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A Large Skin Cancer Screening Quality Initiative:

Description and First-Year Outcomes

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Abstract

IMPORTANCE—The lack of prospective randomized clinical trials demonstrating that full-body skin examination (FBSE) reduces melanoma morbidity or mortality has prompted an “I” rating from the United States Preventive Services Task Force for population-based skin cancer screening. More data on these screening programs are needed.

OBJECTIVES—To describe a skin cancer screening quality initiative in a large health care system and to determine if the intervention was associated with screening of a demographically higher-risk population than previous screening programs and if melanoma incidence and thickness differed in screened vs unscreened patients.

DESIGN, SETTING, AND PARTICIPANTS—This observational evaluation of a prospectively implemented quality initiative was conducted in a large health care system in western Pennsylvania (University of Pittsburgh Medical Center, UPMC) among adults seen in an office visit by a UPMC-employed primary care physician (PCP) in 2014.

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INTERVENTIONS—Implementation of a campaign promoting annual skin cancer screening by FBSE, including training of PCPs, promotion of the initiative to physicians and patients, and modification of the electronic health record (EHR) to include FBSE as a recommended preventive service for patients 35 years or older.

MAIN OUTCOMES AND MEASURES—Characteristics of screened and unscreened patients and melanomas detected among them.

RESULTS—Of 333 735 adult patients seen in an office visit by PCPs in 2014, 53 196 patients (15.9% of the screen-eligible population) received an FBSE, and 280 539 did not. Screened patients were slightly older (median age, 60 vs 57 years; $P < .001$) but did not differ significantly by sex (43.2% vs 43.1% men; $P = .49$) from the unscreened population. Fifty melanomas were diagnosed in screened patients and 104 melanomas were diagnosed in unscreened patients. Screened patients were more likely than unscreened patients to be diagnosed with melanoma (adjusted risk ratio [RR], 2.4; 95% CI, 1.7–3.4; $P < .001$) and to have a thinner invasive melanoma (median thickness, 0.37 mm vs 0.65 mm; $P < .001$). The incidence of melanoma lesions 1 mm or thicker was similar in screened vs unscreened patients (adjusted RR, 0.7; 95% CI, 0.2–2.2; $P = .52$).

CONCLUSIONS AND RELEVANCE—Large-scale screening for melanoma within a United States health care system is feasible and can result in increased detection of thinner melanomas. This intervention also resulted in screening of a higher proportion of men and an older patient population than previous screening interventions in which younger individuals and women predominated.

Melanoma can be detected relatively quickly through a visual full-body skin examination (FBSE).¹ However, data supporting screening are limited.² The largest evaluation of melanoma screening by FBSE comes from a 1-year intervention in Schleswig-Holstein, Germany in which citizens 20 and older were invited to receive a 1-time skin cancer screening.^{3,4} Most screenings were performed by primary care physicians (PCPs), and melanoma mortality in the 5 years following was reduced by nearly 50%.⁵ However, melanoma mortality rates drifted back to baseline despite the initiation of a national program targeting adults 35 years or older; a gap in screening in 2004 through 2008 may be partially responsible for this. To our knowledge, large-scale skin cancer screening in a health care system in the United States has not been reported. We describe an approach to melanoma screening that is novel in its scale and implementation as a quality initiative.

Methods

Data from the electronic health record (EHR) were used to track patients' screening status and melanomas diagnosed. Incidence and tumor thickness in the screened and unscreened population were compared. The screening initiative was approved by the University of Pittsburgh Medical Center (UPMC) as a quality-improvement project. Collection of outcome data and a waiver of patient written informed consent was approved by the University of Pittsburgh institutional review board.

Patients were deemed screen eligible if they were 35 years or older and saw a UPMC-employed PCP for an office visit in 2014. Age 35 years was chosen based on data showing a

low yield of melanoma diagnosis and a high rate of benign lesions excised in patients younger than 35 years in 1 screening program.⁶ The EHR was modified to include FBSE as a preventive service recommendation for patients 35 years or older and to track if and when screening was performed. Participating PCPs documented that the patient was up to date with this screening if they performed the screening or if the patient reported receiving an FBSE in the past 12 months by another clinician. Patients were also considered screened if they had a skin cancer screening visit with a dermatologist documented in the EHR in 2014. The program was promoted by health care system leadership to physicians in town hall–style meetings and email communications and to patients in a health system newsletter. Training was offered to PCPs via INFORMED (INternet curriculum FOR Melanoma Early Detection), a previously validated web-based skin cancer identification training tool.⁷

Demographic data (age, sex, insurance status, and self-reported race and ethnicity [given the predominance of melanoma in non-Hispanic whites]) were collected from the EHR. Melanomas diagnosed in screen-eligible patients on or after the date the patient was first screened were identified using the UPMC cancer registry and text-based search of pathology reports. Patients diagnosed with melanoma in the 12 months prior to their screening visit (screened patients) or anytime in 2013 based on data from the UPMC cancer registry (unscreened patients), were excluded from analysis (Figure).

Key Points

Question

Does population-based skin cancer screening result in increased detection of early-stage melanoma?

Findings

Offering melanoma screening to patients 35 years or older presenting for a routine primary care visit in a large health care system resulted in higher rates of melanoma detection, particularly of thin, earlier-stage melanoma, among screened vs unscreened patients. This approach also resulted in a higher rate of screening than previous screening interventions among men and older patients, the groups at highest risk of melanoma.

Meaning

Population-based screening for melanoma results in detection of thinner tumors and has the potential to reduce melanoma mortality.

Descriptive statistics are used to report demographic characteristics. Comparisons between screened and unscreened patients were performed using the χ^2 test for discrete variables and Wilcoxon rank-sum test for continuous variables. Logistic regression was used to estimate the odds ratio (OR) of detecting a melanoma case vs noncases in the screened population compared with the unscreened population after adjustment for age, sex, race/ethnicity, and insurance status. Multinomial logistic regression was used to estimate the OR of detecting a melanoma in a specific category (in situ, invasive, or specific Breslow thickness) vs noncases in the screened population compared with the unscreened population after adjustment for age, sex, race/ethnicity, and insurance status.

Results

In 2014, 333 788 eligible individuals were seen in an office visit by a PCP. Twenty-nine screened patients were excluded because they had been diagnosed with melanoma in the year prior to their screen, and 24 patients were excluded from the unscreened group because they were diagnosed with melanoma in 2013; thus, 333 735 patients were included in analysis. Screening was declined by 3109 patients, and 53 196 screened patients were included in the screened cohort analysis (Table 1). A total of 1527 PCPs were eligible to perform skin cancer screening, and 939 unique clinicians documented at least 1 screen: 55 dermatology clinicians (5.9%), 155 PCPs who completed INFORMED training (16.5%), and 729 PCPs who did not complete training (77.6%) (see eTable 1 in the Supplement).

In 2014, 50 patients in the screened population (21 men, 42%) and 104 patients in the unscreened population (51 men, 49%) were diagnosed with melanomas. Screened patients were more likely than unscreened patients to receive a melanoma diagnosis overall, and most of their melanomas were in situ or 1 mm or less in Breslow thickness (Table 2). The median Breslow thickness of invasive melanomas in screened patients was significantly lower than that in unscreened patients (0.37 vs 0.65 mm; $P < .001$). The median age of patients diagnosed with melanoma was 64 years in the screened population and 62 years in the unscreened group ($P = .54$).

Discussion

Through this initiative, 53 196 patients were screened for skin cancer in 1 year. Melanoma incidence in the screened population was more than double that in the unscreened population, and melanomas in screened patients were thinner than those in unscreened patients, which is a clinically significant finding. Breslow depth is the strongest indicator of melanoma mortality.

Cancer screening programs may be associated with increased incidence owing to overdiagnosis, particularly of potentially indolent cancers. While it is true that predominantly thin melanomas were detected in the present program, more people actually die from melanomas thinner than 1 mm than from those thicker than 4 mm. The thinner lesions have a lower case-based mortality rate, but their incidence is much greater in the population, hence the potential importance of their diagnosis.⁸ The differences we observed in melanoma thickness and incidence are encouraging. In addition, our group previously showed that skin surgery and dermatology visits were not increased among patients seen by PCPs participating in this screening initiative,⁹ suggesting that this initiative did not drive increased downstream health care costs.

Our findings are observational rather than the results of a randomized trial, and thus there may be factors that influence which patients were screened and the quality of our data, given our “real world” setting and use of the EHR rather than standardized case report forms for data collection. Screenings may not have been counted if the physician did not indicate in the EHR that screening was performed. The PCPs were not required to complete INFORMED training, and clinicians were not compensated for screening above what was

paid for the office visit in which the FBSE was performed. This initiative took place in a large, but not closed, health care system; thus, screenings performed and melanomas diagnosed outside the system could not be captured with certainty.

Conclusions

The ability to screen a high number of patients as part of a quality initiative in a large health care system with both academic and community-based physicians and to use the EHR to encourage screening and track outcomes are strengths of the intervention and potentially can serve as a blueprint for other similar, large-scale interventions. Future studies will be needed to definitively quantify the impact of this approach on melanoma thickness, mortality, and health care costs and to determine which patients benefit most from screening. However, we show in the current intervention that screening with FBSE can be performed on a large scale without additional physician compensation and may increase detection of melanoma at its most curable stages.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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References

1. Siegel RL, Miller KD, Jemal A. Cancer statistics, 2016. *CA Cancer J Clin*. 2016; 66(1):7–30. DOI: 10.3322/caac.21332 [PubMed: 26742998]
2. Bibbins-Domingo K, Grossman DC, Curry SJ, et al. US Preventive Services Task Force. Screening for Skin Cancer: US Preventive Services Task Force Recommendation Statement. *JAMA*. 2016; 316(4):429–435. DOI: 10.1001/jama.2016.8465 [PubMed: 27458948]
3. Geller AC, Greinert R, Sinclair C, et al. A nationwide population-based skin cancer screening in Germany: proceedings of the first meeting of the International Task Force on Skin Cancer Screening and Prevention (September 24 and 25, 2009). *Cancer Epidemiol*. 2010; 34(3):355–358. DOI: 10.1016/j.canep.2010.03.006 [PubMed: 20381443]
4. Anders MP, Nolte S, Waldmann A, et al. The German SCREEN project—design and evaluation of the communication strategy. *Eur J Public Health*. 2015; 25(1):150–155. DOI: 10.1093/eurpub/cku047 [PubMed: 24760725]
5. Waldmann A, Nolte S, Weinstock MA, et al. Skin cancer screening participation and impact on melanoma incidence in Germany—an observational study on incidence trends in regions with and without population-based screening. *Br J Cancer*. 2012; 106(5):970–974. DOI: 10.1038/bjc.2012.22 [PubMed: 22294187]
6. Schmitt J, Seidler A, Heinisch G, Sebastian G. Effectiveness of skin cancer screening for individuals age 14 to 34 years. *J Dtsch Dermatol Ges*. 2011; 9(8):608–616. DOI: 10.1111/j.1610-0387.2011.07655.x [PubMed: 21501381]
7. Eide MJ, Asgari MM, Fletcher SW, et al. INFORMED (INternet course FOR Melanoma Early Detection) Group. Effects on skills and practice from a web-based skin cancer course for primary care providers. *J AmBoard Fam Med*. 2013; 26(6):648–657. DOI: 10.3122/jabfm.2013.06.130108

8. Whiteman DC, Baade PD, Olsen CM. More people die from thin melanomas (≤ 1 mm) than from thick melanomas (>4 mm) in Queensland, Australia. *J Invest Dermatol*. 2015; 135(4):1190–1193. DOI: 10.1038/jid.2014.452 [PubMed: 25330295]
9. Weinstock MA, Ferris LK, Saul MI, et al. Downstream consequences of melanoma screening in a community practice setting: First results. *Cancer*. 2016; 122(20):3152–3156. DOI: 10.1002/cncr.30177 [PubMed: 27391802]

Figure.
Patient Screening Status Classification and Melanoma Case Disposition

Table 1

Characteristics and Disposition of Screen-Eligible and Screened Populations

Characteristic	Participants, No. (%)			P Value (Screened vs Not Screened)
	All Screen Eligible	Screened	Not Screened	
Overall patient (% total eligible)	333 735 (100)	53 196 (15.9)	280 539 (84.1)	NA
Men	143 840 (43.1)	22 981 (43.2)	120 912 (43.1)	.49 ^a
Age, median (range), y	57 (35–99)	60 (35–91)	57 (35–99)	<.001 ^b
Insurance status				
Medicare	105 909 (31.7)	18 713 (35.2)	87 196 (31.1)	<.001 ^a
Medicaid	19 247 (5.8)	1611 (3.0)	17 636 (6.3)	
Commercial	189 964 (56.9)	30 989 (58.2)	158 975 (56.7)	
Self-pay	15 505 (4.6)	1548 (2.9)	13 957 (5.0)	
Other ^c	3110 (0.9)	335 (0.6)	2775 (1.0)	
Race/ethnicity				
White, non-Hispanic	300 833 (90.1)	48 188 (90.6)	252 645 (90.1)	<.001 ^a
White, Hispanic	1011 (0.3)	132 (0.2)	879 (0.3)	
Black (Hispanic and non-Hispanic)	23 879 (7.2)	3625 (6.8)	20 254 (7.2)	
Other (Hispanic and non-Hispanic)	8012 (2.4)	1251 (2.3)	6761 (2.4)	

^a χ^2 Test.^b Wilcoxon rank-sum test.^c Other insurance types include workman's compensation and Veterans Affairs.

Table 2

Logistic and Multinomial Logistic Regression Analysis of Incidence Rate of Melanoma in Screened and Unscreened Patient Populations

Category of Melanoma	Screened (n = 53 196)		Unscreened (n = 280 539)		Unadjusted		Adjusted	
	Cases, No.	Incidence Rate ^a	Cases, No.	Incidence Rate ^a	RR (95% CI) ^b	P Value (2-Sided) ^c	RR (95% CI) ^d	P Value (2-Sided) ^c
All cases	50	94.0	104	37.1	2.5 (1.8–3.6)	<.001	2.4 (1.7–3.4)	<.001
In situ	24	45.1	35	12.5	3.6 (2.2–6.1)	<.001	3.3 (2.0–5.6)	<.001
Invasive	26	48.9	69	24.6	2.0 (1.3–3.1)	.002	1.9 (1.2–3.0)	.005
Breslow thickness, mm	26		67 ^e					
0.01–0.99	23	43.2	45	16.0	2.7 (1.6–4.5)	<.001	2.6 (1.6–4.4)	<.001
1.00	3	5.6	22	7.8	0.7 (0.2–2.4)	.79	0.7 (0.2–2.2)	.52

Abbreviation: RR, relative risk.

^aPer 100 000 persons.

^bRelative risk for melanoma in the screened vs unscreened population.

^cThe *P* values are the *P* value of the screened vs unscreened effect for each corresponding melanoma category outcome. *P* values were not adjusted for multiple comparisons.

^dRelative risk for melanoma in the screened vs unscreened population after adjustment for age, sex, race/ethnicity, and insurance status. Age was dichotomized as 57 years (median age) or younger and older than 57 years; race/ethnicity was categorized as white and other; insurance status was categorized as Medicare, commercial, and other.

^eTwo cases were excluded from this analysis due to missing information.