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Skin Examination Practices Among Melanoma Survivors and their Children

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Background

The population of melanoma survivors in the U.S. has grown rapidly over the past several decades due to increases in incidence and improved five-year survival rates [1]. Following successful treatment of the disease, melanoma survivors remain at elevated risk for recurrence and development of new melanomas [2]. Relative to many other cancers, younger and middle-aged adults bear a disproportionate disease burden, with more than half of melanoma cases diagnosed before the age of 65. Among individuals between 20 and 29, melanoma is the most common cancer in women and the fifth most common cancer in men, giving it special importance among individuals of childbearing and child-rearing age [1]. Children of melanoma survivors are at markedly increased lifetime risk for developing the disease, with prior studies estimating an 8- to 12-fold increase in risk attributable to inherited predisposition, common phenotypic risk, and shared sun exposure and protection habits [3-6].

Skin self-examination is a potentially important tool in reducing risk for mortality from melanoma among melanoma survivors [7]. Prior studies have found that 44-75% of recurrent melanomas are first detected by patients or their significant others rather than by a healthcare provider [8-11]. Furthermore, recurrent melanomas detected by skin self-examination tend to be identified at an earlier stage than recurrent melanomas detected by

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Ethical Standards

The study referenced in this manuscript was approved by the UCLA Institutional Review Board and the California Committee for the Protection of Human Subjects.

Conflict of Interest

The authors declare that they have no conflict of interest.

other means [11], and early detection is itself associated with better outcomes for recurrent melanoma [12, 13].

Skin self-examinations for melanoma survivors are recommended by most health organizations as part of follow-up surveillance. Both the American Cancer Society and the American Academy of Dermatology specifically endorse monthly skin self-examination for melanoma survivors [14, 15], while the National Comprehensive Cancer Network and American College of Preventive Medicine recommend routine skin self-examination for melanoma survivors without specifying an ideal frequency [16, 17].

Wide variation in the frequency of skin self-examination performed by melanoma survivors has been reported across previous research studies. Furthermore, given the lack of specific guidelines regarding the ideal frequency of skin examination, the reporting interval has varied across prior studies, with some studies reporting adherence to skin exams every two months while others report adherence to monthly skin exams. Bowen and colleagues found that 22% of survivors in the northwest U.S. performed skin self-examinations every two months [18], and in a separate study 17% of survivors residing in New Jersey performed skin self-exams every two months [19]. Meanwhile, over 39% of participants in another survey of melanoma survivors in the northeastern U.S. reported performing skin self-examination at least monthly, although only 13.7% of participants met criteria for “thorough” skin exam [20]. In another study, 59% of melanoma survivors recruited from an Arizona cancer registry reported performing thorough skin self-examination, but only 33% met study criteria for thoroughness [21]. Predictors of more frequent skin self-examination by melanoma survivors in these studies included female sex, having no moles, greater perceived risk of recurrence, and greater self-efficacy to perform skin self-examination [19, 20].

Although children of melanoma survivors are also considered a high-risk group, the value of screening children and the age at which screening might be merited is less clear, as melanoma uncommonly presents in childhood. However, some argue for the potential need for screening among high-risk children given recent increases in melanoma diagnosed in childhood and poorer outcomes when individuals are diagnosed as children [22-25]. To date, guidelines regarding pediatric melanoma screening have not been established, and current screening practices for melanoma in childhood have not been well-studied.

Data analyzed in the present study were collected as part of a survey to examine melanoma prevention behaviors among children of melanoma survivors.[26] The purpose of this report was to assess the use of skin self-examination among melanoma survivors and to identify correlates of skin self-examination in this high-risk population. In addition, given the lack of data about the use of skin exams among high-risk children, a secondary purpose was to assess rates of skin exams performed on children of melanoma survivors by parents and healthcare professionals.

Methods

Recruitment and Data Collection Procedures

Contact information was requested from the California Cancer Registry (CCR) for melanoma survivors who met the following criteria: 18 to 50 years of age at the time of diagnosis, alive according to CCR records, and Latino or non-Latino white ethnicity. In order to facilitate ethnic comparisons, Latino cases were oversampled by requesting contact information for all Latino cases diagnosed between 2005-2009, whereas contact information was requested only for a random sample of Non-Latino whites. In addition to the criteria listed above, cases needed to meet the following additional criteria that could only be ascertained after further contact: English or Spanish speaking and parent of a biological child 17 years of age.

Data collection took place between the fall of 2010 and the summer of 2012. The initial mailing sent to survivors included a cover letter that explained the study and eligibility criteria, an information sheet that contained all elements of informed consent, a pamphlet about the CCR, and self-administered versions of the eligibility screener and survey. Participants were also given the option to complete a web-based version of the survey or to request a telephone survey. Approximately 5-7 telephone calls were made for each participant at various times of the day and week in order to enhance response rates. After completion of the survey, participants were sent a \$20 gift card to compensate them for their time. This study was approved by the Institutional Review Boards of the University of California, Los Angeles and the State of California Committee for the Protection of Human Subjects.

Survey Instrument

The data collection instrument included items drawn from the published literature as well as items developed for the present study [27-30]. Although the survey assessed a broad range of topics relevant to melanoma prevention in high-risk families with a primary focus on sun protection practices,[26] the present study utilizes data collected on skin examination practices of survivors and their children as well as potential correlates of these practices based on the Health Behavior Framework.[31] The primary study outcomes for this sub-study included skin self-examination among survivors and whole body skin exams of children performed by parents and health care providers. Skin self-exam was assessed through a single item that asked survivors, "In the past year, how often have you performed a complete examination of your skin by examining all of your skin, both the front and back of your body and the top of your scalp, for signs of unusual moles or growths?" [20]. Receipt of a whole body skin exam performed by a parent was assessed by a single item that asked survivors, "Have you ever examined your child's skin for unusual moles or growths from head to toe?" A similar item assessed receipt of a provider-performed skin exam by asking survivors, "Have you ever had your child's skin examined for unusual moles or growths from head to toe by a health professional? (adapted from Glanz and colleagues, 2007; [32]. In addition, the survey assessed a wide range of variables including sociodemographics (parent and child age and gender, parent education, household income, insurance status), melanoma history and clinical factors (time since melanoma diagnosis, stage at diagnosis, number of

melanoma cases in family, objective risk of parent and child), other skin cancer prevention behaviors and risk factors (sun protection practices, sunburn history), and psychosocial factors (melanoma risk factor knowledge, perceived efficacy of prevention strategies, perceived severity of melanoma, perceived risk for child to develop melanoma) that may be associated with skin examination practices. Additional details about the survey have been included in a separate paper [33].

Data Analysis

Descriptive statistics were used to characterize the sample with regards to skin examination practices and potential correlates of these practices. Bivariate logistic regression analyses were used to initially examine the association between potential correlates and skin examination outcomes. Factors associated in bivariate analyses at the $p < .10$ level were included in the multivariate logistic regression analyses. Statistical significance was assessed at the 0.05 level for multivariate analyses. Data were analyzed using SAS for Windows version 9.3 (2011).

Results

Outcome of Recruitment

We initiated contact with 1820 melanoma survivors, including 1248 non-Latino whites and 572 Latinos. Of the 1820 survivors, 683 (37.5%) completed the eligibility screener. The most common reasons for non-completion of the eligibility screener were inability to make contact with a survivor due to invalid contact information (50% of those not screened), never reaching a survivor after multiple calls (39%) and survivor refusal to be screened (9%). Of the 683 survivors who completed the screener, 336 were found to be eligible and enrolled in the study (49% of those screened for eligibility). The most common reason for ineligibility was not having an age-eligible child (97% of ineligible). The 336 participating survivors provided data on 526 children in total because 190 reported on two children; the other 146 had one child only. Seven respondents were eliminated from the final sample because they self-reported an ethnicity other than Latino or non-Latino white. In addition, five respondents were eliminated due to missing child age. The analytic sample for the overall study, including the present paper, was restricted to one child per respondent given the correlation between responses for individual children from the same parent. In instances when parents reported on two eligible children, we selected the child within or closest to the age range of 5-10 years, because one of the purposes of overall study was to inform future intervention efforts. We anticipated that our future intervention efforts would focus on promoting sun protection among children between the ages of 5-10 years because children of this age are increasingly involved in activities that may put them at risk for sun exposure yet are still under the care of their parents, making parent-focused interventions appropriate [34]. Because one focus of this paper was on skin self-exam use among survivors, we excluded 8 respondents with no personal history of melanoma who completed the survey because their child's other parent, usually their spouse, was a melanoma survivor. The final analytic sample included 316 melanoma survivors and children (263 non-Latino white; 53 Latino). The most common method of providing data was by mailed survey (67% of

respondents) with a smaller proportion selecting the web-based (25%) or telephone survey (8%). Only 4% of the sample opted to complete the survey in Spanish.

Participant Characteristics

Table 1 presents characteristics of the final sample of 316 participating melanoma survivors and the 316 children for whom these respondents provided data. Respondents ranged in age from 26 to 52 years, with a mean age of 42 years. Participants were primarily non-Latino whites (83%), female (70%), and relatively advantaged in level of education and household income. Children in this sample were 49% female, with an average age of 9 years.

Use of Skin Self-Examination Among Melanoma Survivors

Table 1 also displays information about skin exam practices of melanoma survivors in this sample. A little more than a quarter of survivors (28%) reported that they had performed skin self-examination once or not at all during the past year. Only 16% of survivors in our sample reported engaging in monthly skin self-examination, with an additional 8% engaging in skin self-examination every two months.

Factors Associated with Skin Self-Examination in Bivariate and Multivariate Analyses

Bivariate and multivariate analyses were performed to assess potential predictors of skin self-examination frequency among survivors (see Table 2). Factors associated with reporting monthly skin self-examination in unadjusted analyses included having two or more melanoma diagnoses in the family, higher perceived severity of melanoma, and higher reported use of sun protection strategies. None of these factors were retained as significant correlates of skin self-examination in multivariate analyses.

Use of Whole Body Skin Examination of Children by Parents and Providers

Data regarding skin exam practices for children of melanoma survivors are presented in Table 1. Three-quarters of parents reported ever examining their child's skin from head to toe for unusual moles or growths. A little over a third of parents (38%) reported having a health care provider examine their child's skin for unusual moles or growths at some point in the past.

Relationship between Receipt of Skin Exam by Parent and Skin Exam by Provider

Additional analyses were conducted to assess the relationship between reports of skin examinations provided by parents with exams performed by providers. Results of these analyses revealed these outcomes to be highly related. Forty-one percent of parents who reported conducting an exam of their own child's skin also reported that their child had received a skin exam from a provider. Given the high overlap between these two variables, we decided not to include either variable as a predictor in multivariate models.

Factors Associated with Skin Exam by Parent in Bivariate and Multivariate Analyses

A number of factors emerged as correlates of skin examination by parents in unadjusted analyses (see Table 3). Factors associated with ever performing a whole body skin exam of one's child included female gender of responding parent, younger age of child, higher

perceived efficacy of melanoma prevention strategies, higher perceived severity of melanoma, and greater use of sun protection strategies for the child. In multivariate analyses, parent gender, perceived severity, child's age and sun protection strategies were retained as significant.

Factors Associated with Skin Exam by Provider in Bivariate and Multivariate Analyses

As demonstrated in Table 3, factors associated bivariately with skin examination by a health care professional included having two or more melanoma diagnoses in the family, older age of child, higher objective risk of the child, and having discussed the child's risk for melanoma with a provider. In multivariate analyses, having two or more melanoma diagnoses in the family and having discussed the child's risk with a provider were retained as significant correlates of provider-performed skin examination.

Discussion

Although skin self-examination is considered a key component of surveillance following a diagnosis of melanoma, fewer than one in five survivors in our sample reported engaging in monthly skin self-exams as recommended by multiple professional organizations. In fact, a substantial proportion of survivors examined their skin only once or not at all in the past year. Of note, our study participants had all been diagnosed with melanoma before the age of 50, whereas the median age of melanoma diagnosis in the U.S. is 62 [1]. Given their younger age at diagnosis, the melanoma survivors in this study may be at increased risk for recurrence compared to older survivors, increasing the importance of skin self-examination in this population. Despite this, melanoma survivors in our sample reported using skin self-examinations somewhat less frequently than in previous studies. A key difference between prior study samples and the present study is that all survivors enrolled were raising a child. Prior research has provided some evidence that parenting can have detrimental effects on parental health behaviors such as physical activity [35, 36] and dietary choices [36, 37], at least in the short-term. It should also be noted that our results might be an overestimate of skin exam use given the social desirability bias. In addition, we are unable to verify the level of comprehensiveness of exams that were reported by survivors. Previous studies have found that survivors tend to over-report the level of comprehensiveness of the skin exams that they do perform [20, 21].

Relatively few factors we examined were associated with skin self-examination in unadjusted or adjusted analyses. In unadjusted analyses, survivors with a stronger family history of melanoma, survivors who reported greater use of sun protection strategies, and survivors who perceived melanoma as more severe were more likely to report engaging in monthly skin self-examination consistent with the Health Behavioral Framework and other relevant conceptual models. [31, 38, 39] However, after controlling for other influences, these factors did not emerge as independent predictors of performance of skin self-examination. Our lack of ability to identify consistent predictors of skin self-exam has been similarly observed in prior studies. Mujumdar and colleagues (2009) found only two significant predictors of skin self-examination use among a sample of melanoma survivors recruited through the New Jersey state cancer registry.[19] In this study, having moles and

higher self-efficacy for conducting skin self-exam were associated with a higher likelihood of utilizing skin self-exam. However, no significant relationships were observed between skin self-exam and any demographic factors, medical or family history variables, or perceived risk for recurrence. Manne and colleagues (2006) examined a wide range of correlates of skin self-exam among a sample of melanoma survivors recruited through a cancer center and found only three significant correlates of skin-self exam; female gender, having a physician recommendation for skin self-exam, and perceiving fewer barriers were associated with a higher likelihood of skin self-exam.[20] With the exception of gender, the correlates identified as significant in these two prior studies were not assessed in the present study. Future research that examines a broader set of potential correlates including physician recommendation—a key influence on health behavior in a plethora of prior research—may shed additional light on this issue[20, 40-42] Another factor that may have contributed to our failure to identify self-exam correlates is the relative lack of variability for some measures. For example, knowledge and perceived severity of melanoma were uniformly high among survivors in our study. Recruitment of a more diverse sample of survivors or utilization of more extensive measures of some constructs may lead to greater variability, which could enhance identification of skin self-exam correlates. Our study also assessed use of skin examinations among the children of melanoma survivors in our sample. A surprisingly high proportion of parents in our sample reported that they had examined their child's skin for unusual moles or growths—nearly three-quarters of survivors. A bit over one third of parents reported taking their child to a healthcare provider for a whole body skin exam at some point. Whole body skin examinations are not recommended by most professional organizations for children with a parental history of melanoma, yet we found that a substantial proportion of children of our sample had received a skin exam performed by their parent, a health professional, or both. Parents who reported performing an exam on their child's skin were more likely to be female, report higher perceived severity of melanoma, have younger children, and report greater use of sun protection strategies for their child. We were unable to identify other published studies that assessed use of parent and provider skin exam among non-adult children of melanoma survivors. However, these findings are fairly consistent with prior research examining correlates of skin self-exam among melanoma survivors and other high risk populations.[20, 43] Parents who reported that their child had received an exam performed by a professional were more likely to have two or more cases of melanoma in the family, to have discussed their child's risk with a healthcare provider, and to have an older child. Despite the lack of professional recommendations regarding skin exams performed by a healthcare professional for children of melanoma survivors, it is not surprising that survivors with more extensive family histories may be more likely to seek skin exams for their children compared to survivors with less extensive family histories, especially as their children near adulthood.

We found that melanoma prevention behaviors appear to be strongly associated with each other. For example, many parents who reported performing a whole body skin exam for their child also reported that their child had received an exam from a health professional. We also observed sun protection practices to be related to a child's receipt of a skin exam from a parent and a provider. These findings suggest that, not surprisingly, survivors who perform one of these prevention strategies for their children tend to engage in multiple risk reducing

strategies for their child. Prior research has documented clustering of preventive health behaviors among adolescents and adults.[44, 45]

Conclusion

Few previous studies have examined skin self-examination practices among high-risk families. Whereas melanoma survivors examined their own skin relatively infrequently in our study compared to recommendations by healthcare organizations and data from other studies, they commonly reported use of skin exams for their children despite the lack of clear recommendations to guide this practice. Future efforts are needed to ensure the adequate use of skin self-examinations including frequency and level of comprehensiveness among melanoma survivors and to guide melanoma survivors who are also parents about the best melanoma prevention strategies for their children.

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Table 1

Sample Characteristics and Skin Exam Practices

Variable	Categories	% (N) or \bar{x}
<i>Characteristics of Parent/Respondent (n= 316)</i>		
Mean age	Range (26-52 yrs)	\bar{x} = 42.2 years
Gender	Female	70.0% (220)
Ethnicity	Non-Latino White	83.2% (263)
	Latino/Hispanic	16.8% (53)
Education	Less than college degree	39.2% (124)
	College graduate	60.8% (192)
Total household income	< \$70,000	28.1% (80)
	\$70,000	71.9% (205)
Perceived general health	Very good or Excellent	82.2% (258)
	All others	17.8% (56)
Objective melanoma risk/ Sun sensitivity	(min=3, max=12)	\bar{x} = 8.34
Stage at diagnosis	In-situ	10.1% (32)
	All others	89.9% (284)
Time since diagnosis (months)	(min = 17, max = 76)	\bar{x} = 41
Family history of melanoma	1 other diagnoses in family	29.1% (91)
Melanoma knowledge	(min=0, max=9)	\bar{x} = 7.04
Perceived severity of melanoma	(min=0, max=10)	\bar{x} = 9.56
Perceived efficacy of early intervention	High	70.83 (221)
	All others	29.17 (91)
Skin self-exam frequency	Never in past year	12.3% (39)
	Once in past year	15.8% (50)
	2-5 times in past year	48.1% (152)
	Every other month or 6 times	7.6% (24)
	Monthly or 12 times	16.1% (51)
Sunburn within the past year	% yes	25.4% (80)
Sun protection practices composite	(min = 1, max = 4)	\bar{x} = 3.03
<i>Characteristics of Selected Child (n=316)</i>		
Mean age		\bar{x} = 9.2 years
Sex	Female	49.4% (156)
Objective melanoma risk/ Sun sensitivity	(min=4, max=16)	10
Perceived risk of child for melanoma	Certain/Very high chance	52.7% (165)
	50-50 chance, little, no chance	47.3% (148)
Skin exam by parent	% ever examined	75.2% (237)

Variable	Categories	% (N) or \bar{x}
Skin exam by professional	% ever examined	38.2% (120)
Sun protection practices composite	(min = 1, max = 4)	$\bar{x} = 2.28$
Discussed child's risk with MD	% ever	46.82% (147)

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Table 2

Predictors of Monthly Skin Self-Examination among Survivors

Variable	Unadjusted OR (95% CI)	Multivariate OR (95% CI)
Parent age (<i>continuous</i>)	1.00 (0.95—1.05)	-
Female (<i>vs. male</i>)	1.06 (0.55—2.04)	1.11 (0.56—2.21)
More recent diagnosis (<3 <i>vs.</i> 3 years)	1.39 (0.75—2.58)	-
Non-Latino white (<i>vs. Latino</i>)	2.04 (0.77—5.39)	1.90 (0.70—5.11)
College graduate (<i>vs. less education</i>)	1.00 (0.54—1.85)	-
Annual household income < \$70,000 (<i>vs. \$70,000/year</i>)	0.64 (0.29—1.40)	-
Greater perceived health (<i>excellent/very good vs. other categories</i>)	1.02 (0.46—2.23)	-
Earlier stage at diagnosis (<i>in situ vs. others</i>)	0.51 (0.15—1.74)	-
1 melanoma diagnosis in family (<i>vs. no additional diagnoses</i>)	1.74 (0.93—3.24)	1.58 (0.83—3.01)
Sunburn in past year (<i>vs. no</i>)	0.89 (0.44—1.79)	-
Objective melanoma risk (<i>continuous</i>)	1.11 (0.94—1.32)	-
Sun protection practices (<i>continuous</i>)	1.88 (1.01—3.51)	1.70 (0.90—3.24)
Melanoma knowledge (<i>continuous</i>)	0.98 (0.79—1.23)	-
Perceived severity of melanoma (<i>continuous</i>)	1.60 (0.97—2.65)	1.57 (0.91—2.71)

Table 3

Predictors of child skin examination by parent or professional

Variable	Skin exam by parent		Skin exam by professional	
	Unadjusted OR (95% CI)	Multivariate OR (95% CI)	Unadjusted OR (95% CI)	Multivariate OR (95% CI)
Female Parent (<i>vs. male</i>)	2.04 (1.20—3.47) *	1.94 (1.09—3.44) *	1.33 (0.79—2.23)	1.43 (0.82—2.51)
Time since diagnosis (<i>continuous</i>)	1.00 (0.98—1.03)	-	1.00 (0.97—1.02)	-
Non-Latino white (<i>vs. Latino</i>)	0.99 (0.50—1.97)	0.79 (0.37—1.71)	1.15 (0.61—2.15)	0.84 (0.41—1.70)
Parent with college education (<i>vs. less education</i>)	0.66 (0.39—1.14)	-	0.84 (0.52—1.34)	-
Annual household income < \$70,000 (<i>vs. \$70,000</i>)	1.23 (0.67—2.27)	-	0.82 (0.47—1.43)	-
Earlier stage at diagnosis (<i>vs. other stages</i>)	0.82 (0.36—1.86)	-	0.52 (0.22—1.25)	-
1 melanoma diagnosis in family (<i>vs. no additional diagnoses</i>)	0.97 (0.56—1.71)	-	2.21 (1.33—3.66) *	1.86 (1.07—3.23) *
Melanoma knowledge (<i>continuous</i>)	0.96 (0.79—1.16)	-	1.12 (0.93—1.34)	-
Greater perceived risk of child for melanoma (<i>certain/very high chance vs. other categories</i>)	1.41 (0.65—3.07)	-	1.77 (0.92—3.37)	1.32 (0.62—2.77)
Greater perceived efficacy of early intervention (<i>high vs. other categories</i>)	2.12 (1.24—3.64) *	1.37 (0.74—2.52)	1.29 (0.76—2.17)	-
Perceived severity of melanoma (<i>continuous</i>)	1.27 (1.03—1.58) *	1.29 (1.02—1.62) *	1.19 (0.93—1.52)	-
Discussed risk with MD (<i>vs. never discussed</i>)	1.53 (0.90—2.58)	-	3.15 (1.94—5.11) *	2.93 (1.76—4.87) *
Boy (<i>vs. girl</i>)	1.03 (0.62—1.72)	-	1.23 (0.77—1.95)	-
Child age (<i>continuous</i>)	0.88 (0.83—0.94) *	0.89 (0.83—0.95) *	1.06 (1.00—1.11) *	1.05 (0.99—1.11) †
Child sun protection (<i>continuous</i>)	2.30 (1.32—4.04) *	1.81 (1.00—3.29) *	1.48 (0.92—2.36)	-
Child objective risk (<i>continuous</i>)	1.02 (0.93—1.12)	-	1.11 (1.02—1.21) *	1.09 (0.98—1.20)

† p < 0.10

* p < 0.05