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Opportunities for Skin Cancer Prevention Education among Individuals Attending a Community Skin Cancer Screening in a High-Risk Catchment Area

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Abstract

Despite the highly preventable nature of skin cancer, it remains the most commonly diagnosed form of cancer in the United States. Recommendations for a complete skin cancer prevention regimen include engaging in photoprotection (e.g., sunscreen use), avoiding skin cancer risk behaviors (e.g., tanning), and receiving total body skin exams from a health care provider. The current study examined reported engagement in these behaviors among participants attending a community skin cancer screening (N = 319) in a high-risk catchment area to assess the need for increased health education on skin cancer prevention. Participants' responses indicate a history of suboptimal avoidance of skin cancer risk behaviors. Over half of participants (52%) reported four or more blistering sunburns before age 20, and 46% reported indoor tanning at least one during their lifetime. There is a need among this population for education regarding a complete skin cancer prevention regimen, which could improve adherence to photoprotection and avoidance of skin cancer risk behaviors, thereby reducing morbidity and mortality due to skin cancer.

Keywords

Skin cancer; prevention; health education; community screening

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INTRODUCTION

Although many cases of skin cancer are preventable (U.S. Department of Health and Human Services, 2014), skin cancer remains the most commonly diagnosed cancer in the United States (American Cancer Society, 2015a). Certain geographic regions in the U.S. have a particularly high incidence of melanoma, the deadliest form of skin cancer (American Cancer Society, 2015b; Centers for Disease Control and Prevention, 2016). For example, Utah has the highest incidence rate of melanoma in the country with an incidence of 32.8 per 100,000 compared to the national average of 19.9 (American Cancer Society, 2015a; National Cancer Institute, 2016).

Current recommendations for a comprehensive skin cancer prevention regimen include: engaging in photoprotective behaviors (e.g., using sunscreen, seeking shade, wearing protective clothing), avoiding skin cancer risk behaviors (e.g., sunburns, tanning) and receiving total body skin exams (TBSEs) (American Academy of Dermatology, 2015; Skin Cancer Foundation, 2015b; World Health Organization, 2015). Although TBSEs are not currently recommended for the entire population (U.S. Preventive Services Task Force, 2015), studies have found that they may facilitate early detection of melanoma, which is essential for early and effective treatment (Breitbart et al., 2012; Goldberg et al., 2007; Kantor & Kantor, 2009; Waldmann et al., 2012). Encouragingly, skin cancer prevention behaviors are modifiable and could be amenable to health education strategies, whereas certain risk factors for skin cancer (e.g., fair skin, presence of moles, family history of skin cancer) are not modifiable.

Unfortunately, evidence suggests that adherence to skin cancer prevention and screening behaviors among the U.S. population is poor. Substantial proportions of the U.S. population report experiencing frequent sunburns, not practicing regular photoprotection, and being exposed to high levels of ultraviolet radiation (UVR), a prime risk factor for skin cancer (American Cancer Society, 2016; Centers for Disease Control and Prevention, 2016) (Hall, May, Lew, Koh, & Nadel, 1997; Santmyire, Feldman, & Fleischer, 2001; Stryker, Yaroch, Moser, Atienza, & Glanz, 2007). For instance, less than one-third of the U.S. population reported being “very likely” to implement recommended photoprotective behaviors such as using sunscreen, wearing protective clothing and seeking shade (Santmyire et al., 2001). Even individuals with a history of skin cancer, or with a friend of family member with skin cancer, have been found to report sunburns and having sunbathed outside (Basch, Cadorett, MacLean, Hillyer, & Kernan, 2017). Additionally, rates of receiving a TBSE are low (19.8%) (Lakhani, Saraiya, Thompson, King, & Guy, 2014; Saraiya et al., 2004). As a result of this poor adherence to skin cancer prevention recommendations and increased incidence of skin cancer (National Cancer Institute, 2016; U.S. Department of Health and Human Services, 2014), educational programs for skin cancer prevention have been designated a high priority by the U.S. Surgeon General (U.S. Department of Health and Human Services, 2014). Over time, a number of educational and service-oriented programs have been enacted (Geller et al., 2001; Koh et al., 1996; U.S. Department of Health and Human Services, 2014), including a national program focused on provision of TBSEs sponsored by the American Academy of Dermatology (AAD). Through this program, dermatologists provide free TBSEs to their local communities (Geller et al., 2003; Koh et al., 1996; Weinstock,

1990). Community based screening has been found in previous studies to encourage individuals to establish a regular source of care (Carney, Dietrich, & Freeman, 1992).

Little is known regarding the extent to which TBSE screening participants engage in other recommended skin cancer prevention behaviors, such as photoprotection. However, low adherence to photoprotective behaviors in the general population suggests that free TBSE screenings, such as the ones offered through the AAD program, could offer a unique opportunity for providing skin cancer prevention education. Understanding to what extent individuals who attend free TBSE screenings engage in photoprotection and avoid skin cancer risk behaviors is an essential first step in designing tailored educational programs on skin cancer prevention that could be used in this setting. Providing additional education on skin cancer prevention is of particular importance in regions where there are high incidence and mortality rates from melanoma.

The overall goal of the current study was to expand understanding of adherence to photoprotective behaviors and avoidance of modifiable skin cancer risk behaviors in a high-risk state. The first aim was to describe the population served by a free community skin cancer screening at a cancer center located in a high-risk state, including the relationship between demographic factors and both modifiable and non-modifiable factors that could contribute to skin cancer. The second aim was to identify potential predictors of engagement in photoprotective behaviors, to determine if this population could benefit from targeted health education on skin cancer prevention.

METHODS

Participants

Huntsman Cancer Institute (HCI), located in Salt Lake City, UT, is the only National Cancer Institute-designated comprehensive cancer center in the Intermountain West and provides an annual free skin cancer screening to the community, sponsored by the AAD. Advertisement for the skin cancer screening event occurred through media outlets (television, newspaper, web), social media (Facebook, Twitter), flyers distributed throughout HCI, and the through HCI's information telephone hotline. Interested individuals who contacted HCI were scheduled on a first-call, first-serve basis, regardless of insurance status or income level. Data for the 2015 skin cancer screening event are included in this analysis. All participants signed a release authorizing the disclosure of their health information for research purposes. As a result, informed consent was not required. All study procedures were reviewed by the University of Utah Institutional Review Board, and this study was considered non-human subjects research.

Measures

Immediately prior to screening, participants were asked to complete a standardized self-report questionnaire designed by the AAD (Geller et al., 2003). The questionnaire assessed the following: (1) participant demographic information (e.g., age, sex, race, number of changing moles, personal or family history of skin cancer), (2) participant skin cancer risk behaviors (e.g., number of blistering sunburns before age 20 [0–3, 4–6, 7–10, or +10],

number of times indoor tanning [0, 1–4, 5–10, 11–20, 21–30, or 30+ times]), (3) participant frequency of engagement in photoprotective behaviors (e.g., wearing sunscreen, seeking shade, wearing photoprotective clothing [1=always, 2=sometimes, 3=rarely, 4=never]), and 4) whether participants would have otherwise sought screening.

For the current analyses, participants' ages were categorized (18–25, 26–35, 36–45, 46–55, 56–65, 66–75, 58–85, 86–95, 95+). Responses for photoprotective and skin cancer risk behaviors were dichotomized. Specifically, responses about sunscreen, shade, and protective clothing behaviors were dichotomized into "engagement in photoprotective behavior" (always, sometimes) versus "lack of engagement in photoprotective behavior" (rarely, never) (Bandi, Cokkinides, Weinstock, & Ward, 2010; Cardinez, Cokkinides, Weinstock, & O'Connell, 2005). For reported skin cancer risk behaviors, responses about blistering sunburns before age 20 were dichotomized into "few sunburns" (0–3 sunburns) versus "many sunburns" (4–6, 7–10, 10+ sunburns) (Skin Cancer Foundation, 2015a; Wu, Han, Laden, & Qureshi, 2014). Responses about indoor tanning behaviors were dichotomized into "never tanning indoors" (0 times) versus "tanning indoors one or more times" (1–4, 5–10, 11–20, 21–20, 30+ times) (Division of Cancer Prevention and Control, 2015; Sweden, 2007; Wehner et al., 2014).

Analytic Plan

Descriptive statistics were calculated for all demographic, photoprotective, and skin cancer risk items. Correlational analyses were performed to examine potential associations between (1) photoprotective behaviors (wearing sunscreen, seeking shade, wearing protective clothing) and with risk behaviors (blistering sunburns before age 20, history of indoor tanning) and (2) demographic variables (age, sex, race, personal history of skin cancer, family history of skin cancer).

Logistic regression analyses were performed to identify predictors of engagement in photoprotective behaviors. The first set of logistic regression analyses examined whether engagement in each photoprotective behavior was predicted by engagement in other photoprotective behaviors (e.g., the first regression examined whether sunscreen use was predicted by shade-seeking). The second set of logistic regression analyses examined whether avoidance of risk behaviors was predicted by engagement in photoprotective behaviors (e.g., the first regression in this set examined whether avoidance of indoor tanning was predicted by sunscreen use). Covariates included in the analyses were selected based on preliminary analyses that identified statistically significant associations between potential covariates and the outcomes of interest (e.g., between sex and indoor tanning). We used an alpha level of $p<.05$ to define statistical significance for all statistical tests. All analyses were completed using SPSS, Version 23.0.

RESULTS

The skin cancer screening served 319 individuals. Of those who presented for screenings, 88% were White (n = 282), and 60% were female (n = 191). Fifty-one percent of participants (n = 164) reported a family history of skin cancer, 17% of individuals reported a personal history of skin cancer, and 12% of all participants had both a family and personal

history of skin cancer (Table 1). Thirty-four percent of individuals reported having noticed a mole on their body that had recently changed, and 45% of those with changing moles reported that they would not have sought a skin check without the AAD-sponsored screening (Table 1). The majority of participants reported engaging in photoprotective behaviors (75–90%), and approximately half of all participants (52%) reported a history of suboptimal avoidance of skin cancer risk behaviors (46–52%) (Table 1).

Demographic Factors Associated with a History of Skin Cancer Risk Behaviors and with Engagement in Photoprotective Behaviors

Descriptive statistics for reported participation in photoprotective and in skin cancer risk behaviors were stratified by race, age, sex, and history of skin cancer (Table 2). Chi-square analyses indicated a significant association between demographic characteristics and engagement in photoprotective and risk behaviors, including seeking shade, wearing protective clothing, and indoor tanning (Table 3). Engagement in shade-seeking differed by age (χ^2 (1) = 5.0, p = .03) such that adults aged 56–95 years were more likely to report seeking shade than adults 18–55 years. Wearing protective clothing differed by age (χ^2 (1)=12.1, p=.001), and sex (χ^2 (1) = 5.5, p = .02), such that individuals 56–95 years and females were more likely to report wearing protective clothing than individuals 18–55 years and males. Reported number of times engaging in indoor tanning also differed by age (χ^2 (1) = 5.6, p = .02), and sex (χ^2 (1) = 13.9, p<.001), such that individuals aged 18–55 years and females were more likely to report indoor tanning one or more times compared to individuals 56–95 years and males, respectively. Additionally, reported times engaging in indoor tanning differed by race (χ^2 (1) = 5.6, p = .02), and personal history of skin cancer (χ^2 (1) = 4.1, p = .04), such that individuals who were White and individuals without a personal history of skin cancer were more likely to report indoor tanning. There were no statistically significant differences in seeking shade by sex, race, or personal or familial skin cancer history (p's = .11–.99). There were no statistically significant differences in wearing protective clothing by race or personal or familial skin cancer history (p's = .09–.40), nor in engaging in indoor tanning and family history of skin cancer (p = .65). There were also no significant differences in number of blistering sunburns before age 20 by race, sex, age, or personal or familial skin cancer history (p = .08–.95).

Likelihood of Engagement in Photoprotective Behaviors

Logistic regression analyses indicated that the likelihood of participation in one or more photoprotective behaviors was predicted by participation in other photoprotective behaviors, such that reported engagement in one photoprotective behavior (e.g., wearing sunscreen, protective clothing, seeking shade) was associated with a higher likelihood of reported participation in the other two behaviors (Table 4). Covariates included were family history, age, and sex based on preliminary analyses indicating statistically significant associations between these variables.

For example, the reported likelihood of wearing seeking shade was significantly more common in individuals who wore sunscreen (OR = 5.37, p<.001) or protective clothing (OR = 4.84, p=.001) (Table 4).

Likelihood of Engagement in Skin Cancer Risk Behaviors

After controlling for age, sex, race, and personal history of skin cancer, there was not a significant association between current participation in any of the photoprotective behaviors and past use of of indoor tanning ($p = 0.08–0.38$) or the reported number of sunburns before age 20 ($p = 0.22–0.69$) (Table 5).

DISCUSSION

Engagement in photoprotective behaviors and avoidance of skin cancer risk behaviors are critical to preventing skin cancer (American Academy of Dermatology, 2015; World Health Organization, 2015). Unfortunately, findings reported in the literature show that substantial proportions of the U.S. population report suboptimal adherence to photoprotection (e.g., wearing sunscreen, seeking shade) and avoidance of skin cancer risk behaviors (e.g, avoiding sunburn and tanning). Similarly, the results of the current study indicated that although the majority of participants attending a community skin cancer screening reported current engagement in photoprotective behaviors, this was not associated with lower rates of past engagement in risk behaviors. Although at least 75% of participants reported engaging in each photoprotective behavior, this did not translate to a history of better avoidance of risk behaviors; 52% of individuals reported four or more sunburns before the age of 20, and 46% reported indoor tanning at least once in their lifetime. Additionally, although 34% of individuals reported having noticed a mole on their body that had recently changed, nearly half (45%) of those individuals would not have sought a skin check without the AAD-sponsored screening.

These findings are in line with prior research in the general population, as well as individuals who attend skin cancer screening events. Among other skin cancer screening samples, a substantial proportion of the population (39–51%) would not have seen a doctor for skin cancer without the free screening (Geller et al., 2003; Koh et al., 1991). Further, previous studies of AAD screenings have found consistently high rates of other skin cancer risk factors among participants (e.g., no prior skin screening, no regular dermatologist) (Geller et al., 2003; Koh et al., 1991; Weinstock, 1990).

Implications for Health Education Programs

The results have several implications for health education programs aiming to increase photoprotection behaviors and reduce skin cancer risk behaviors. First, the finding that engagement in photoprotective behaviors does not automatically translate into optimal avoidance of skin cancer risk behaviors indicates that there is a need for health education on the importance of avoiding these risk behaviors (e.g., tanning, sunburns) and optimal engagement in photoprotection (e.g., using sunscreen as recommended). Similarly, because it was found that females 18–55 years were more likely to report indoor tanning one or more times, it could be beneficial to target this population to receive education regarding avoiding indoor tanning in addition to focusing on other photoprotective and risk behaviors. Second, participants at skin cancer screening events report high rates of skin cancer risk factors (changing moles, history of skin cancer), suggesting that the community screening serves a high-risk population that could benefit from health education regarding skin cancer

prevention. Third, because the majority of participants had a family and/or personal history of skin cancer and many would not have otherwise sought screening, participants not only belong to a population at elevated risk, but may also face barriers to skin cancer screening. Overall, these findings indicate that among this population there is a need for further skin cancer prevention health education, particularly regarding avoidance of skin cancer risk behaviors and the potential benefits of skin screening.

Strengths and Limitations

The current study had a number of strengths and limitations worth noting. A strength was the study's focus on an understudied, high-risk catchment area in a state that has the highest incidence rate of melanoma skin cancer in the country (American Cancer Society, 2015b; Skin Cancer Foundation, 2015c; U.S. Cancer Statistics Working Group, 2015). Additionally, study data were collected with a widely-used questionnaire developed by the AAD, which increases comparability to other screening samples. Participants in the current study were offered screening regardless of their insurance status or ability to pay for screening, which may have decreased the likelihood that only individuals with insurance were included. The current study's findings should be interpreted within the context of several limitations, including that this convenience sample was recruited from one geographic area. Our sample size may have limited our ability to detect some effects. Future studies could consider including larger samples from multiple geographic areas where skin cancer and/or melanoma incidence are high. The current study, similar to prior screening studies (Coups, Manne, & Heckman, 2008; Hall et al., 1997; Hall et al., 2003; Linos et al., 2011), relied on self-report of photoprotective and risk behaviors. Future studies could incorporate tools like daily sun exposure diaries, or UVR monitors worn on the body, to more objectively assess current photoprotective and skin cancer risk behaviors. Additionally, future studies should take into consideration the implications of evolving skin cancer screening recommendations, since receiving a TBSE by a healthcare provider is currently recommended by some organizations (American Academy of Dermatology, 2015; Skin Cancer Foundation, 2015b; World Health Organization, 2015) but not others (U.S. Preventive Services Task Force, 2015). Finally, the questionnaire used in this study asked participants about *past* skin cancer risk behaviors and *current* photoprotective behaviors; however, it would be useful for future studies to compare both types of behaviors as reported currently. This would clarify whether individuals are simultaneously engaging in photoprotective and skin cancer risk behaviors, and would better inform future skin cancer prevention efforts.

Additional studies are needed to identify what barriers to avoiding risk behaviors and facilitators to engaging in photoprotective behaviors exist so that education campaigns and interventions can benefit from knowing both how individuals adhere to a sun protection regimen and what makes it more difficult or easy for them to do so. For instance, if a common barrier to avoiding sunburn is not realizing that sunburn can occur in the winter, educational campaigns could better emphasize the importance of sunscreen year round.

Comprehensive skin cancer prevention education requires emphasizing both engagement in photoprotective behaviors and avoidance of skin cancer risk behaviors. Results suggest that although reported rates of engagement in photoprotection among this screening sample are

high, reported rates of skin cancer risk behaviors are also high and there is no association between engagement in photoprotection and avoidance of skin cancer risk behaviors. Health education regarding skin cancer prevention should consider emphasizing the avoidance of risk behaviors as a critical element of a complete skin cancer prevention regimen.

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Table 1

Participant demographic and behavior characteristics (N = 319)

Race	n	%[a]
White	282	88
Black	1	1
Hispanic	23	7
Asian	3	1
Other	10	3
Sex	**n**	**%**
Male	126	40
Female	191	60
Age	**n**	**%**
18–25	18	6
26–35	30	9
36–45	41	13
46–55	59	19
56–65	99	31
66–75	46	14
76–85	15	5
86–95	3	1
Personal history of skin cancer	**n**	**%**
Yes	55	17
No	259	81
Family history of skin cancer	**n**	**%**
Yes	164	51
No	138	43
Moles that recently changed	**n**	**%**
Yes	109	34
No	188	59
Without this screening, whether participant would have seen a doctor for a skin check	**n**	**%**
Yes	154	48
No	143	45
Participant uses sunscreen	**n**	**%**
Yes	255	80

No	58	18
Participant seeks shade when possible	**n**	**%**
Yes	287	90
No	26	8
Participant wears sun-protective clothing?	**n**	**%**
Yes	238	75
No	73	23
Reported number of sunburns before age 20	**n**	**%**
0–3	139	44
4+	167	52
Reported number of times indoor tanning	**n**	**%**
0	159	50
1+	146	46

[a]Percentages calculated for number of individuals who answered each question, therefore may not add up to 100%

Table 2

Practice of photoprotective and risk behaviors by participant demographic factors

	Uses sunscreen n (%)	Seeks shade when possible n (%)	Wears sun-protective clothing n (%)	Reported sunburns before age 20 n (%)	Reported times indoor tanning n (%)
Race	**Yes**	**Yes**	**Yes**	**0–3**	**0**
White	230	254	216	121	136
	(83)	(92)	(78)	(45)	(50)
Non-White	25	33	22	18	23
	(68)	(89)	(59)	(49)	(62)
Sex					
Male	94	113	101	55	77
	(77)	(93)	(84)	(47)	(65)
Female	160	173	135	82	80
	(85)	(91)	(72)	(44)	(43)
Age					
18–35	39	30	27	28	20
	(81)	(63)	(56)	(58)	(42)
36–55	84	89	71	36	44
	(85)	(90)	(72)	(36)	(44)
56–75	114	134	117	56	76
	(81)	(96)	(84)	(40)	(54)
76–95	11	16	16	13	14
	(61)	(89)	(89)	(72)	(78)
Personal history of skin cancer					
Yes	46	52	44	66	35
	(84)	(96)	(82)	(41)	(65)
Family history of skin cancer					

	Uses sunscreen	Seeks shade when possible	Wears sun-protective clothing	Reported sunburns before age 20	Reported times indoor tanning
	n (%)	n (%)	n (%)	n (%)	n (%)
Race	Yes	Yes	Yes	0–3	0
Yes	143 (88)	154 (95)	129 (79)	67 (52)	83 (52)

Table 3

Bivariate associations between participant demographic factors and photoprotective and risk factors

	Use sunscreen	Seek shade	Wear protective clothing	Few sunburns (0–3) before age 20	Never indoor tanning
	χ^2	χ^2	χ^2	χ^2	χ^2
Race	2.6	0.00	3.0	0.87	5.6*
Sex	2.9	0.55	5.5*	0.42	13.9***
Age	1.0	5.0*	12.1***	0.003	5.6*
Personal history of skin cancer	0.06	1.7	0.71	0.93	4.1*
Family history of skin cancer	7.7**	2.6	1.8	3.1	0.2

Note. Photoprotective behavior variables (sunscreen, shade, clothing) were dichotomized for analysis: “Always” and “sometimes” responses were combined to describe participants who practiced sun protective behaviors. Risk behavior variables (sunburns, indoor tanning) were dichotomized into those who had received 0–3 sunburns and those who received four or more sunburns, and those who had never indoor tanned, and those who had tanned one or more times.

*Statistically significant at .05

**Statistically significant at .01

***Statistically significant at ≤ .001

Table 4

Logistic regression results: Prediction of photoprotective behaviors

	Use sunscreen		Seek shade		Wear protective clothing	
	OR	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Use sunscreen	1.00	REF	5.37	2.16–13.37	2.91	1.44–5.90
Seek shade	3.08	1.19–7.98	1.00	REF	5.26	2.03–13.59
Wear protective clothing	2.41	1.22–4.76	4.84	1.94–12.05	1.00	REF

Note. Covariates included in these models:

- Sunscreen as outcome (family history). This model was run a second time with additional covariates from the literature (race, sex, age, and personal history of skin cancer), which did not significantly impact the results.
- Shade as outcome (age)
- Protective clothing as outcome (age and sex)

Table 5

Logistic regression results: Prediction of skin cancer risk behaviors

	Few (0–3) sunburns before age 20		Never indoor tanning	
	OR	**95% CI**	**OR**	**95% CI**
Use sunscreen	0.77	0.42–1.42	1.37	0.68–2.78
Seek shade	0.57	0.24–1.39	1.98	0.67–5.86
Wear protective clothing	0.89	0.51–1.57	1.79	0.94–3.40

Note. Covariates included in these models:

- Sunburns as outcome (none). This model was run a second time with additional covariates from the literature (race, sex, and age), which did not significantly impact the results.
- Tanning as outcome (age, sex, race, personal history).