



Prevalence and correlates of skin self-examination practices among cutaneous malignant melanoma survivors

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ABSTRACT

Melanoma patients are at elevated risk for recurrence of the primary cancer as well as second primary melanomas. Regular skin self-examination (SSE) is recommended as part of follow-up surveillance. In this study, we examined SSE performance and comprehensiveness as well as knowledge and attitudinal correlates of SSE performance and comprehensiveness. Four hundred forty-one melanoma survivors completed measures of SSE performance as well as knowledge and attitudes about SSE and melanoma. Approximately two-thirds of the sample reported having conducted an SSE in the past two months; the average number of body parts examined was 10.64 (out of 15 maximum). Only 7.5% of the sample checked all 15 body parts. Greater worry about recurrence, fewer barriers to SSE, more planning for when to conduct SSE, and more confidence in the ability to conduct SSE and recognize a suspicious growth were associated with both SSE performance and greater SSE comprehensiveness. Physician influence was positively associated with SSE performance. Survivor education efforts may benefit from reminding survivors to check hard-to-see and sensitive areas, develop a plan for how to ask for assistance in conducting exams, as well as use mirrors to see hard-to-reach areas. Addressing perceived SSE barriers, fostering SSE planning, and improving SSE self-efficacy may be important foci for intervention efforts to enhance SSE performance and comprehensiveness.

Invasive cutaneous melanoma skin cancer is the fifth most common cancer in the United States (National Cancer Institute, 2019). The annual incidence of melanoma has risen in the last several decades, with incidence rates more than tripling from 7.9 new cases per 100,000 persons in 1975 to 27 new cases per 100,000 persons in 2018 (American Cancer Society, 2019). Melanoma patients are at elevated risk for recurrence of the primary cancer as well as secondary melanomas. Recurrence rates depend upon the tumor thickness and nodal involvement and range from 3% to 24% among patients with thinner lesions to 51% among patients with thicker lesions or lymph node involvement (Francken et al., 2005, 2008; Leiter et al., 2012). The risk for the development of second primary cancers is approximately 0.5% each year for the first five years after diagnosis and slightly lower after the first five year period (Bhatia et al., 1999).

For these reasons, this patient population should be followed closely by their dermatologist and/or oncologist after initial cancer treatment. In addition to total cutaneous exams conducted by these care providers, regular skin self-examination (SSE) is recommended as part of follow-

up surveillance. SSE is associated with reduced risk of advanced disease and research suggests that greater skin awareness is associated with improved survival (Berwick et al., 1996, 2005). With regard to professional recommendations for the frequency of SSE, the American Cancer Society and the American Academy of Dermatology recommend SSE for melanoma survivors (American Cancer Society, 2019). However, the National Comprehensive Cancer Network recommends routine SSE for melanoma survivors without specifying an ideal frequency (National Comprehensive Cancer Network, 2019).

Studies document a wide variation in the frequency of SSE performed by melanoma survivors, with figures largely dependent upon the way that SSE is measured and the time frame of examination being assessed. When patients report whether they have performed any form of SSE in the past two months, high rates of performance are seen (71.5%) (Coups et al., 2016). Rates of SSE are even higher when using the same assessment approach but specifying performance in the past year (84.3%) (Manne and Lessin, 2006). Significantly lower rates are found if SSE completion is defined by examination thoroughness.

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Manne and colleagues (Manne and Lessin, 2006) reported that 13.7% checked four key areas and had someone assist them or used a mirror for hard-to-view areas. Loescher and colleagues (Loescher et al., 2006) found that 16% of women and 7% of men examined each of seven designated body parts in the last two months. Mujumdar and colleagues (Mujumdar et al., 2009) reported that 17% of survivors examined a minimum number of areas of the body (8/9 areas) in the past two months.

To guide the development of more efficacious interventions, it would be beneficial to identify demographic, medical, psychological, social, melanoma and SSE knowledge, and attitudinal correlates of SSE among melanoma survivors. In terms of demographic and medical factors, studies suggest that women (Manne and Lessin, 2006), more educated patients (Coups et al., 2016), patients diagnosed with stage 2 melanoma (Loescher et al., 2006), and patients with moles (Loescher et al., 2006) are more likely to engage in SSE than others. Knowledge about skin cancer has been associated with SSE in one study (Coups et al., 2016, 2019) but not others (Manne and Lessin, 2006; Oliveria et al., 1999). Physician recommendation, physician education about how to perform an SSE, and education about what a suspicious mole looks like (Coups et al., 2016) have been consistently associated with SSE performance (Coups et al., 2016; Manne and Lessin, 2006). Barriers to performing SSE (Manne and Lessin, 2006) and greater self-efficacy to perform SSE (Coups et al., 2016; Mujumdar et al., 2009) have been consistently associated with SSE. Perceived skin cancer risk and cancer worry have not been associated with SSE in prior work (Manne and Lessin, 2006; Mujumdar et al., 2009; Bowen et al., 2012).

Drawing from the limited prior work evaluating correlates of SSE among melanoma survivors (Coups et al., 2016; Manne and Lessin, 2006; Bowen et al., 2012), we used a conceptual framework for examining correlates based on the Preventive Health Model: (Myers et al., 1994) knowledge, self-efficacy, benefits and barriers, controllability of melanoma, influences from family, friends, and health care professionals, severity of melanoma, SSE planning, and distress about melanoma. We advanced the knowledge base in two ways. First, we characterized the recent performance of SSE among melanoma survivors by assessing both whether they conducted SSE and what body parts they examined using a more specific and comprehensive list of body parts than used in prior research. We will be able to compare modifiable knowledge and attitudinal characteristics of survivors who perform less comprehensive SSE with survivors who perform more comprehensive SSE. Second, we examined variables that have not been evaluated in prior work: Family and friend influence on SSE and SSE planning. Family and friend support and recommendations have been studied for SSE intentions among relatives of melanoma survivors (Coups et al., 2011), but have not been studied among survivors. Planning is a well-established aspect of goal setting (Schwarzer and Renner, 2000) and a predictor of engagement in a number of health behaviors, including physical activity and cancer screening (Gollwitzer, 1999; Luszczynska et al., 2007; van Osch et al., 2008). Setting a plan for when to engage in a behavior has been incorporated into behavioral interventions for health behaviors, and evaluating its role in SSE would guide intervention content (Arbour and Martin Ginis, 2009; Bolman et al., 2015).

1. Methods

The data for this study were drawn from the baseline survey from a randomized controlled trial of a web-based intervention (called *mySmartSkin*) to promote SSE and sun protection behaviors among individuals diagnosed with melanoma. Detailed information regarding the study is available elsewhere (Coups et al., 2019).

1.1. Eligibility

Patients were eligible for this study if they: a) had a diagnosis of primary stage 0 to III cutaneous malignant melanoma; b) completed

surgery between 3 and 24 months prior to consenting; c) were not adherent to thorough SSE, defined as not checking each of 15 areas of the body at least once during the past two months, *and/or* were not adherent to sun protection recommendations (a mean score of less than 4 on a 5-point Likert rated sun protection behavior scale (Glanz et al., 1999); d) were ≥ 18 years of age; e) had access to a computer connected to the internet; f) were able to speak and read English, and; g) were able to provide informed consent.

1.2. Recruitment

Participants were recruited from the Rutgers Cancer Institute of New Jersey (CINJ), the Department of Dermatology at Robert Wood Johnson Medical Center (New Jersey), Saint Barnabas Medical Center (New Jersey), and the New Jersey State Cancer Registry (NJSCR). With the exception of participants recruited by the NJSCR, prospective participants were mailed an information letter about the study and a consent form, which was followed by a telephone call. During the call, eligibility was ascertained and questions about the study were answered. Interested and eligible patients provided verbal consent and were emailed a link to the survey to complete online. Treating physicians of potentially eligible participants identified by the NJSCR and sent an information letter about the study and asked to notify the NJSCR if there was a reason not to contact their patient(s). The NJSCR team then sent a study information package and called each patient. Patients who expressed interest and agreed to allow their contact information to be shared with the CINJ study staff were sent study information and consent forms. The same recruitment procedures described above were then followed for these patients. A total of 1411 individuals were assessed for eligibility and study interest. Of these, 926 were excluded (n = 150, ineligible, n = 776, declined), 44 consented but did not complete the baseline survey, and 441 participants were recruited to the study. Following established guidelines for estimating the proportion of individuals of unknown eligibility status who were in fact eligible for the study, the participant response rate was 40.9% (American Association of Public Opinion Research [AAPOR] response rate 3) (Research TAAfPO, 2016) More detailed information is presented in the study CONSORT diagram.¹⁴

2. Measures

2.1. Skin self-exam outcomes

Participants were asked whether they checked any part of their body for early signs of skin cancer in the last 2 months. Participants who indicated they had checked their skin at least once indicated the number of times they checked their skin in the last 2 months, the last time they checked their body, and the specific areas that they thoroughly examined during their last skin check. Two outcomes were used: SSE performance in the past two months: yes/no; and SSE comprehensiveness: The number of body parts checked in the last SSE (1–15).

2.2. Demographic, medical, and skin cancer risk factors¹

Demographic information. Participants completed information about their age, sex, race/ethnicity, education level, and marital status.

Medical factors. The number of months since the melanoma surgery was performed and stage of disease were collected from medical charts.

Skin cancer risk. Participants rated their melanoma risk factors (blue/green/gray eyes; blonde or red hair; very fair/fair skin; burn easily/do not tan; few or many freckles; at least 10 mol larger than a pencil eraser; ever having used a tanning bed or booth; and having a

¹ The survey is included in Supplement A.

first-degree relative diagnosed with melanoma). Risk factors were summed (score range, 0–8). Participants were also asked whether or not they had a sunburn in the past year (yes/no).

2.3. Melanoma knowledge and attitudes

Knowledge. Thirteen true–false items assessed knowledge about melanoma (Manne and Lessin, 2006) (sample item: “Melanoma is the most common form of skin cancer”).

Perceived severity of melanoma (Manne and Lessin, 2006; Coups et al., 2011). Six Likert-rated items assessed how disruptive a recurrence of melanoma would be to areas of life (e.g., emotional well-being), and two items assessed how severe the health consequences would be if having melanoma would be if it was caught early or late (1 = *not at all severe*, 5 = *very severe*). Alpha = 0.87.

Perceived controllability of melanoma (Moss-Morris et al., 2002). Four Likert-rated items assessed controllability (sample item, “I have the power to influence my melanoma.”) (1 = *strongly disagree*, 5 = *strongly agree*). Items are averaged. Alpha = 0.67.

Perceived risk for melanoma recurrence (Manne and Lessin, 2006; Coups et al., 2011). Four Likert-rated items assessed risk (sample item: “I feel I will experience melanoma again”) (1 = *strongly disagree*, 5 = *strongly agree*). Alpha = 0.81.

2.4. Psychological factors

Worry about melanoma recurrence. Four Likert-rated items adapted from Vickberg and colleagues (Vickberg, 2003) assessed worry about the possibility of melanoma recurrence (sample item, “How often do you worry about the possibility you could have melanoma again?”) (1 = *never*, 6 = *all the time*). Alpha = 0.92.

Distress about melanoma. A single item measure was used (“Select the number that describes how distressed you are currently about your melanoma”) (1 = *not at all distressed*, 10 = *extremely distressed*).

2.5. Social influence

Health care professional influence (Coups et al., 2016). Three items asked whether a health care professional suggested that the participant regularly examine their skin, has shown them the best way to do SSE, and shown them what a suspicious mole looks like (*yes/no*). A sum was calculated with a range of 0 to 3.

Family and friend influence. Two items adapted from prior work with relatives of melanoma survivors (Coups et al., 2011) assessed friend and family beliefs about the importance of SSE (e.g., “My friends and family want me to do a regular skin self-examination”) (1 = *strongly disagree*, 5 = *strongly agree*). Alpha = 0.80.

2.6. SSE knowledge and attitudes

Knowledge. Six multiple choice items assessed knowledge of the ABCDEFs of SSE (Coups et al., 2016; Gillen et al., 2011). The ABCDEFs refer to characteristics of abnormal lesions: asymmetrical, irregular border, inconsistent color, large diameter, evolving or changing, and funny looking.

Benefits (Manne and Lessin, 2006; Coups et al., 2011). Eight Likert-rated items assess perceived benefits of SSE (e.g., “Doing regular skin self-examination would provide me with peace of mind about my health”) (1 = *strongly disagree*, 5 = *strongly agree*). A mean was calculated. Alpha = 0.88.

Barriers (Manne and Lessin, 2006; Coups et al., 2011). Eleven Likert-rated items assess perceived barriers to conducting SSE (e.g., “Doing skin self-examination would be very embarrassing”) (1 = *strongly disagree*, 5 = *strongly agree*). A mean was calculated. Alpha = 0.81.

Planning. Two Likert-rated items developed for this study (Janda

et al., 2013; Schwarzer, 2008) assessed planning the next SSE (“I know the date when I will do my next skin self-examination”, “I have a regular schedule that I follow for when to check my body for skin cancer”) (1 = *strongly disagree*, 5 = *strongly agree*). A mean was calculated. Alpha = 0.94.

Self-efficacy (Coups et al., 2016; Robinson et al., 2008). A 12-item measure composed for this study assessed confidence in examining different parts of the body for signs of skin cancer as well as confidence in telling the difference between a normal mole or skin growth and a melanoma based on shape, border, color, size, changes, and compared to other moles or skin growths (1 = *strongly disagree*, 5 = *strongly agree*). A mean was calculated. Alpha = 0.94.

2.7. Approach to analysis

A hierarchical logistic regression was conducted predicting whether the individual reported conducting an SSE in the past two months. Variables were entered in seven steps: demographic, medical, skin cancer risk, melanoma knowledge and attitudes, psychological, social influence, and SSE knowledge and attitudes. SSE-specific knowledge and attitudes were entered last into the regression equation in order to determine if these factors contributed to variance in outcomes after accounting for the contributions of all other variables. A similar hierarchical linear regression was conducted with the outcome of SSE comprehensiveness and the same set of predictor variables. A cutoff of $p < .05$ was used to determine statistical significance.

3. Results

3.1. Performance of SSE

Table 1 presents information about the study sample. Table 2 presents descriptive statistics for SSE engagement and thoroughness. Of the 441 participants, approximately two-thirds reported having conducted an SSE in the past two months (N = 287, 65.5%). In terms of the thoroughness of that SSE, among participants reporting conducting an SSE, the average number of body parts examined was 10.64 (SD = 3.20, range = 1–15), and the median was eight body parts. Only 7.5% of the sample checked all 15 body parts. Among those conducting an SSE, the most commonly-checked areas were: face (98.3%), front of

Table 1
Descriptive information for the study sample.

| Variable | N (%) | M (SD) |
|---------------------------------------|------------|---------------|
| Sex | | |
| Female | 216 (49.0) | |
| Male | 225 (51.0) | |
| Age | | 61.39 (13.27) |
| Race/ethnicity | | |
| Non-Hispanic White | 432 (98.0) | |
| Non-Hispanic Black | 1 (0.2) | |
| Non-Hispanic other | 2 (0.5) | |
| Hispanic | 6 (1.4) | |
| Education | | |
| ≤ High school graduate | 54 (12.2) | |
| Some college | 87 (19.8) | |
| Bachelor degree | 133 (30.2) | |
| Graduate degree/professional training | 167 (37.9) | |
| Marital status | | |
| Not married or living with partner | 90 (20.4) | |
| Married or living with partner | 351 (79.6) | |
| Disease stage | | |
| 0 | 136 (30.8) | |
| I | 245 (55.6) | |
| II | 34 (7.7) | |
| III | 26 (5.9) | |
| Months since surgery | | 14.07 (5.11) |
| Melanoma risk factors (0–8) | | 4.35 (1.64) |
| Sunburn in past year (yes) | 114 (25.9) | |

Table 2
Descriptive statistics for SSE engagement and thoroughness.

| Variable | N (%) | Mean (SD) |
|---|------------|--------------|
| Conducted an SSE in past 2 months | 287 (65.5) | |
| Body parts examined during SSE in the past two months (yes) | | 10.64 (3.20) |
| Scalp | 108 (37.9) | |
| Face | 282 (98.3) | |
| Neck | 256 (89.8) | |
| Shoulders | 253 (88.2) | |
| Front of arms | 280 (97.9) | |
| Back of arms | 229 (79.8) | |
| Chest | 268 (93.8) | |
| Stomach | 250 (87.7) | |
| Upper back | 157 (54.9) | |
| Lower back | 139 (48.8) | |
| Front of legs | 266 (94.0) | |
| Back of legs | 204 (72.6) | |
| Bottom of feet | 119 (41.6) | |
| Buttocks | 116 (40.4) | |
| Genitals | 127 (44.4) | |

Note. SSE = Skin self-examination. Due to missing date, sample sizes for the areas of the body vary from N = 281–287.

the arms (97.9%), front of the legs (94.0%), chest (93.7%), neck (89.8%), shoulders (88.2%), and stomach (87.7%). The least-commonly checked areas were: scalp (37.9%), buttocks (40.4%), bottom of the feet (41.6%), and genitals (44.4%). Almost half (46.2%) of the sample reported using a mirror to view hard-to-see places, and only 39% reported asking for assistance. Only five participants (1.7%) reported using a mole map to guide their most recent SSE.

3.2. Correlates of SSE

3.2.1. SSE in the past 2 months

Table 3 presents the results of a hierarchical logistic regression predicting whether the individual reported conducting an SSE in the past two months. The demographic characteristics together accounted for about 5% of the variance in conducting an SSE in the past two months. Although none of the coefficients in the final model are statistically significant, estimates from the model that included only the demographic predictors (step 1) indicated that age was the primary demographic predictor of SSE, with $b = -0.028$, $OR = 0.972$, $Wald = 10.51$, $p = .001$, such that older individuals were less likely to report having done an SSE in the past two months. The second and third steps in the model, which included cancer-related variables and skin-cancer risk factors respectively, did not account for significant variance in SSE performance.

The significant change in R (American Cancer Society, 2019) for skin cancer knowledge and attitudes is largely an effect of perceived risk of recurrence as well as melanoma knowledge. In the model that included the first four steps only, the effect of knowledge was $b = 0.170$, $OR = 1.186$, $Wald = 11.143$, $p = .001$. This suggests that individuals with greater knowledge were more likely to have done an SSE. The effect of perceived risk of melanoma recurrence was significant in both the full model and in the model that included only the first four steps, $b = 0.419$, $OR = 1.520$, $Wald = 7.608$, $p = .006$, indicating that individuals who perceive themselves to be at greater risk of recurrence were more likely to have conducted an SSE. The significant change in R SUPERScript 2 which refers to "squared" not the reference number 2. it is a stats term. R squared

Although the two psychological variables together did not predict a significant amount of variance in SSE, the effect of worry was significant in both the full model and the fifth step model. Individuals who expressed greater worry about recurrence were more likely to conduct an SSE. The effect of social influence was primarily due to physician recommendation such that individuals who reported that the physician

Table 3
Predicting whether an SSE was performed in the past two months using hierarchical logistic regression.

| | b | OR | OR 95% CI | Wald | p |
|---|---------------------|-------|--------------|-------|-------|
| Demographics | | | | | |
| Age | -0.010 | 0.990 | 0.97 to 1.01 | 0.920 | 0.337 |
| Education | -0.106 | 0.899 | 0.69 to 1.17 | 0.631 | 0.427 |
| Marital status | 0.104 | 1.110 | 0.83 to 1.49 | 0.479 | 0.489 |
| Sex | 0.012 | 1.012 | 0.77 to 1.34 | 0.007 | 0.934 |
| Step 1 $\Delta R^2 = 0.053^{**}$ | | | | | |
| Medical factors | | | | | |
| Months since surgery | 0.027 | 1.027 | 0.98 to 1.08 | 1.246 | 0.264 |
| Disease stage | -0.041 | 0.960 | 0.70 to 1.31 | 0.067 | 0.796 |
| Step 2 $\Delta R^2 = 0.001$ | | | | | |
| Skin cancer risk factors | | | | | |
| Number of risk factors | -0.060 | 0.942 | 0.81 to 1.09 | 0.657 | 0.418 |
| Sunburn in past year | 0.015 | 1.015 | 0.59 to 1.75 | 0.003 | 0.957 |
| Step 3 $\Delta R^2 = 0.001$ | | | | | |
| Melanoma knowledge & attitudes | | | | | |
| Knowledge | 0.103 | 1.108 | 0.99 to 1.24 | 3.065 | 0.080 |
| Severity | 0.028 | 1.029 | 0.71 to 1.49 | 0.022 | 0.882 |
| Controllability | 0.167 | 1.181 | 0.83 to 1.67 | 0.879 | 0.349 |
| Risk of recurrence | 0.473 ^{**} | 1.605 | 1.14 to 2.27 | 7.163 | 0.007 |
| Step 4 $R^2 = 0.075^{**}$ | | | | | |
| Psychological | | | | | |
| Distress about melanoma | -0.068 | 0.935 | 0.82 to 1.07 | 0.950 | 0.330 |
| Worry about recurrence | 0.318 [*] | 1.375 | 1.04 to 1.82 | 4.890 | 0.027 |
| Step 5 $\Delta R^2 = 0.016$ | | | | | |
| Social influence | | | | | |
| Physician influence | 0.429 ^{**} | 1.536 | 1.15 to 2.05 | 8.393 | 0.004 |
| Family and friend influence | -0.043 | 0.958 | 0.76 to 1.22 | 0.128 | 0.721 |
| Step 6 $\Delta R^2 = 0.085^{**}$ | | | | | |
| SSE knowledge & attitudes | | | | | |
| Knowledge | 0.000 | 1.000 | 0.86 to 1.17 | 0.000 | 1.000 |
| Benefits | -0.022 | 0.978 | 0.67 to 1.43 | 0.013 | 0.910 |
| Barriers | -0.485 [*] | 0.616 | 0.40 to 0.94 | 4.974 | 0.026 |
| Planning | 0.262 [*] | 1.299 | 1.04 to 1.62 | 5.457 | 0.019 |
| Self-efficacy | 0.532 ^{**} | 1.703 | 1.17 to 2.48 | 7.691 | 0.006 |
| Step 7 $\Delta R^2 = 0.088^{**}$ | | | | | |

Note. * $p < .05$, ** $p < .01$. Coefficients are from the full model that included all of the predictors. Total Nagelkerke R^2 for the model is 0.318, $\chi^2(21) = 114.61$, $p < .001$. Education is coded 1 = Bachelor's degree or greater education, -1 = less than a Bachelor's degree. Marital status is coded 1 = partnered, -1 = not partnered. Sex is coded 1 = male, -1 = female. Change in R^2 is based on Nagelkerke R^2 . SSE = skin self-examination.

provided guidance about doing an SSE were more likely to do the exam. Finally, from the final step of the model, there is evidence that, controlling for all other variables in the model, individuals who reported more barriers to SSE were less likely to conduct one, but individuals who indicated greater planning and higher self-efficacy were more likely to conduct an SSE.

3.2.2. SSE thoroughness

Table 4 presents the results of a hierarchical linear multiple regression predicting thoroughness of the SSE conducted as indicated by the number of body parts examined. The demographic attributes accounted for about 5% of the variance. Individuals with a bachelor's degree examined fewer body parts than those without a bachelor's degree, and men examined more body parts than women. Although it was not statistically significant in the final model, in the model that only included demographics, age was also a significant predictor, with older individuals conducting less thorough exams, $b = -0.032$, $\beta = -0.135$, $t(284) = 2.17$, $p = .031$. Cancer related variables, skin cancer risk factors, and knowledge and attitudes about skin cancer did not predict thoroughness of SSE.

The two psychological measures together did not account for significant variance in step 5 of the model, but worry about recurrence predicted number of body parts examined: individuals who reported greater worry did more thorough SSE. For social influence, although

Table 4

Hierarchical linear regression results predicting thoroughness of SSE (number of body parts examined) for individuals who conducted at least one SSE in the past 2 months, $N = 287$.

| | <i>b</i> | 95% CI <i>b</i> | β | <i>t</i> (419) | <i>p</i> |
|---|----------|-----------------|---------|----------------|----------|
| Demographics | | | | | |
| Age | -0.018 | -0.05 to 0.01 | -0.075 | -1.192 | 0.234 |
| Education | -0.419* | -0.80 to -0.04 | -0.124 | -2.182 | 0.030 |
| Marital status | -0.251 | -0.70 to 0.20 | -0.061 | -1.106 | 0.270 |
| Sex | 0.409* | 0.01 to 0.81 | 0.128 | 2.006 | 0.046 |
| Step 1 $\Delta R^2=0.047^{**}$ | | | | | |
| Medical factors | | | | | |
| Months since surgery | -0.011 | -0.08 to 0.06 | -0.017 | -0.315 | 0.753 |
| Disease stage | 0.197 | -0.26 to 0.66 | 0.048 | 0.846 | 0.398 |
| Step 2 $\Delta R^2=0.010$ | | | | | |
| Skin cancer risk factors | | | | | |
| Number of risk factors | -0.023 | -0.25 to 0.20 | -0.011 | -0.203 | 0.839 |
| Sunburn in past year | -0.269 | -1.05 to 0.52 | -0.037 | -0.673 | 0.501 |
| Step 3 $\Delta R^2=0.005$ | | | | | |
| Melanoma knowledge & attitudes | | | | | |
| Knowledge | -0.015 | -0.19 to 0.16 | -0.010 | -0.174 | 0.862 |
| Severity | -0.116 | -0.66 to 0.43 | -0.029 | -0.420 | 0.675 |
| Controllability | -0.199 | -0.73 to 0.33 | -0.042 | -0.740 | 0.460 |
| Risk of recurrence | 0.111 | -0.37 to 0.60 | 0.027 | 0.451 | 0.653 |
| Step 4 $\Delta R^2=0.011$ | | | | | |
| Psychological | | | | | |
| Distress about melanoma | -0.111 | -0.30 to 0.08 | -0.078 | -1.138 | 0.256 |
| Worry about recurrence | 0.402* | 0.00 to 0.80 | 0.155 | 1.981 | 0.049 |
| Step 5 $\Delta R^2=0.011$ | | | | | |
| Social influence | | | | | |
| Physician influence | 0.228 | -0.16 to 0.62 | 0.067 | 1.152 | 0.250 |
| Family and friend influence | 0.156 | -0.18 to 0.50 | 0.054 | 0.907 | 0.365 |
| Step 6 $R^2=0.069^{**}$ | | | | | |
| SSE knowledge & attitudes | | | | | |
| Knowledge | 0.012 | -0.22 to 0.25 | 0.007 | 0.103 | 0.918 |
| Benefits | -0.022 | -0.60 to 0.55 | -0.005 | -0.076 | 0.939 |
| Barriers | -0.975** | -1.65 to -0.30 | -0.185 | -2.859 | 0.005 |
| Planning | 0.453** | 0.14 to 0.77 | 0.172 | 2.811 | 0.005 |
| Self-efficacy | 0.802** | 0.28 to 1.33 | 0.226 | 3.011 | 0.003 |
| Step 7 $R^2=0.141^{**}$ | | | | | |

Note. * $p < .05$, ** $p < .01$. Coefficients are from the full model that included all of the predictors. Total R^2 for the model is 0.295, $F(21,267) = 5.33$, $p < .001$. Education is coded 1 = Bachelor's degree or greater education, -1 = less than a Bachelor's degree. Marital status is coded 1 = partnered, -1 = not partnered. Sex is coded 1 = male, -1 = female. SSE = skin self-examination.

neither coefficient was statistically significant in the final model, the two variables together accounted for almost 7% of the variance in number of body parts examined. In the hierarchical model that did not include the final set of predictors, both physician recommendation, $b = 0.666$, $\beta = 0.196$, $t(272) = 3.31$, $p = .001$, and social normative influences, $b = 0.419$, $\beta = 0.144$, $t(272) = 2.35$, $p = .019$, were significant positive predictors of thoroughness.

Finally, barriers, planning, and self-efficacy were all significant predictors of thoroughness of SSE, controlling for all other variables in the model. The knowledge and attitudes about SSE predicted 14% of the variance in thoroughness. Individuals who reported fewer barriers, greater planning, and higher self-efficacy to conduct an SSE conducted more thorough SSE.

4. Discussion

Regular skin self-examination is recommended for melanoma survivors. Our results suggest that more than half of participants reported having conducted an SSE in the past two months, which is similar to figures reported in previous work (Coups et al., 2016). Seven and one half percent of participants reported examining all 15 body parts, which is less than the figure reported in our prior work (14.2%) (Coups et al., 2016). The most commonly-checked areas (face, chest, front of arms, front of legs, neck, stomach, and shoulders) and the least-commonly checked areas (bottom of feet, buttocks, genitals, lower back, upper back, and scalp) were the same as reported in our prior work (Coups et al., 2016). About half of participants reported using a mirror to view

hard-to-see places, and only 39% reported asking for assistance in conducting SSE. These results suggest that survivor education efforts may benefit from reminding survivors to check these hard-to-see and sensitive areas as well as develop a plan for how to ask for assistance in conducting exams as well as use mirrors to see hard-to-reach areas.

Although demographic and clinical factors were not associated with SSE performance, less educated and older survivors performed less comprehensive SSEs, and men conducted more comprehensive SSEs. Greater worry about recurrence, fewer barriers to SSE, more planning for when to conduct SSE, and more confidence in the ability to conduct SSE and recognize a suspicious growth were associated with both SSE performance and greater SSE comprehensiveness, and physician influence was positively associated with SSE performance. These findings are consistent with our prior work, which has indicated that fewer SSE barriers are associated with greater SSE adherence (Manne and Lessin, 2006). Our results extend the knowledge base by suggesting that SSE specific-attitudes such as identifying and addressing perceived barriers, fostering planning, and improving self-efficacy are important foci for intervention efforts to enhance SSE performance and comprehensiveness among survivors, and that intervention developers might want to focus on increasing comprehensiveness among more educated, older and/or female survivors. In this study, knowledge about melanoma or SSE was not associated with either outcome, which is in contrast to our prior work (Coups et al., 2016). If this finding is replicated in future studies, interventions seeking to improve SSE may benefit from less emphasis on information about melanoma and SSE and more content on barriers, skills, planning, and self-efficacy.

Before closing, it is important to point out the study's limitations. Most importantly, this is a cross-sectional study, and therefore causal inferences cannot be made. The extent to which prevalence estimates and correlates of SSE generalize to other populations of melanoma survivors outside of New Jersey is unclear. Second, participants who volunteer for an intervention study may be more motivated to improve their SSE behaviors than other melanoma survivors. Third, the 40.9% response rate is not high and may impact generalizability of results. Finally, explained variability ranged from 29.5% to 31.8%. Other possible correlates such as self-consciousness or preference for physician exams rather than self-exam are other potential correlates.

In conclusion, many melanoma survivors do not engage in regular SSE or examine their entire bodies. Lower worry about recurrence, more perceived barriers, lower self-efficacy, and lower levels of planning when to conduct an SSE may contribute to low engagement and less comprehensive self-exams. Efforts to improve SSE may benefit from focusing on these SSE-specific attitudes.

CRediT authorship contribution statement

Sharon L. Manne: Conceptualization, Methodology, Formal analysis, Writing - original draft, Writing - review & editing, Supervision, Visualization, Funding acquisition. **Carolyn J. Heckman:** Conceptualization, Methodology, Formal analysis, Visualization, Writing - review & editing. **Deborah Kashy:** Conceptualization, Methodology, Formal analysis, Writing - original draft, Writing - review & editing. **Carolina Lozada:** Data curation, Supervision, Investigation, Project administration. **Joseph Gallo:** Data curation, Supervision, Investigation, Project administration. **Lee Ritterband:** Conceptualization, Funding acquisition, Software. **Elliot J. Coups:** Conceptualization, Methodology, Software, Formal analysis, Investigation, Data curation, Visualization, Writing - review & editing, Supervision, Project administration, Funding acquisition.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.pmedr.2020.101110>.

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