56)	.50	0.77 (0.59-1.00)	.05
Total Time Spent in Some Form of Structured Learning for Skin Cancer						
<60 min	1 [Reference]	...	1 [Reference]	...	1 [Reference]	...
≥60 min	6.35 (4.05-9.98)	<.001	2.32 (0.96-5.59)	.06	2.42 (1.41-4.14)	.001
Knowledge of Melanoma Risk						
No	1 [Reference]	...	1 [Reference]	...	1 [Reference]	...
Yes	3.71 (2.27-6.06)	<.001	1.83 (1.33-2.50)	<.001	1.56 (0.98-2.51)	.06
Methods by Which You Have Been Instructed to Perform the SCE						
No instruction	1 [Reference]	...	1 [Reference]	...	1 [Reference]	...
Lecture	7.54 (4.08-13.94)	<.001	2.72 (0.93-7.97)	.07	5.04 (2.30-11.05)	<.001
Physical diagnosis	15.35 (8.62-27.34)	<.001	4.84 (1.13-20.74)	.03	15.48 (7.84-30.54)	<.001
Clinical encounter	11.48 (4.81-27.40)	<.001	2.39 (1.66-3.43)	<.001	21.67 (9.64-48.69)	<.001
No. of Patients for Whom You Have Observed an SCE						
None	1 [Reference]	...	1 [Reference]	...	1 [Reference]	...
1-3 times	2.70 (1.81-4.05)	<.001	1.95 (1.06-3.60)	.03	9.92 (4.67-21.10)	<.001
≥4 times	3.03 (1.38-6.68)	<.01	4.72 (0.85-26.10)	.07	16.57 (5.00-54.85)	<.001

Abbreviations: ellipsis, not applicable; OR, odds ratio; SCE, skin cancer examination.

[a] Adjusted for age, sex, and school clustering and based on an a priori *P* value of .05.

dents' confidence and intent, we propose that educational interventions on the SCE should be designed to demonstrate the SCE and emphasize its relevance rather than to simply discuss its principles or approach.

Time and resource allocation toward exposures to skin cancer physical examination and clinical encounter sessions for all medical students may not be practical for all medical schools. A feasible and effective alternative in this instance is to facilitate students' observation of the SCE. The support of dermatology faculty and skilled PCPs in providing even 1 to 3 opportunities to observe an SCE resulted in significant augmentation of confidence, intent, and performance regarding the SCE among students.

Our recommendations for curricular enhancement to augment confidence and intent to practice the ISE include offering practical training experiences in the preclinical curriculum, which has traditionally emphasized didactic course work. Specifically, we suggest the following to improve performance of the SCE among students: (1) providing a minimum of 60 minutes of instruction related to melanoma and the SCE, (2) describing during this time the surveillance opportunity for melanoma in which all types of physicians should participate,[20,26] (3) teaching the principles of the ISE as part of the physical diagnosis course, (4) highlighting content on high-risk demographic groups and anatomic sites specific to men and women and on the ABCDEs of melanoma, and (5) ensuring at least 1 opportunity to observe the SCE early in medical school.

Although our survey of 8 US medical schools captures a geographically diverse selection of public and private institutions with varied curricular structures, we cannot be certain that our findings are representative of all schools. However, our study sample was similar to graduating US medical students in 2012 with respect to age, sex, and intended specialty.[27] While the students' response rates were high, we cannot exclude the occurrence of response bias because students with particularly positive or negative perceptions of skin cancer training may have been more or less likely to participate in the voluntary survey. Further recall bias of educational exposures as influenced by self-perception of skill could have affected our results. Based on an a priori *P* value of .05, some variables trended toward significance.

Conclusions

Our survey of more than 800 second-year medical students across 8 schools has yielded information that may guide course directors in constructing curricula that optimize the narrow windows of opportunity to teach medical students about melanoma and to augment the practice of skin examinations for suspicious pigmented lesions. Our data can support dermatology course directors with the vertical integration of clinical experiences that is being emphasized across medical school curricula.

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Study concept and design: Garg, Geller.
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